

National Board of Examinations

Considering the variations in the level of standards of post graduate and post doctoral examinations in our country and based on the recommendations of an Expert Group set up for maintaining uniform standards, the Ministry of Health & Family Welfare, Government of India, established the National Board of Examinations (NBE) in 1975, with its headquarters at New Delhi.

Objectives of NBE

Conduct postgraduate examinations in the disciplines of modern medicine at the national level.

Maintain a high standard of examination, so as to ensure that candidates have received adequate training and are competent in every way to practice as specialists, in their respective fields.

Constitute Speciality Boards in which the examinations are to be conducted.

Formulate basic training requirements for eligibility to appear for the respective examinations.

Prescribe course curricula for postgraduate studies.

Organize postgraduate courses, workshops, seminars, symposia and training programmes of specialised nature.

Institute professorships, other faculty positions, fellowships, research cadre positions and scholarships etc. for realising the objectives of the Board.

Constitute an Accreditation Committee to approve centers for DNB courses.

Co-ordinate with national and international bodies, agencies, universities for the furtherance of the objectives of the Board.

Vol. IV. No. 6, November-December, 2009

Journal of Postgraduate Medical Education, Training & Research

National Board of Examinations



Contents

Editorial

- Objective structured clinical examination (OSCE) revisited 1
Piyush Gupta, Pooja Dewan, Tejinder Singh

Commentary

- Management of pain in orthopedics 11
A. Devadoss

Review articles

- Risk factors of coronary heart disease: a review 15
Radhika Sood, Anupa Siddhu, Pooja Jain, Piyush Jain

- Approach to a case of thyroid nodule-bed side to scintigraphy 29
Sourya Acharya, Samarth Shukla, S.N.Mahajan, S.K.Diwan, Datta Meghe

- Behaviour change communication 36
T. Mathiyazhagan, Deoki Nandan

- Dengue fever- management 45
P. G. Raman, Tehsin .A. Petiwala, Adnan .Z. Bootwala

Original Articles

- Mapping the risk factors of coronary heart disease among females
(45-65 years): a case-control study 51
Radhika Sood, Anupa Siddhu, Pooja Jain, Piyush Jain

- Study of the universal precautions practices in high risk areas of
a super-specialty tertiary care hospital 71
Amit Lathwal, Sanjay Kumar Arya, I.B.Singh, D.K.Sharma

- Reduction of neonatal mortality under integrated management of
neonatal and childhood illness (IMNCI) strategy: role of
behavior change communication 76
M. Parashar, J. Kishore, T. Mathiyazhagan

Clinical and radiological evaluation and management of infected non-union of long bones S.S.Yadav, Abhishek Kumar	80
Correspondence	
Accidental dural puncture with epidural needle – what to do next? Deepak Narang, Ravinder Kumar Batra	85
Recent Advances	
Etiological role of angiogenetic factors in preeclampsia: a review Betsy Varughese, Rani Kuma, Manoj Dhingra, Renu Dhingra	87
Ultrasound-enhanced trauma management Chetan Merchant, Sushma Sagar, Maneesh Singhal	92

Piyush Gupta, Pooja Dewan, Tejinder Singh

Department of Paediatrics, University College of Medical Sciences, Delhi, Christian Medical College, Ludhiana

Objective structured clinical examination (OSCE) was introduced in 1975 as a standardized tool for objectively assessing clinical competencies - including history-taking, physical examination, communication skills, data interpretation etc. It consists of a circuit of stations connected in series with each station devoted to assessment of a particular competency using pre-determined guidelines or checklists. OSCE has been used as a tool for both formative and summative evaluation of medical graduate and postgraduate students across the globe. The use of OSCE for formative assessment has great potential as the learners can gain insights into the elements making up clinical competencies as well as feedback on personal strengths and weaknesses. However, the success of OSCE is dependent on adequacy of resources, including the number of stations, construction of stations, method of scoring (checklists and/or global scoring), the number of students assessed and adequate time and money. Lately, OSCE has drawn some criticism for its lack of validity, feasibility, practicality, and objectivity. There is evidence to show that many OSCEs may be too short to achieve reliable results. There are also currently no clear cut standards set for passing an OSCE. It is perceived that

OSCEs test the student's knowledge and skills in a compartmentalized fashion, rather than looking at the patient as a whole. This article focuses on the issues of validity, objectivity, reliability, and standard setting of OSCE. As of now, the Indian experiences with OSCE are limited and there is a need to sensitise the Indian faculty and students. A cautious approach is desired before it is considered as a supplementary tool to other methods of assessment for the summative examinations in Indian settings.

That '*learning is driven by assessment*' is a well known fact. This is also referred to as the '*steering effect of examinations*'. To foster actual learning, assessment should be educative and formative. Medical education aims at the production of competent doctors with sound clinical skills. Competency encompasses six inter-related domains as developed by Accreditation Council for Graduate Medical Education (ACGME): knowledge, patient care, professionalism, communication and interpersonal skills, practice based learning and improvement, and systems based practice¹. Epstein and Hundert have defined competence of a physician as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values and

reflection in daily practice for the benefit of the individuals and the community being served"². The community needs to be protected from incompetent physicians; and thus there is a need for summative component in the assessment of medical graduates.

Looking beyond the traditional assessment tools-The traditional tools for assessment of medical students have mainly consisted of written exams (essay type, multiple choice, and short-answer type questions), bedside viva and clinical case presentation. These have focussed on the "*knows*" and "*knows how*" aspects, i.e., the focus has been on the base of the '*Miller's pyramid of competence*'. These methods of assessment however have drawn a lot of criticism over the years because of their inability to evaluate the top levels of the pyramid of competency in a valid and reliable manner. The following flaws were realised:

- They test only the factual knowledge and problem-solving skills of students, which may be appropriate only in the early stages of medical curriculum. These methods do not evaluate the clinical competence of students. Important aspects like performing a particular physical examination (shows how), clinical maneuver, and communication-skills are not

tested. Only the end result is tested and not the process of arriving at a result.

- The students are tested on different patients (patient variability). Each student is adjudged by only one or two examiners, thereby a scope for marked variation in the marking by different examiners (examiner variability). These factors increase the subjectivity of marking (lack of reliability).
- There is often a lack of clarity on what is actually being tested (lack of validity). Assessment is usually global and not competency based.
- Students are not examined systematically on core procedures.
- There is no systematic feedback from the students and teachers.

To obviate the drawbacks of conventional clinical evaluation, objective structured clinical examination (OSCE) was first introduced by Harden in 1975, as a more objective, valid, and reliable tool of assessment³. In an ideal OSCE, all domains of competencies are tested, specially the process part; the examination is organized to examine all students on identical content by the same examiners using predetermined guidelines; and a systematic feedback is obtained from both students and the teachers. OSCE is meant to test the 'shows how' level of the Miller's pyramid⁴.

Content and process of OSCE- OSCE consists of a circuit of stations which are usually

connected in series Each station is devoted to evaluation of one particular competency. The student is asked to perform a particular task at each station. These stations assess practical, communication, technical, and data interpretation skills and there is a predetermined decision on the competencies to be tested. Students rotate around the complete circuit of stations, and keep on performing the tasks at each of the stations. All students move from one station to another in the same sequence. The performance of student is evaluated independently on each station, using a standardized checklist. Thus, all students are presented with the same test; and are assessed by the same or equivalent examiners. Students are marked objectively on the checklist⁵ by the examiner.

Types of OSCE stations-The stations are categorized as 'procedure station' or 'question station'. Procedure stations are observed (by the examiner) while question stations are unobserved (only a written answer is desired). Student performance on a Procedure station is observed and marked there and then only while the Question stations can be evaluated later. The details of these stations along with specific examples have been described in one of our previous publication in *Indian Pediatrics*⁵. Procedure station and a question station can also be used together. In the original description of OSCE by Harden, every Procedure station was followed by a Question

station. Students are given a task to perform in Station 1 (which is observed and assesses the process of performing the task) and the questions are presented later (in Station 2). Questions in station 2 are related to station 1 only. This has two advantages: (a) different domains of learning can be assessed by them; and (b) the effect of cueing is minimized. It is also advisable to incorporate a *rest station* for every 30-40 minutes into the exam, to give a break to the students, the observers and the patients. They also allow time to substitute patients at a clinical station, or to complete the written left over task from the previous stations.

OSCE setup-The number of stations can vary from 12 to 30 though usually 20 stations suffice¹. The usual time allotted is 5 minutes for each station; ACGME however recommends station duration of 10-15 minutes. Giving more time per station allows more competencies to be tested in relation to the given task. All students begin simultaneously. The number of students appearing in the exam should not exceed the number of stations. In case, the number of students is more, one or more parallel sessions can be organized, subject to availability of space, examiners and patients. If facilities do not permit this, then two sessions can be planned. All students should commence the examination from a procedure station. The entire exam is usually completed within 60-150 minutes. Details of micropla-

ning of OSCE have been described earlier⁶.

Blueprinting: Preparing the Stations-Once the consensus is reached on the number and type of stations to be included, the next task is to formulate the questions, model keys, and checklists for each station. When planning an OSCE, the learning objectives of the course and the students' level of learning need to be kept in mind. The test content need to be carefully planned against the learning objectives- this is referred to as "blueprinting"⁷. Blueprinting ensures a representative sample of what the student is expected to have achieved. Blueprinting in practice consists of preparing a two-dimensional matrix: one axis represents the competencies to be tested (for example: history taking, clinical examination, counseling, procedure) and the second axis represents the system or problems on which these competencies are to be shown (for example: cardiovascular system, nutritional assessment, managing cardiac arrest, etc.)⁸.Blueprinting is essential for building a higher *construct validity* of OSCE by defining the problems which the student will encounter and the tasks within the problem which he is expected to perform. By laying down the competencies to be tested in a grid, the correct balance between different domains of skill to be tested can be obtained. Clinical competencies (including psycho-motor skills and certain affective domains) should be primarily identified and included in the OSCE setup.

OSCE can test a wide range of skills ranging from data gathering to problem solving⁴. Although it can be used for this purpose, OSCE is not very suited for evaluating the cognitive domain of learning, and certain other behaviors like work ethics, professional conduct, and team-work skills. For these objectives, it is appropriate to use other modes of assessment. Feasibility of the task is equally important. Real patients are more suited to assessing the learner's examination skills while simulated patients are more suited to evaluate the communication skills of the learner.

Setting the standards- The major impediment in the success of OSCE remains '*setting the pass mark*'. The standards for passing OSCE can be either relative (based on norm-referencing) or absolute (based on criterion-referencing). Both have their own utility as well as merits and demerits.

Norm-referencing- '*Angoff approach*' and '*borderline approach*' are commonly used to set relative standards for OSCE. In the former, expert judges determine pass marks based on their estimates of the probability that a borderline examinee will succeed on each item in a test⁹. A major drawback of this method is that the overall performance of a candidate is not judged. Also the estimates are based keeping a hypothetical candidate in mind and therefore may be incorrect. This way, different pass marks will be set across different medical institutions¹⁰. In addition, this is

a time-consuming process and requires greater commitment from the examiners. A minimum of 10 judges are required to obtain reliable results¹¹. The borderline approach (formulated by Medical Council of Canada)¹² is a simpler and more commonly accepted method for setting the pass marks. In this method the expert judges score examinees at each station according to a standardized checklist and then give a *global rating* of each student's overall performance. The student can be rated as pass, borderline, fail, or above expected standard. The mean scores of examinees rated as borderline becomes the pass mark for the station and the sum of the means becomes the overall pass mark¹³. To increase the reliability of this method all the expert judges should be subject experts and several examiners should examine at each station. The Otago study¹⁴ showed that 6 examiners per station and 180 examinees are needed to produce valid and reliable pass marks. This method has gained wider acceptance because the pass marks set are actually an average of differences in opinion of examiners unlike the '*Angoff marks*' which are obtained by arguing out the differences in opinion of the examiners. Whatever method of standard setting it used, a fine tuning of the 'experts' is necessary so that they view the performance of the students appropriate to his level (e.g. undergraduate or postgraduate) and not from a specialist perspective. Wass, *et al.*⁷ state that "Norm-referencing is clearly

unacceptable for clinical competency licensing tests, which aim to ensure that candidates are safe to practise. A clear standard needs to be defined, below which a doctor would not be judged fit to practise. Such standards are set by criterion-referencing.”

Criterion-referencing-An absolute clear-cut minimum accepted cut-off is decided beforehand¹⁵. For example, Medical Council of India (MCI) recommends 50% as the minimum pass marks for all summative examinations in medical specialities. National Board of Examination (NBE), India also accepts overall 50% marks as minimum acceptable for passing in OSCE examinations. A problem with using the overall pass mark as a benchmark for competence may not be acceptable as exceptional performance in a few stations would compensate for poor performance in other stations. It would be more appropriate to decide upon a minimum total score and a defined proportion of stations which the examinee must pass in order to pass the OSCE¹³. Certain institutions also make it mandatory to pass the critical stations. However, it should be kept in mind that OSCE allows students to score much higher marks as compared to case presentation and adding the two to decide a pass percentage may be in-appropriate. As a good practice, scores obtained at OSCE should be reported separately from the scores obtained at case presentations. Correlation between

the two sets of scores is generally poor¹⁶.

Checklists vs. Global Rating-Checklists were designed and incorporated into OSCE to increase the objectivity and reliability of marking by different examiners. However, scoring against a checklist may not be as effective as it was thought to be¹⁷. Evidence is accumulating that global rating by an experienced physician is as reliable as the standardised checklist. Regehr, *et al.*¹⁸ compared the psychometric properties of checklists and global rating scales for assessing competencies on an OSCE format examination and concluded that “global rating scales scored by experts showed higher inter-station reliability, better construct validity, and better concurrent validity than did checklists. Further the presence of checklists did not improve the reliability or validity of the global rating scale over that of the global rating alone. These results suggest that global rating scales administered by experts are a more appropriate summative measure when assessing candidates on performance based assessment.” Use of global ratings, however, mandates that only people with subject expertise can be used as examiners. However, there is still no consensus on the gold standard for the same. A balanced approach is suggested by Newble⁸ wherein checklists may be used for practical and technical skills stations and global rating scales are employed for Stations pertaining to diagnosis, communication skills

and diagnostic tasks. Another approach could be to use checklists during early part of clinical training and global ratings during final summative years.

Example of a global rating scale for assessing communication skills

Task: Counsel this 35 year old woman who is HIV positive about feeding her newborn baby. The student is rated on a scale of 1-5. The examiner score sheet would read as follows:

1. Exceptional
2. Good
3. Average
4. Borderline
5. Poor/Fail

Note: A checklist can be provided to assist the examiner in making his judgement of the student's performance, though no marks are decided for each item on the checklist. Using a checklist for a global rating can enhance the validity and reliability of OSCE.

The Concerns-OSCE, now into 35th year of its inception, has had its share of bouquets and brickbats. Despite controversies, it has stood the test of the time and has come to be recognized as a standard tool of assessment of medical competencies. OSCE has been used for both formative and summative examination at graduate and postgraduate level, across the globe. However, there is a Mr Hyde side to this Dr Jekyll. **Table II** outlines the factors that can affect the generalisability, validity, reliability and practicality of OSCE. The OSCE remains a toothless exercise if these factors

are not taken care of. Unfortunately that is what is happening at most of the places where OSCE is now being introduced.

Feasibility and practicality-It is agreed that setting and running an OSCE is very resource intensive in terms of manpower, labour, time, and money; requires very careful organization; and meticulous planning⁴. Training of examiners and patients, and preparation of stations and their checklists is a time consuming affair. Cost is high both in human resource needs and money expended - patient (actor) payment, trainer payment, building rental or utilities, personnel payment, student time, case development, patient training, people to monitor, video taping. Most OSCEs are administered in medical center outpatient facilities. A separate room or cubical is needed for each station and this may be difficult to administer in smaller set-ups. The problem is more acute in the developing countries and resource poor settings where a medical teacher has to assume the role of a consultant, service provider, researcher and administrator. This way, there is not much time the educator can spend on planning, preparing and executing an OSCE. This results in an OSCE which is more of artefact and less of a true assessment.

Objectivity -The objectivity of OSCE is determined by the skill of the experts who prepare the OSCE stations and the checklists. Over the years, however,

enthusiasm in developing detailed checklist (for increasing the objectivity) has led to another problem i.e. “trivialisation.” The task is fragmented in to too many small components; and all of them may not be clinically relevant for managing a patient. A higher objectivity also does not imply higher reliability and that global ratings (which are by and large subjective) are an inferior tool for assessment, especially in the hands of experienced examiners. An agreement has to be reached whether replacing the checklists by global rating on particular stations would improve the overall reliability, and then the OSCE can include both types of assessment tools.

Validity-Content validity can only be ensured by proper blueprinting⁸. Following this, each task must be standardized and there must be itemization of its components using appropriate scoring checklists. Blueprinting also ensures multimodality OSCE that increases the content validity¹⁹. Feedback from the examiners and the students can help in further improving the validity. OSCE is not suited to assess the competencies related to characteristics like longitudinal care of patients, sincerity and dedication of the examinee to patient care and long-term learning habits (consequential validity)^{20,21}. Mavis, *et al.*²¹ have questioned the validity of OSCE by arguing that “observing a student perform a physical examination in OSCE is not performance based assessment

unless data from this task is used to generate a master problem list or management strategy.” Brown, *et al.*²³ have questioned the predictive and concurrent validity of OSCE by observing that the correlation between the students’ result on OSCE and other assessment tools is low. It would be appropriate to use OSCE to assess specific clinical skills (psychomotor domain) and combine it with other methods to judge the overall competency. Verma and Singh²⁴ concluded that OSCE needs to be combined with clinical case presentation for a comprehensive assessment. Panzarella and Manyon²⁵ have recently suggested a model for integrated assessment of clinical competence studded with supportive features of OSCE (ISPE: integrated standardized patient examination) to increase the overall validity.

Reliability of OSCE on its Own is Less than Desirable-There are some issues related to reliability which need to be cleared for a proper understanding. Reliability does not simply mean reproducibility of results (for which, objectivity is a better term)-rather, reliability refers to the degree of confidence that we can place in our results (i.e. if we are certifying a student as competent, then how confident we are that he is really competent). This way of looking at reliability of educational assessment is different from the way we look at the reliability of say a biochemical test. It also needs to be understood that reliability is not

the intrinsic quality of a tool; rather it refers to the inferences we draw from the use of that tool. Reliability is generally content specific, meaning thereby that it is difficult to predict that if a student has done well on a case of CNS, he will do well on a case of anaemia also. Various factors can make results of OSCE less reliable include fewer stations, poor sampling, trivialization of the tasks, inappropriate checklists, time constraints, lack of standardized patients, trainer inconsistency, and student fatigue due to lengthy OSCEs. Leakage of checklists can also seriously compromise the validity as well reliability. A lot of variation has been reported when different raters have observed a station, and also between the performance from one station to another. High levels of reliability (minimum acceptable defined as the reliability co-efficient of 0.8, maximum achievable: 1.0) can be achieved only with a longer OSCE session (of 4-8 h)¹⁹. The reliability of a 1 and 2 h session is as low as 0.54 and 0.69 respectively; which is lower than the reliability of a case presentation of similar duration; but which can be increased to 0.82 and 0.9 in a 4 or 8 h session, respectively²¹. However, it is impractical to conduct an OSCE of more than 3 hours duration. Newble and Swanson(26) were able to increase the reliability of a 90 min OSCE from 0.6 to 0.8 by combining it with a 90 minute free-response item written test. Item analysis of OSCE station and exclusion of problem stations is a useful exercise to

improve the reliability²⁷. By ensuring content validity and by increasing the number of stations so that enough items can be sampled, reliability can be improved. All students should encounter similar test situation and similar real or simulated patients. Where it is difficult to arrange for similar real patients, it would be better to use simulated patients. However, arranging for children as simulated patients is usually not possible.

Traditional OSCE does not Integrate Competencies-The OSCE model suggested by Harden revolves around the basic principle of "one competency-one task-one station." Skills were assessed in an isolated manner within a short time span. This does not happen in a real life scenario where the student has to perform all his skills in an integrated manner with the ultimate aim to benefit the individual and the community. The modern educational theory also stipulates that integration of tasks facilitate learning²¹. It is thus imperative that the OSCE moves towards integrated assessment. For example dietary history taking and nutritional counseling can be integrated at one Station; similarly, chest examination and advising chest physiotherapy (based on the physical findings) can be integrated. There are important implications of these aspects in the design of OSCE. There is a general agreement now that everything that is objective is not necessarily reliable; and conversely, all that is subjective is not always unreliable. It is also

accepted that the advantages of OSCE do not relate to its objectivity or structure. If it was so, then the reliability of even a one hour OSCE would also have been high. Rather, the benefits seem to accrue from a wider sampling and use of multiple examiners, both of which help to overcome the threats to validity and reliability of assessment. OSCE should not be seen as a replacement for something - for example, a case presentation or viva; rather it should be supplementing other tools. Using multiple tools helps to improve the reliability of assessment by taking care of content specificity and inter-rater variability. At the same time, one should not be over-enthusiastic to use OSCE type examination for competencies, which can be effectively tested by means of a written examination.

Indian Experiences with OSCE-OSCE has been by and large used as an assessment tool for formative assessment of undergraduate medical students at a few centers^{5, 24, 28}. Most of the faculty is not oriented to its use, and not many universities have incorporated it in summative assessment plan for the undergraduates. Probably this is because the Medical Council of India has yet to recognise and recommend it as an acceptable tool for summative assessment. Another main reason for hesitancy, we feel, is the lack of training and time required on part of the faculty to initiate and sustain a quality OSCE. National Board of Examination, Ministry of

Health and Family Welfare, India has been using OSCE for summative assessment of postgraduate students for certification in the subjects of Otolaryngology, Ophthalmology, and Pediatrics for last few years. However, we feel that there are concerns as to the validity, reliability, scoring pattern and setting the standard in these examinations. For examples, there are only 6 procedure (observed) stations in a 24-30 station OSCE. The rest are based on recall and application of knowledge; for which more cost-effective testing tools are available. Many OSCE stations sample a very basic skill without relating them to a real life clinical situation. Most of the time, normal individuals are used as patient material. The standardized simulated patients include student nurse or a resident, who has not been trained specifically for this task. He/she is picked up only a few minutes before the exam. It is difficult to obtain uniformity in marking and inter-rater variability is likely to be more since the test is run concurrently at more than one center, spread all over India. There is no formal feedback given to the students or to the examiners to improve their performance. Finally, the passing standard is set arbitrarily at 50% which is not only not in conformity either with the accepted Angoff or Borderline approach but also obtained by adding the scores of multiple tools of variable reliability. Thus the OSCE pattern has limited validity and reliability and there is need for a

re-look – either the present system be strengthened, or alternative methods should replace them.

Conclusions- it is generally agreed that OSCE is a tool of assessment that tests competency in fragments and is not entirely replicable in real life scenarios. OSCE is useful for formative assessment and can be continued for this purpose. However on its own, it cannot be relied upon to fulfil the three necessary prerequisites for a summative assessment as laid down by Epstein²⁹ i.e., promote future learning, protect the public by identifying incompetent physicians, and choosing candidates for further training. Limited generalizability, weak linkages to curriculum, and little opportunity provided for improvement in examinees' skill have been cited as the reasons for replacing OSCE with alternative methods in certain medical schools²². On a closer look there are gaps with respect to objectivity, validity and reliability of this assessment, especially in resource poor settings. It is costly and time consuming. It requires special effort and money to design OSCE stations, which will measure the essential professional competencies including ability to work in a team, professional ethical behaviour, and ability to reflect on own (self-appraisal). Therefore, it can be considered as a supplementary tool to other methods of assessment in the final examination. For a summative assessment, OSCE should not constitute more than

one-third of the total evaluation scheme and as far as possible, its grades should be reported separately. The need of the hour is an integrated multiplanar (3 dimensional) 360° assessment in its true perspective, of which OSCE can be a vital component.

References

1. Accreditation Council for Graduate Medical Education (ACGME). Outcome Project. <http://acgme.org/Outcome/>. Accessed on 23rd July 2009.
2. Epstein RM, Hundert EM. Defining and assessing professional competence. *JAMA* 2002; 287: 226-235.
3. Harden RM, Stevenson W, Downie WW, Wilson GM. Assessment of clinical competence using an objective structured clinical examination. *Br Med J* 1975; 1: 447-451.
4. Harden RM, Gleeson FA. Assessment of clinical competence using objective structure clinical examination (OSCE). *Med Edu* 1979; 13: 41-54.
5. Gupta P, Bisht HJ. A practical approach to running an objective structured clinical examination in neonatology for the formative assessment of undergraduate students. *Indian Pediatr* 2001; 38: 500-513.
6. Boursicot K, Roberts T. How to set up an OSCE. *Clin Teach* 2005; 2: 16-20.
7. Waas V, van der Vleuten CPM. The long case. *Med Edu* 2004; 38: 1176-1180.

8. Newble D. Techniques of measuring clinical competence: objective structured clinical examination. *Med Edu* 2004; 38: 199-203.
9. Angoff WH. Scales, norms and equivalent scores. In: Thorndike RL, ed. *Educational Measurement*. Washington, DC: American Council on Education; 1971. p. 508-600.
10. Boursicot KAM, Roberts TE, Pell G. Using borderline methods to compare passing standards for OSCEs at graduation across three medical schools. *Med Edu* 2007; 41: 1024-1031.
11. Kaufman DM, Mann KV, Muijtjens AMM, van der Vleuten CPM. A comparison of standard setting procedures for an OSCE in undergraduate medical education. *Acad Med* 2001; 75: 267-271.
12. Dauphinee WD, Blackmore DE, Smee SM, Rothman AI, Reznick RK. Using the judgements of physician examiners in setting the standards for a national multi-center high stakes OSCE. *Adv Health Sci Education: Theory Prac* 1997; 2: 201-211.
13. Smee SM, Blackmore DE. Setting standards for an objective structured clinical examination: the borderline group method gains ground on Angoff. *Med Edu* 2001; 35: 1009-1010.
14. Wilkinson TJ, Newble DI, Frampton CM. Standard setting in an objective structured clinical examination: use of global ratings of borderline performance to determine the passing score. *Med Edu* 2001; 35: 1043-1049.
15. Cusimano MD. Standard setting in medical education. *Acad Med* 1996; 71(suppl 10): S112-120.
16. Verma M, Singh T. Experiences with objective structured clinical examination (OSCE) as a tool for formative assessment in Pediatrics. *Indian Pediatr* 1993; 30: 699-702.
17. Reznick RK, Regehr G, Yee G, Rothman A, Blackmore D, Dauphinee D. Process-rating forms versus task-specific checklists in an OSCE for medical licensure. *Acad Med* 1998; 73: S97-99.
18. Regehr G, MacRae H, Reznick RK, Szalay D. Comparing the psychometric properties of checklists and global rating scales for assessing performance on an OSCE-format examination. *Acad Med* 1998; 73: 993-997.
19. Walters K, Osborn D, Raven P. The development, validity and reliability of a multimodality objective structured clinical examination in psychiatry. *Med Edu* 2005; 39: 292-298.
20. Barman A. Critiques on the Objective Structured Clinical Examination. *Ann Acad Med Singapore* 2005; 34: 478-482
21. van der Vleuten CPM, Schuwirth WT. Assessing professional competence: from methods to programmes. *Med Edu* 2005; 39: 309-317.
22. Mavis BE, Henry RC, Ogle KS, Hoppe RB. The Emperor's new clothes: OSCE reassessed. *Acad Med*. 1996; 71: 447-453.
23. Brown B, Roberts J, Rankin J, Stevens B, Tompkins C, Patton D. Further developments in assessing clinical competence. In: Hart IR, Harden RM, Walton HJ, eds. *Further developments in assessing clinical competence*. Montreal: Canadian Health Publications; 1987. p. 563-571.
24. Verma M, Singh T. Attitudes of Medical students towards objective structured clinical examination (OSCE) in pediatrics. *Indian Pediatr* 1993; 30: 1259-1261.
25. Panzarella KJ, Manyon AT. A model for integrated assessment of clinical competence. *J Allied Health* 2007; 36: 157-164.
26. Newble D, Swanson D. Psychometric characteristics of the objective structured clinical examination. *Med Edu* 1988; 22: 325-334.
27. Auewarakul C, Downing SM, Praditsuwan R, Jaturatamrong U. Item analysis to improve reliability for an internal medicine undergraduate OSCE. *Adv Health Sci Edu* 2005; 10: 105-113.
28. Mathews L, Menon J, Mani NS. Mico-OSCE for assessment of undergraduates. *Indian Pediatr* 2004; 41: 159-163.
29. Epstein RM. Assessment in medical education. *N Engl J Med* 2007; 356: 387-396.

Table-1, list of materials needed for the conduct of OSCE

General

1. Venue: Suitable spacious hall with sound proof parti-tions, or multiple adjacent rooms, waiting rooms for back up patients, rest rooms, refreshment area, briefing room
2. Furniture: Tables, chairs (for patient, examiner and examinee at each station), beds or examination couches, patient screen, signages, room heater or cooler
3. Timing device: Stop watch or bell
4. Stationery: Score sheets, checklists, answer scripts, pens/ pencils
5. Manpower: Nurses, order-lies, simulated/ real patients, helpers/marshals
6. Catering: Drinking water & food (snacks & lunch)

Station Specific				
Station No.	Station description	Basic equipment	Specific needs	Patient requirement
1.	Data interpretation	Table, 1 chair	Calculator	-
2.	Clinical examination of CNS	Patient screen, examination couch/ warmer, 2 chairs, heater/blower, handrub, paper napkins	Patellar hammer, cotton wisps, tuning fork,	4 simulated patients,
3.	E q u i p m e n t : Phototherapy	Writing desk, 1 chair	Phototherapy equipment with duly labeled parts/components	-
4.	Rest station	Table, 1chair	A tray with biscuits, napkins	-
5.	Clinical photographs	Mounting board, writing desk, 1 chair	A chart with affixed and labeled photog-raphs	-

Table-2, factors affecting the usefulness of OSCE as an assessment tool

	Factor	Limitation
1	Number of stations	Requires min 14-18 stations ¹ . Lesser the number-lesser the reliability ²⁹ , and lesser the content validity
2	Time for assessment	Lesser the time-lesser the reliability. A 10 minute station is more reliable as compared to a 5 minute station ^{25,30}
3	Unreliably standardised patients	Limits reliability and validity
4	Individualised way of scoring	Limits reliability
5	Assessing only one component at a time	Limits validity ⁴
6	Lack of Item analysis	Affects reliability ²⁶
7	Skill of the person preparing the checklist	May hamper objectivity; limits validity and reliability
8	Number of procedure stations	Lesser the number, lesser the no of clinical competencies that can be tested. Content specificity of stations limits reliability
9	Identification and deletion of problem stations	Increases reliability ²⁶
10.	Task specific checklists	May not exactly replicate an actual clinical encounter, limits validity ¹³
11.	Blueprinting	Increases the content validity ¹⁰
12.	Competencies assessed	Not useful for assessing the learning behaviour, dedication to patients, and longitudinal care of patients ⁴
13.	Expensive and labour-intensive	Limits practicality and feasibility ³¹

Table-3, Grid showing the OSCE blueprint to assess final year medical students

	History	Examination	Procedure/data interpretation
CVS	Chest pain	Cardiovascular system	ECG interpretation; BP
Chest	Fast breathing and cough	Respiratory system	Chest physiotherapy/ Peak flow
Abdomen	Abdominal distension	Abdomen examination	Ascitic tap
CNS	Headache	Nervous system/ Eyes	Fundoscopy
Cardiac arrest			CPR

A.Devadoss

Institute of Orthopedic Research and Accident Surgery, Madurai

In this modern era of joint replacement surgeries and the day care surgery like arthroscopic surgeries, carpal tunnel release etc, the acute post operative pain is often under treated, the consequences of which add to the huge burden of pain management on patients and society. We see in our day to day practice, inadequate relief of postoperative pain can delay recovery, necessitate re-hospitalization, increase the duration of the hospital stay and reduce patient satisfaction. It is often the case that orthopedic operations are more painful than other surgical procedures. This is because bone injury is more painful than soft tissue injury; this increased pain occurs because the periosteum has the lower pain threshold of the deep somatic structures. But other factors also play a part e.g: patient's age, health status, chronic pain history, type of surgery (spinal surgery and total knee replacement are very painful) and inpatient/outpatient setting influence the choice of anaesthesia and technique of acute pain management.

Basic science of pain -De Leo (2006) clearly brought out that the processing of pain takes place in an integrated matrix at peripheral, spinal and supraspinal nerve sites. The peripheral nerve fibres have a delta and beta fibers which

are myelinated. They conduct cold and well localized pain sensations. The C fibres are unmyelinated, they signal pain that is poorly localised or caused by heat or mechanical stimuli. Acute pain results from mechanically, chemically or thermally induced damage to tissue integrity. Several chemicals such as, histamine, bradykinin, Prostaglandins, serotonin, P substance, acetylcholine, leukotrienes are released by damaged cells in response to tissue injury and local inflammation. Sensitisation lowers the nociceptive threshold to painful stimuli and can result in repeated afferent input in the nervous system that leads to activation – dependent neuronal plasticity. Pain is recognized not only as a sensory experience but also as a phenomenon with affective and cognitive components. The general stress response to surgical and other trauma results in endocrine and metabolic changes that affect cardiovascular, respiratory, and gastrointestinal and musculo skeletal systems. The general stress response may be caused by nociceptive impulses and by factors including anxiety, haemorrhage and infection as well as local tissue factors. Anxiety and fear causing from unrelieved severe, acute pain can exacerbate the perception of pain and lead

to behavioral changes, including depression. Pain can also produce sleeplessness, which can further compound the vicious cycle of acute pain. Acute pain may produce decreased blood flow which may interfere with wound repair. Segmental and suprasegmental motor activity in response to pain results in muscle spasm.

Treatment of acute pain-NSAIDS, opioids and steroids have commonly been offered as first line treatments of acute pain.

- **NSAIDS**-Their main action is inhibition of prostoglandin production by the COX enzyme. The anti-inflammatory and the analgesia activity are produced by inhibition of the COX-2 isoenzyme. NSAIDs are very useful in mild to moderate postoperative pain after minor and day care surgeries. They enhance the quality of analgesia produced by opioid and decrease its requirements. NSAIDs are frequently used in osteoarthritis of knee joints in day to day practice and also in Rheumatoid arthritis. In 2004, the manufacturer of rofecoxib withdrew the drug from the world market due to the incidences of thrombotic cardiovascular problems. The safety of nonselective NSAID in this patient group has not

been established since patients may require prophylaxis to prevent gastroduodenal damage. For fracture repair, inflammation is an essential component for healing process. Hence there is a concern that because NSAIDs are commonly used to manage pain due to fractures, they may also delay the healing of fractures but there is no high quality randomised, controlled trials to verify this on fracture healing.

- **Acetaminophen**-This antipyretic and analgesic drug's effects are centrally mediated. The analgesic effect is by increasing the pain threshold, possible by means of central inhibition of prostaglandin production. Its antipyretic properties may be to its action on the hypothalamic heat centre. Although acetaminophen is a safe drug when used at its therapeutic doses (325 to 650mg every 4 to 6 hours – not to exceed 4gm/day), overdoses, may produce fatal and non fatal hepatic necrosis. In alcoholics, acetaminophen poisoning can cause acute liver failure.
- **Tramadol hydrochloride**-A synthetic analogue of codeine. It has two modes of action – a centrally acting analgesic agent and as an inhibitor of more norepinephrin and serotonin uptake . It has no adverse effects of sedation, respiratory depression, gastrointestinal stasis or abuse potential. The combi-

nation of tramadol hydrochloride and acetaminophen has been used extensively with success in moderate to moderately severe acute and chronic pain. But some patients develop nausea after taking tramadol tablets.

- **Opioids**-They are very good in relieving moderate to severe pain. Their analgesic effect is by mimicking the action of the endogenous opioid peptides. There are three major classes of opioid receptor Mu, kappa and delta Mu subtype produces supraspinal analgesia and Mu subtype 2 affects respiratory, cardio vascular and gastrointestinal functions. Codeine is a weak opioid derived from morphine that must be metabolised for analgesic effects . Codeine is useful in mild to moderate pain and can be combined with acetaminophen and NSAIDs. Morphine is still the gold standard for severe pain arising from deep structures. But its side effects include nausea, vomiting, constipation and respiratory depression. Fentanyl citrate is used intra-operatively by Anaesthesiologists for intra operative analgesic because of its short duration of action. Oxycodone is an oral opioid used to relieve moderate to severe pain . Addiction to this tablet is a common problem.
- **Corticosteroids** - Corticosteroids are of two types glucocorticoids and

mineralocorticoids . Glucocorticoids have the most powerful anti-inflammatory characteristics of all steroids. Most of the unwanted complications are caused by their mineralo corticoid properties. However corticosteroids are very useful in relieving acute sciatic pain brachial neuralgia. But one has to be aware of the numerous potential side effects like diabetes mellitus, gastritis, hypertension cushingoid face etc. Local steroid injection is very useful in selected resistant cases of tennis elbow, plantar fasciitis, rotator cuff disease, cervical spondylosis etc. One has to be very careful and diabetic and better done in operation theatre. Adverse effects associated with the use of steroids can be attributed to high mineralocorticoid activity. Although, the ideal dose and mode of administration has yet to be determined, there is overwhelming evidence that corticosteroids increase the efficacy of pain reduction following surgery in a manner that does not significantly compromise patient safety

Perioperative acute pain management-The Task Force of American Society of Anaesthetists on pain management has produced guidelines. They include the preoperative planning, patient education 24 hour availability of anaesthetists and use of standardised institutional policies. They also stressed the importance

of multimodal, organized interdisciplinary approach to peri-operative pain management and also recognized the special needs of paediatric, geriatric and day care surgery patients². Anaesthetic options include general anaesthesia, neuraxial blocks and peripheral nerve blocks alone or in combination. Regional anaesthesia are performed safely in patients who are scheduled to receive an anticoagulant after surgery as long as there is an appropriate interval between removal of the epidural catheter and the start of the anti coagulation therapy. Epidural anaesthesia, as opposed to general anaesthesia, is associated with reduced morbidity and mortality in patients undergoing general and orthopaedic procedures³. There are evidences to suggest that epidural anaesthesia reduces the risk for Thrombo embolism⁴. However to avoid the complication of epidural haematoma, the use of epidural anaesthesia requires the strict observance of guidelines in patients receiving thromboprophylaxis. The ultimate choice of anaesthesia depends on the patient preference and type and duration of surgery, patient positioning and blood loss. Pre-emptive analgesia may have less of an effect in patients with preoperative pain who undergo orthopaedic procedures. This will have a definitive preemptive effect on postoperative pain following metal exit and mass excision but less of an effect after fracture and arthritis related surgery.

Postoperative acute pain management-Postoperative Pain is a horrible experience for many patients and they also discourage other patients to undergo elective surgery especially total knee replacement. Postoperative pain, whether after ambulatory surgery or major inpatient surgery, can cause tremendous patient suffering and delay recovery and discharge from hospital. It is very important to suppress the development of the acute postoperative stress syndrome. Preoperative patient education, is essential that includes identifying options, setting realistic goals, and reassuring the patient that pain issues will be adequately taken care of. The degree of tissue trauma plays a major role in the intensity of post operative pain⁵. Many of our orthopaedic operations require postoperative physical therapy. The requirement of active versus passive physiotherapy influences the postoperative pain management regimen. Active mobilization requires a preferential sensory block with motor sparing, whereas passive therapy does not. The use of low concentration local anaesthesia (Particularly ropivacaine, which is motor sparing) produces preferential sensory block when active physical therapy is required. Continuous peripheral nerve block techniques also eliminate the concern of anticoagulation therapy and the risk of epidural haematoma.

Multimodal anesthesia-This type of anaesthesia is very popular is relieving pain after joint

replacement surgery. This term refers to the simultaneous use of multiple analgesic methods or drugs. Pain is an integrated process that is mediated by activation of numerous biochemicals and anatomic pathways. Multimodal approach deploys interventions such as local anesthesia, NSAIDS or an opioid to achieve combination analgesic therapy. The combination of pain modulation at multiple foci affords the anaesthetist and the surgeon an opportunity to address peripheral spinal and supraspinal mechanism of pain transmission. By effectively targeting each site, decreased doses of individual agents may be used to reduce the side effects. Synergistic action can also be beneficial through this approach.

Management of chronic pain -Chronic pain in orthopaedics may be due to multi various causes including various types of chronic arthritis, low back ache, cervical spondylosis and above all some element of functional overlay. Various treatment modalities, including multimodal anaesthesia, NSAIDS (some patients take them on their own without realizing its complications), antiepileptic medications like gabopentin, selective serotonin receptor uptake inhibitors, tri-cyclic antidepressants and non pharmacological pain control media like transcutaneous electrical nerve stimulation and acupuncture may give some relief temporarily⁵. Depression and

anxiety and two of the most common psychologic correlates of chronic pain and greatly complicate the patient's condition and treatment.

Conclusion - Orthopaedic Surgery has advanced tremendously in the last three decades in the diagnosis and treatment of most common orthopaedic conditions including trauma and joint replacement surgeries, the source of musculoskeletal pain is often an enigma to the treating orthopaedic surgeon. Appropriate pain management can be obtained through a multi modal approach, proper education, appropriate explanation and a comprehensive treatment plan.

References

1. De Leo JA, Basic Science of Pain JBJS, 2006- 88A, 58-62.
2. American Society of Anaesthesiologists Task Force on Acute Pain Management. Practice guidelines for acute pain management in the perioperative setting: An updated report by the American Society of Anaesthesiologist Task Force on Acute Pain Management Anaesthesiology 2004; 100: 1573 -1581.
3. Gonano C, Leitgeb U, Sitywolh C, Ihra G, Weinstabl C, Kettner SC, Spinal Verses general anaesthesia for orthopaedic surgery ; Anaesthesia and supply costs . Anaesth Analg .2006; 102; 524-529.
4. Sharrork NE, G.O.G, William, Russo P. Harpes SB, Harpe PC; Comparison of extradural and general anaesthesia on the fibrinolytic response to total knee arthroplasty. Br. J. Anaesthesia 1997; 79: 29-34.
5. Allegrante JP: The role of adjunctive therapy in the management of non malignant pain. American Journal of Medicine 1996; 101: 335-395.

Sushruta

Sushruta (also spelt **Susruta** or **Sushrutha**) (c. 6th century BC) was the first surgeon in the world who lived in ancient India and is the author of the book *Sushruta Samhita*, in which he describes over 120 surgical instruments, 300 surgical procedures and classifies human surgery in 8 categories. He lived and taught and practiced his art on the banks of the Ganga in the area that corresponds to the present day city of Varanasi in North India.

In the Sushruta school, the first person to expound Âyurvedic knowledge was Dhanvantari who then taught it to Divodasa who, in turn, taught it to Sushruta, Aupadhenava, Aurabhra, Paushakalâvata, Gopurarakshita, and Bhoja.

Because of his seminal and numerous contributions to the science and art of surgery he is also known by the title "Father of Surgery." Much of what is

known about this inventive surgeon is contained in a series of volumes he authored, which are collectively known as the *Susrutha Samhita*. The "Samhita" has some writings that date as late as the 1st century, and some scholars believe that there were contributions and additions to his teachings from generations of his students and disciples. Susrutha is also the father of Plastic Surgery and Cosmetic Surgery since his technique of forehead flap rhinoplasty (repairing the disfigured nose with a flap of skin from the forehead), that he used to reconstruct noses that were amputated, is practiced almost unchanged in technique to this day. The *Susrutha Samhita* contains the first known description of several operations, including the uniting of bowel, the removal of the prostate gland, the removal of cataract lenses and the draining of abscesses. Susrutha was also the first surgeon to advocate the practice of operations on inanimate objects such as watermelons, clay pots and reeds; thus predating the modern practice of the surgical workshop by half a millennium

Radhika Sood, Anupa Siddhu, Pooja Jain, Piyush Jain

Lady Irwin College, Daulat Ram College, Escort Heart Institute and Research Centre, New Delhi

Over the 20th century, most countries in the world have experienced great transitions in social structures, economics, politics, education, and home environments. These social and economic transitions have resulted in major changes in population demography, industrial structure, income levels, expenditure patterns, education levels, family structures, eating habits, and physical activity. These changes have markedly increased cardiovascular risk factors and disease rates (Yusuf et al, 2001). Premature disability from Cardio Vascular Diseases (CVD) is now emerging as a leading community health problem in developing nations. The economic transition, industrialization and urbanization, of many Asian countries have been accompanied by a sharp increase in CVD morbidity and mortality (Abeywardena, 2000). CVD include Coronary Heart Disease (CHD) [also referred to as coronary artery disease (CAD) or Ischemic Heart Disease (IHD)], cerebrovascular disease and peripheral arterial disease. Inappropriate nutrition has most consistently been associated with CHD. The basic pathological lesion underlying CHD is the atheromatous plaque that bulges on the inside of one or more of coronary arteries that supply blood to the heart muscle (myocardium). In addition, a superimposed thrombus or clot

may further occlude the artery. A variety of cells and lipids are involved in pathogenesis of atherosclerotic plaque and the arterial thrombus, including lipoproteins, cholesterol, triglyceride, platelets, monocytes, endothelial cells, fibroblast and smooth muscle cells. Two major clinical conditions associated with these processes are:

- Angina pectoris, which is characterized by pain or discomfort in chest that is brought on by exertion or stress, and which may radiate down the left arm and to neck. It results from a reduction or temporary block to the blood flow through the coronary artery to the heart muscle. The pain usually passes with rest and seldom lasts for more than 15 min.
- Coronary thrombosis, or Myocardial Infarction (MI), results from prolonged total occlusion of artery, which causes infarction or death of some of the heart muscle cells and is associated with prolonged, and usually excruciating, central chest pain. The terms coronary thrombosis and MI are used to describe the same clinical condition, although they really describe pathological condition.

In most industrialized countries, CHD is the most common single cause of death and a major cause

of admission to hospitals. However, mortality and hospital statistics appreciably underestimate the total morbidity resulting from CHD. Some cases of MI, especially in older people are not admitted to hospital and there are no statistics regarding the far greater number of people who are debilitated by angina pectoris even though they may not have suffered an acute MI (Mann, 2005).

Epidemiological transition-

The health status and disease profile of human societies have historically been linked to the level of their economic development and social organization. With industrialization, the major causes of death and disability, in the more advanced societies, have shifted from a predominance of nutritional deficiencies and infectious diseases, to those classified as degenerative chronic diseases such as CVD, cancer, and diabetes. This shift has been termed “the epidemiological transition” (Yusuf et al, 2001). Epidemiological transition is due to improved longevity. As the life expectancy increases, the period of exposure to CAD risk factors also increases. Other important contributors to this transition are the so-called “globalization” of dietary habits and urbanization (Okraïnec et al, 2004)

CHD in developing countries- IHD mainly heart attacks and CAD is the leading cause of

mortality in the world. More than 80% of these have been found in developing countries (Dhall, 2009). According to the Global Burden of Disease (GBD) Study, the developing countries contributed 3.5 million of 6.2 million global deaths attributable to CHD in 1990. These countries will account for 7.8 million of 11.1 million deaths related to CHD in 2020. Because of the early onset of the disease and early age of death, the developing countries contributed to 66% global Disability adjusted life years (DALY) loss related to CHD in 1990 and will contribute to 78% of global estimates in 2020 (Murray and Lopez, 1997)

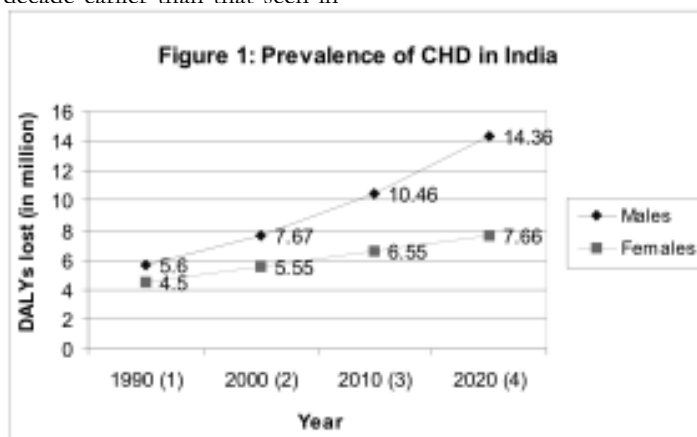
CHD scenario in India-CHD has assumed epidemic proportions in India. The disease is more prevalent in urban populations and there is a clear gradient in its prevalence from rural to semi-urban to urban populations. The disease occurs at a younger age in Indian subjects compared to western developed nations (Gupta, 2005). A recent study assumes that by 2010 India would be the home to 60% of world's heart disease burden, nearly four times more than its share of global population. What is more striking is fact that these conditions are now striking at an earlier age. Heart disease is indeed crippling India. Annually over two million people die of coronary disease in India and the country stands to loose \$236 billion in next 10 years due to lost productivity and treatment cost (Dhall, 2009).

CHD mortality -The mortality due to non-communicable disease is expected to increase from 28.1 million in 1990 to 49.7 million in 2020 worldwide. In 2020, IHD will be a leading cause of DALY. According to the GBD Study in India, in the year 1990 CHD caused 0.62 million deaths in men and 0.56 million deaths in women (total 1.18 million). By the year 2000, CHD had led to 1.59 million deaths and stroke to 0.60 million deaths (Murray and Lopez, 1997). In western countries where CVD is considered a disease of aged, 23% of CVD death occurs below the age of 70; this compared with 52% of CVD deaths occurring among people under 70 years of age in India. As a result, the Indian subcontinent suffers from a tremendous loss of productive working years due to CVD deaths (Goyal and Yusuf, 2006).

CHD prevalence - The prevalence of CHD is known to be high in people of South Asian descent. Moreover, CHD among them is often premature and occurs a decade earlier than that seen in

Europeans and/ or Americans (Guha et al, 2005). The GBD Studies reported the DALYs lost by CHD in India among males and females (Gupta et al, 2008). Figure-1, shows the prevalence of CHD in India among males and females.

Prevalence of CHD in urban and rural population-Rural-urban comparison shows that while prevalence has increased two-fold in rural areas (2.06% in the 1970s to 4.14% in the 1990s) the prevalence in urban areas has increased nine-fold (1.04% in the early 1960s to 9.45% in the mid 1990s) (Gupta and Gupta, 1996). In the absence of reliable nationwide prospectively collected morbidity data, estimates of the burden of CHD have been based on indicators from population-based, cross-sectional surveys. Multiple epidemiological studies have been performed in urban and rural populations in India over the past 60 years (Gupta et al, 2008). The prevalence of CHD in various studies is shown in Table-1.



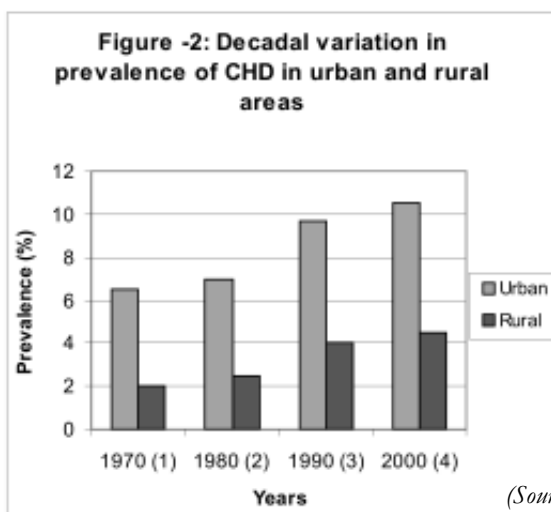
(Source: Gupta et al, 2008)

Table-1, CHD prevalence studies in India

First Author	Year	Age group	Place	Sample size	Prevalence %
Urban population					
Mathur KS	1960	30-70	Agra	1046	1.05
Padmavati S	1962	30-70	Delhi	1642	1.04
Sarvotham SG	1968	30-70	Chandigarh	2030	6.60
Gupta SP	1975	30-70	Rohtak	1407	3.63
Chadha SL	1990	25-65	Delhi	13723	9.67
Gupta R	1995	20-80	Jaipur	2212	7.59
Mohan V	2001	20-70	Chennai	1150	11.00
Gupta R	2002	20-80	Jaipur	1123	8.12
Pinto VG	2004	35-64	Panjim	371	13.21
Kumar R	2006	35-80	Chandigarh	1012	7.12
Kamili MA	2007	40-80	Srinagar	1576	8.37
Rural population					
Dewan BD	1974	30-70	Haryana	1506	2.06
Jajoo UN	1988	30-70	Vidarbha	2433	1.69
Chadha SL	1989	35-65	Haryana	1732	2.71
Kutty VR	1993	25-65	Kerela	1130	7.43
Wander GS	1994	30-70	Punjab	1100	3.09
Gupta R	1994	20-80	Rajasthan	3148	3.53
Gupta AK	2002	20-80	Himachal	1160	5.00
Chow C	2007	20-90	Andhra	345	3.60
Kamili MA	2007	40-80	Kashmir	1552	6.70

(Source: Gupta et al, 2008)

Analysis of prevalence studies in various decades in India provides significant information regarding the absolute number of CHD cases. Decadal variations indicate that the prevalence has increased in urban areas (Figure -2). As epidemiological studies exclude many patients with silent and asymptomatic CHD, the actual numbers may be much greater (Gupta, 2005).



(Source: Gupta, 2005)

Urban rural differences in risk factors-The steep rise in CVD risk factor burden is the result of rapid increase in the proportion of urban inhabitants (currently at 30% with a projected rise to 43% in 2021). Urbanization is characterized by a marked increase in the intake of energy-dense foods, a decrease in physical activity, and a heightened level of psychosocial stress, all of which promote the development of dysglycemia, hypertension, and dyslipidemia (Goyal and Yusuf, 2006). Some of the studies from India suggest that individuals with lower levels of income or education are at higher risk of CHD. This is similar to trend in developed countries the highest prevalence is shifting from the more affluent to less affluent (Gupta and Gupta, 1996; Ramachandran et al, 2001).

Recent case-control studies-A few case-control studies have been conducted on native Indians. Pais et al (1996), conducted a prospective hospital based case-control study of 200 cases with first Acute Myocardial Infarction (AMI) and compared the risk factor profile with age matched 200 controls. The most important predictor of AMI was current smoking, history of hypertension and diabetes. Other factors that were independent predictors were fasting blood glucose and abdominal obesity. Rastogi et al (2004) performed a multicentric case control study to identify important risk factors and reported similar findings. Cigarette smoking, beedi smoking, body mass index >25kg/m², waist to hip ratio >1.0, and history of

hypertension, high cholesterol and diabetes were important risk factors. The INTERHEART study was a standardized case-control study of AMI in 52 countries representing every inhabited continent. 15,512 cases and 14,820 controls, both males and females were enrolled. The study identified nine easily measured risk factors- abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychological factors, low fruit and vegetable consumption, low alcohol consumption, and lack of physical activity were associated with more than 90% of the risk of an AMI world wide (Yusuf et al, 2004). Jain et al (2008) conducted a hospital based case control study on 197 middle aged urban males (40-64 years) with angiographically proven CHD and 197 age-matched and gender-matched healthy controls. The factors low HDL-C, low educational status, history of diabetes mellitus, full cream milk consumption, high milk intake, low fruit consumption, tobacco abuse, family history of premature CVD, high fasting blood glucose, history of hypertension contributed to 44.1% of the Population Attributable Risk (PAR).

CHD in women-CHD is the leading cause of death among women in developed and developing countries (Reddy, 2004). The incidence of CHD is markedly lower among women than men prior to the age of 50 years after which time CHD increases and approaches that seen among men by the eighth decade (Sytkowski et al, 1996). Although the Framingham Study described

risk factors for CHD in women, the study was limited to white Caucasians living in the USA, and was unable to explain the later age of first occurrence of MI among women compared to men (Kannel et al, 1976). This may be because Framingham study only measured a limited number of risk factors. It is generally believed that the later age of MI in women is due to the protective effects of female sex hormones, but differences in diet and smoking may also be important (Anand et al, 2008). According to WHO (2008), CVD affects as many women as men, albeit at an older age. Heart disease is underestimated in women. In developed countries women are less likely to be referred to heart specialist. Women are more likely to enter medical system with diagnosis of second heart attack. More research is needed to improve the understanding of differences in response to treatment in men and women.

Established coronary risk factors-The concept of risk factors constitutes a major advance for developing strategies for preventing CHD. The Framingham Heart Study played a vital role in defining the contributions of risk factor to CHD occurrence in general population of United States (Grundey et al, 1997). The risk factors have been categorized into four categories that match the intensity of risk factor management with the evidence for association with CVD, clinical usefulness, and response therapy, Table-2 (Pasternak et al, 1996).

Table-2, Cardiovascular risk factors

Risk factors
Category-I, Risk factors for which intervention have been proven to reduce the incidence of CAD event Cigarette smoking, Hypertension, Dietary factors (High-fat/ cholesterol diet), LDL-cholesterol, Left ventricle hypertrophy, Thrombogenic factors
Category-II, Risk factors for which intervention is likely to reduce the incidence of CAD event Diabetes Mellitus, Physical inactivity, HDL- cholesterol, Triglycerides, Obesity, Post menopausal status (women)
Category-III, Risk factors clearly associated with increase in CAD risk, which if modified, might lower the incidence of CAD Psychosocial factors, Homocysteine, Lipoprotein (a), No alcohol consumption, Oxidative stress
Category-IV, Risk factors associated with increased risk but which cannot be modified Age, Gender, Family history

Source: Pasternak et al, 1996)

Category I - Risk factors for which interventions have been proven to lower the CVD risk

- Cigarette smoking** -Smoking is currently very important determinant of cardiovascular mortality among men in all regions of world and among women in industrialized world (Ezati et al, 2005). Smoking is both an independent risk factor of IHD and also interacts actively with other factors like hypertension, hyperlipidemias, and diabetes mellitus. Many of health effects of smoking depend on exposure history, including age at which smoking began, the number of cigarette smoked and cigarette characteristics such as tar and nicotine content or filter type (Gajalakshmi et al, 2003). Stampfer et al (2000) found that risk of coronary events was 5.48 among women who smoked > 15 cigarettes/ day compared to non-smokers. Epidemiological evidence has been increasing that passive smoking at home is related to heart disease among never smokers (Steenland, 1992). Passive smoking reduces the blood's ability to deliver oxygen to the heart and compromises the myocardium's ability to use oxygen to create Adenosine-Tri-Phosphate (ATP). Passive smoke increases platelet activity, accelerates atherosclerotic lesions, and increases tissue damage following ischemia or myocardial infarction. Nonsmoker exposed to passive smoking in everyday life exhibit an increased risk of fatal and nonfatal cardiac events (Glantz and Parmley, 1995).
- Hypertension**-Hypertension is a most powerful risk factor for fatal and non-fatal cardiovascular events (Chiong, 2008). Hypertension is more prevalent (20-40% among urban and 12-17% among rural adults), and was affecting an estimated 118 million inhabitants in India in the year 2000. This number is projected to almost double to 214 million in 2025 (Goyal and Yusuf, 2006). Adequate control of blood pressure (BP) is of enormous public health importance as evidence has convincingly shown that treatment of hypertension reduces the risk of stroke, CHD, congestive heart failure (CHF), and mortality (Chiong, 2008).
- Dietary factors**-Observational studies strongly support the hypothesis that multiple dietary factors determine CHD risk. Numerous epidemiological studies have identified dietary patterns and food categories associated with reduced risk of CVD (Hu and Willet, 2002).
- Mediterranean diets**-Mediterranean style diets emphasize on whole grains, fruits, vegetables, legumes, nuts, seeds (olive oil), dairy products, fish, poultry, wine,

and egg (Kris-Etherton et al, 2001). This diet is effective in reducing both the prevalence of the metabolic syndrome and its associated CVD (Esposito et al, 2004).

- **Lyon diet heart study**-The Lyon diet heart study, a randomized controlled trial with free living subjects, tested the effectiveness of a Mediterranean type diet on composite measures of the coronary recurrence rate after a first MI. Diet contained more bread, more root vegetables and green vegetables, more fish, fruits at least once a day, less red meat, and margarine (rich in alpha-linolenic acid) supplied by the study to replace butter and cream. After a mean follow-up of 27 months, there was 70% reduction in total mortality and 73% reduction in combined endpoint of cardiovascular deaths among intervention group (Kris-Etherton et al, 2001).
- **DASH diet**-Dietary Approaches to Stop Hypertension (DASH) diets emphasize on less refined grains and sweets and more whole grains, fruits, and vegetables. DASH diet is rich in potassium, magnesium, calcium, and fibre, and is low in fat, saturated fat and cholesterol, and high in protein. In a trial DASH diets lowered LDL, HDL, and total cholesterol. DASH diets are likely to reduce CHD risks (Obarzanek et al, 2001).
- **Atkins diet**-Atkins diet is high-fat, high-protein and drastically low in carbohydrate

(intake limited to 20g/d). The premise is to eat as much as one need to “feel satisfied”. The long-term effects of the Atkins diet are controversial, especially with regard to increasing the risk of CHD and possible effects on renal function (Zivkovic et al, 2007).

- **Fish and Omega-3 fatty acids**-There is strong evidence that consumption of fish, especially those species with high content of omega-3 fatty acids, confers protection from IHD and this relationship is particularly strong for CHD mortality and sudden cardiac death (Marckmann and Groenbaek, 1999; Kris-Etherton et al, 2002). Although fish have a number of important nutritive qualities, it is likely that major cardiovascular benefits are due to their content of the omega-3 fatty acids, eicosapentanoic acid (EPA) and docosahexanoic acid (DHA), (Albert et al, 2002). Among women, higher consumption of fish and omega-3 fatty acids is associated with a lower risk of CHD, particularly CHD deaths (Hu et al, 2002). According to Ghafoorunissa and Krishnaswamy (1994), a regular intake of 100-200 g of fish twice a week is recommended as a preventive dietary approach for heart diseases. Dietary factors that may contribute to a high IHD risk in India include low intakes of vitamin B₆ and folate, and high intakes of trans-fatty acids. In parts of India, trans fats from

hydrogenated vegetable oil in the form of vanaspati are consumed in greater quantity. In contrast, in North India mustard oil and canola oil, rich in alpha-linolenic acid, are used for cooking which may reduce IHD risk. A study shows diets rich in vegetables and use of mustard oil could contribute to lower risk of IHD among Indians (Rastogi et al, 2004).

- **Low-density lipoprotein – Cholesterol (LDL-C)**-LDL-C is conclusively linked to CHD development and acute events. Thus, LDL-C is a primary target for intervention efforts. A decrease in 1 mg/dl in LDL-C results in about 1% to 2% decrease in the relative risk of CHD (Pasternak et al, 1996). Case-control studies within India have reported high total cholesterol, and LDL-C and triglycerides levels in patients suffering from CHD (Gupta et al, 2001). An epidemiological study done in South India reported, high levels of LDL-C in CAD subjects, even a modest elevation of LDL-C with consequent elevation of the LDL-C:HDL-C and Total cholesterol:HDL-C could contribute to atherogenesis in this population (Mohan et al, 2001).
- **Left ventricular hypertrophy (LVH)**-The left ventricle increases in size in response to high blood pressure and increased workload secondary to obesity. In Framingham study, LVH was found to be

a strong risk factor for CVD, CHF, and sudden death. LVH is a risk factor in all age, gender, and ethnic groups (Krummel, 2004).

- **Thrombogenic factors**-Most MIs are the result of an intracoronary thrombosis. Prospective studies have shown that plasma fibrinogen is an independent predictor of CHD risk (Krummel, 2004). Factors associated with elevated fibrinogen are smoking, sedentary lifestyle, elevated triglycerides, and genetic factors (Wood, 2001).

Category II- Risk factors for which interventions are likely to lower CVD risk

- **Diabetes Mellitus**-Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially eyes, kidney, nerves, heart and blood vessels (ADA, 2008). Several prospective studies including non-diabetic and type 2 diabetic patients have convincingly shown that hyperglycemia cannot be neglected as a cardiovascular risk factor (Laakso, 1999). Patients with type 2 diabetes have a 2-4 fold increased risk of dying from CVD. Type-2 diabetes is frequently accompanied by hypertension, which additionally increases the cardiovascular risk (Ronnback et al,

2006). Rates of CVD occur four times more often in women 18 to 44 years of age with diabetes compared with women without the disease (Hu, 2001).

- **Physical inactivity**-Physical inactivity or low level of fitness is an independent risk factor of CHD. A 1990 meta-analysis concluded that physically active individuals had about half the CHD rates of those who were sedentary (Lee et al, 2001). A strong inverse association between leisure time physical activity and CVD mortality or non-fatal MI among postmenopausal women was found in the Iowa Women's Health Study and Group Health Cooperative enrollees (Sesso et al, 1999). Physical activity lessens CHD risk by retarding atherogenesis, increasing the vascularity of myocardium, increasing fibrinolysis, and modifying other risk factors, such as increasing HDL cholesterol, improving glucose tolerance and insulin sensitivity, aiding weight management, and reducing blood pressure (Krummel, 2004).
- **HDL-Cholesterol (HDL-C)** –an anti-risk factor-HDL-C has emerged as an important independent predictor of CHD- every 1mg/dL decrease in HDL-C causes a 3 to 4% increase in CAD (ATP III, 2002). The studies have found that increase in HDL-C was associated with a 3.7% and 4.7% decrease in CHD

mortality rates of men and women, respectively (Zang et al, 2008) DHH. This protective effect of HDL-C has been confirmed by intervention studies in which HDL-C was raised. In the Helsinki Heart Study, simultaneous increase in HDL-C and decrease in LDL-C during drug therapy were accompanied by a 34% reduction in CHD events in middle age men (Manninen et al, 1988).

- **Triglycerides**-According to ATP III (2002), elevated triglycerides levels are now recognised as an independent risk factor of CHD. Hypertriglyceridemia is most common in metabolic syndrome. Because of their roles in metabolism triglycerides and HDL-C levels are inversely related. A series of meta-analysis support an association between elevated triglycerides and subsequent cardiovascular event. In Asians, with Asia Pacific cohort studies collaboration meta-analysis of prospective cohort studies, elevated serum triglycerides emerged as an independent risk factor for CVD (Maksoud et al, 2008).
- **Obesity**-Obesity is well recognized as a major risk factor for CHD in men and women (Rexrode et al, 1998). Body mass index (BMI) is positively correlated with CHD (Krummel, 2004). Yusuf et al (2005) analyzed the findings from INTERHEART study and reported truncal obesity characterized by increased waist to hip ratio

(WHR) was more predictive of first MI as compared to BMI. The prevalence of overweight and obesity in children and adolescents is rising. This alarming trend of early obesity is a strong predictor of CVD in latter life (Ogden et al, 2002). Abdominal obesity has been linked to significant metabolic abnormalities, including insulin resistance, hyperinsulinemia, and elevated triglyceride levels, as well as increased incidence of hypertension, glucose intolerance, and diabetes mellitus (Rexrode et al, 1998). Similar correlation was observed in Jaipur Heart Watch Studies (Gupta et al, 2008).

- **Postmenopausal status in women-CHD** is a major cause of mortality in women in industrialized countries, particularly after the age of 50 years, coinciding with the onset of menopause and potentially adverse metabolic changes that occur during transitional peri-menopausal and postmenopausal periods. In particular, alterations in lipid metabolism that are attributable to estrogen deficiency are thought to increase CHD risk among postmenopausal women (Collins, 2008). In past 30 years numerous observational studies concluded that, postmenopausal hormone replacement therapy (HRT) was associated with 40-50% reduced risk of coronary events in women (Grodstein and Stampfer, 1995). Recent randomized control trials have

provided evidence of harm with postmenopausal hormone therapy. The primary finding of estrogen plus progestin trial of Women's Health Initiative (WHI) suggested an overall increase in the risk of CHD among trial group as compared to placebo (Rossouw et al, 2002). Another study by Manson et al (2003) concluded, combined estrogen and progestin does not confer cardiac protection and may slightly increase the risk of coronary events.

Category III- Risk factors associated with increased CVD risk that if, modified might lower the risk

- **Psychosocial factors-Depression, anxiety, hostility, anger, stressful lifestyle, and social isolation** increase the risk of CVD by enhancing unhealthy lifestyle such as smoking, excess of alcohol consumption, physical inactivity, and poor compliance with the treatment (Anda et al, 1990). INTERHEART study reported that stress at work and at home was highly correlated to CHD (Yusuf et al, 2004). Framingham heart study, found that type A behaviour (TABP) was an independent predictor of CHD and MI in middle aged men and angina in middle-aged women (Haynes et al, 1980).
- **Depression-Depression** is common factor after an acute coronary event and adversely affects the subsequent quality of life. A large number of

studies have also examined whether depression increases the risk of CHD or adversely affects CHD prognosis (Jain, 2005). In National Health Examination Follow-up Survey (NHEFS), depression was associated with 50-60% excess risk of fatal and nonfatal CHD. Hopelessness alone predicted a more than 2-fold increased risk of nonfatal CHD over 12 years of follow-up of 2,832 initially healthy men and women (45-77 years) (Anda et al, 1993).

- **Anxiety-Anxiety disorders** are classified as phobic anxiety, panic disorders, posttraumatic stress disorder, and generalized anxiety disorders. High levels of any form of anxiety may increase CHD risk (Eaker et al, 1992).
- **Hostility and anger-Studies** have shown, hostility and anger are related to hypertension, stroke, and CVD morbidity and mortality. A meta-analysis of 45 studies published in 1996 concluded that hostility is an independent risk factor for CHD and all-cause mortality (Jain, 2008). The studies have reported a positive association between anger/ suppressed anger and CVD. In the Precursors study, of initially healthy individuals, higher levels of anger increased the incidence of CHD 2-3 folds (Chang et al, 2002).
- **Psychosocial stressors-** Stressors like poverty, poor housing, and work conditions have significant influence on health. Severe and prol-

onged stress could lead to tissue damage (Jain, 2005). Occupational stressors (job strains) are consistently associated with increased risk of CHD in women. . Chronic stressors are non-occupational daily life stressors. In a study marital stress was found to have an adverse effect on CHD prognosis in women (Orth-Gom'er et al, 2000).

- **Social support**-Social support encompasses social networks, a structural component, and social support, a functional component. Studies have consistently found positive associations between social relations and CVD (Case et al, 1992). In a 15-year follow up study of 6,861 Swedish men and women, lack of social support increased the risk of incident of CHD by 1.7 fold (Sundquist et al, 2004).
- **Homocysteine** -Homocysteine is derived from sulfur containing amino acid methionine and is metabolized through pathways associated with folate, vitamin B₆ and vitamin B₁₂ as cofactor. Elevated homocysteine levels play an important role in production of arterial lesions. Homocysteine was proposed as a risk factor of CVD when it was observed that children with homozygous homocystinuria, a rare in born error of metabolism causing markedly elevated blood total homocysteine, had a high incidence of premature occlusive vascular disease. However, inconsistent results have been

reported from prospective observational studies with some showing highly significant correlation, of elevated homocysteine levels as independent predictor of IHD and stroke, but others showing none (Clarke et al, 2002).

- **Lipoprotein (a) [Lp(a)]**-Epidemiological studies of CHD and blood concentrations of Lp(a), a large protein attached to an LDL particle, have yielded apparently conflicting results, ranging from a strongly positive association to no association at all (Enas and Mehta, 1998). A meta-analysis of 27 prospective study demonstrate a clear association between Lp(a) and CHD, but further studies are needed to determine the extent to which this is causal (Danesh et al, 2000). Studies have shown that Lp(a) was a strong, independent risk factor of premature CHD. Lp(a) levels were increased among CAD patients vs controls (Krummel, 2004). Lp(a) has been identified as a major genetic risk factor in Indians. Lp(a) levels are about 2 times higher in Indians as compared with whites, and are probably responsible for the excess risk seen in Indians (Gupta et al, 2000; Geetanjali et al, 2002).
- **No alcohol consumption**-Epidemiological evidence suggests that moderate alcohol drinkers have lower CHD risk than do abstainers or very high drinkers (Mukamal et al, 2008). There

is a dose response relationship between alcohol consumption and risk of CHD. In a recent meta-analysis 51 studies supported the common belief that 25 mL of alcohol per day (i.e. 2 drinks/ day) reduces the CHD risk by 25% compared with no drinking at all. Moreover significant harmful effect of alcohol was estimated for doses ³ 113 mL/ day (i.e. more 9 drinks/ day) (Corrao et al, 2000). Mechanisms underlying the effect of moderate alcohol consumption, defined as one or two drinks daily, include raising HDL levels, improving fibrinolytic capacity, and reducing platelet aggregation and hs-CRP (Gaziano et al, 2005).

- **Oxidative stress**-Oxidation of LDL in the vessel wall hastens the atherogenic process by recruiting macrophages, stimulating autoantibodies, increasing LDL uptake, increasing vascular tone and coaguability (Pasternak et al, 1996). Evidence suggests that oxidants (free radicals) are involved in development and clinical expression of CHD and that antioxidant may contribute to disease resistance. Antioxidant defense system includes both endogenous and exogenous (diet) derived compounds; dietary antioxidants including vitamin C, vitamin E, and beta-carotene have received the greatest attention with regard to CHD prevention. Other dietary factors like trace

elements including selenium, copper, zinc, and manganese are proposed to act as antioxidants. Some of them also serve as cofactor for enzymes with antioxidant activity (e.g. glutathione peroxidase, and superoxide dismutase) (Tribble, 1999).

Category IV- Risk factors associated with increased CVD risk that cannot be modified

- **Age**-With increasing age, higher mortality rates from CHD are seen in both the gender. The incidence of premature CHD in middle-aged men (35-65 years) is three times as high as the incidence in the women of same age (ATP III, 2002).
- **Male Gender**-Gender differences in the incidence and prevalence of heart disease are well established, as is the decrease in the gender gap with increasing age, due largely to an increase in risk for women (Hossain and Khan, 2007). According to Anand et al (2008), all the nine risk factors of INTERHEART study explained 93.3% of acute MI in men <60 years and 88.6% of acute MI in women <60 years, a difference of 4.7%. A study by Campbell (2008) concluded that men had their first MI at a younger age than women because younger men had higher risk factor levels than younger women.
- **Family history of early onset of CVD**-A family history of premature disease is a strong risk factor, even when other risk factors are considered. A family history

is considered to be positive when MI or sudden death occurs before the age of 55 years in a male first degree relative or the age of 65 in female first degree relative (parents, offspring, and sibling). Numerous hyperlipidemias are inheritable and lead to premature atherosclerosis and CHD (ATP III, 2002).

Emerging risk factors

- **Inflammation**-Homeostatic and inflammatory markers, novel lipid parameters, cellular adhesion molecules, indicator of prior infection, and markers of oxidative stress all have been linked to steps of atherogenesis, thrombosis, or cardiovascular disease events. C-reactive protein (CRP) is the best studied of the inflammatory factors and the most consistently observed association has been that of CRP, with coronary risk (Pearson et al, 2003).
- **Infections**-Infectious agents such as Chlamydia pneumoniae, Helicobacter pylori or Cytomegalovirus (CMV) have been linked to atherosclerotic vascular disease and acute coronary events based on sero-epidemiological data and/ or identification of the organism in the atherosclerotic plaque (Whincup and Danesh, 2005).
- **Genetic markers**-A number of common genetic polymorphism has been associated with coronary risk factors. For example, carriers of a common mutation in methylene tetrafolate reductase or MTHFR gene have

elevated levels of homocysteine, and there are multiple inherited abnormalities of lipid metabolism linked both to hyperlipidemias and elevated vascular risk. Similarly, almost half of the variance in hs-CRP is heritable (Libby and Ridker, 1999).

- **Low birth weight**-Low birth weight has been consistently shown to be associated with CHD and its biological risk factors (Barker, 2002). Recent studies have shown that the path of childhood growth modifies the effect of small body size at birth on later CVD and type-2 diabetes (Forsen et al, 1999).

Other risk factors reported in literature

- **Metabolic syndrome**-The metabolic syndrome is also known as syndrome X, the insulin resistance syndrome, and deadly quartet. The constellation of metabolic abnormalities includes glucose intolerance (type 2 diabetes, impaired glucose tolerance, or impaired fasting glycemia), insulin resistance, central obesity, dyslipidemia, and hypertension, all well documented risk factors of CVD (Eckel et al, 2005). Cross-sectional and longitudinal studies have shown that metabolic syndrome is associated with an increase in risk of CVD and death (Mancia et al, 2007).
- **Anemia**-Anemia has been documented in approximately 15% of the patients presenting with AMI. Two

mechanisms are believed to worsen the ischemic insult in the myocardium in AMI: decreased oxygen content of the blood supplied to myocardium and increased myocardial oxygen demand due to higher cardiac output, necessary to maintain adequate systemic oxygen demand (Levy et al, 1996). WISE study linked lower hemoglobin levels with higher risk for adverse cardiovascular outcomes, in women evaluated for suspected ischemia in the absence of acute MI (Arant et al, 2004).

- **Pregnancy**-Pregnancy exaggerates atherogenic responses, including insulin resistance and dyslipidemia, manifesting as pre-eclampsia and gestational diabetes. These complications increase the post-partum risk of CVD, with a 2-fold increased risk of CHD and cerebrovascular disease (Kaaja and Greer, 2005). A Scottish study interpreted, complication of pregnancy linked to low birth weight are associated with an increased risk of subsequent IHD in mother (Smith et al, 2001).

- **Oral contraceptives**-The use of oral contraceptives (OC) has been associated with an increased risk of atherosclerosis as well as venous thrombosis (Tanis and Rosendaal, 2003). In a case-control study in Netherland, there was a 2-fold increased risk of AMI among users of any type of OC; the relative risk of OC users with no

conventional risk factors was 3.1 when compared with non-users (Tanis et al, 2001).

References

1. Abeywardena MY. Heart disease among Asians: Why is it rising? In Seshadari M, Siddhu A, editors. Nutrition Goals for Asia-Vision 2020: Nutrition Foundation of India, 2000;538-544.
2. ADA, American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes care* (Suppl.) 2008;31:S55-S60.
3. Anand S, Islam S, Rosengren A, Franzosi MG, et al. Risk factors for myocardial infarction in women and men: insights from INTERHEART study. *Eur Heart J* 2008;29:932-940.
4. Anda RF, Williamson DF, Escobedo LG, et al. Depression and the dynamics of smoking: a national perspective. *JAMA* 1990;264: 541-1545.
5. Arant CB, Wessel TR, Olson MB, Merz NB, Sopko G. Hemoglobin level is an independent predictor for adverse cardiovascular outcomes in women undergoing evaluation for chest. *J Am Coll Cardiol* 2004;43(11):2009-2014.
6. ATP III. The third report of NCEP Expert Panel on Detection, Evaluation, and Treatment of high blood cholesterol in adults (ATP III): Final report. NIH publication no. 02-5315; 2002.
7. Barker DJP, Erikson JG, Forsen T, Osmond C. Fetal origin of adult disease: strengths of effects and biological basis. *Int J Epidemiol* 2002;31:1235-1239.
8. Campbell DJ. Why do men and women differ in their risk of myocardial infarction? *Eur Heart J* 2008; 29:835-836.
9. Case RB, Moss AJ, Case N, et al. Living alone after MI: impact on prognosis. *JAMA* 1992; 267:520-524.
10. Chang PP, Ford DE, Meoni et al. Anger in young men and subsequent premature cardiovascular disease: The precursors study. *Arch Intern Med* 2002;162:901-906.
11. Chiong JR. Controlling hypertension from public health perspective. *Int J Cardiol* 2008;127:151-156.
12. Clarke R, Collins R, Donald A, Lewington S, et al. Homocysteine and of risk ischemic heart disease and stroke. *JAMA* 2002;288(16): 2015-2022.
13. Corrao G, Rubbiati L, Bagnardi V, Zambon A, Poikolainen K. Alcohol and coronary heart disease: a meta-analysis. *Addiction* 2000;95 (10):1505-1523.
14. Danesh J, Collins R, Peto R. Lipoprotein (a) and coronary heart disease meta-analysis of prospective studies. *Circulation* 2000;102:1082-1085.
15. Dhall A. Heart diseases crippling India. *Hindustan Times*. January 1, 2009.
16. Eaker ED, Pinsky J, Castelli WP. Myocardial infarction and coronary death among women: Psychological predic-

- tors from a 20-year follow up of women in Framingham study. *Am J Epidemiol* 1992; 135: 854-864.
17. Eckel RH, Grundy SM, Zimmet RZ. The metabolic syndrome. *Lancet* 2005;365: 1415-1428.
 18. Enas EA, Mehta JL. Lipoprotein (a): An important risk factors in coronary artery disease. *J Am Clin Cardiol* 1998;32:1132-1134.
 19. Esposito K, Marfella R, Ciotola M, Palo CD, Giugliano F et al. Effect of a Mediterranean style diet on endothelial dysfunction and markers of vascular inflammation in metabolic syndrome: a randomized trial. *JAMA* 2004;292:1440-1446
 20. Ezati M, Henley JS, Thun MJ, and Lopez AD. Role of smoking in global and regional cardiovascular Mortality. *Circulation* 2005;112(4):489-497.
 21. Forsen T, Erikson JG, Tuomilehto J, Osmond C, Barker DJP. Growth in utero and during childhood among women who develop coronary heart disease in later life: longitudinal study. *BMJ* 1999;319:1403-1407.
 22. Gaziano JM, Manson JE, Ridker PM. Primary and secondary prevention of coronary heart disease. In: Zips DP, Libby P, Bomow RO, and Braunwald E (eds). *Heart disease- A textbook of cardiovascular medicine* (7th edition); 2005:1057-1084.
 23. Gajalakshmi V, Peto R, Kanaka TS, Jha P. Smoking and mortality fro tuberculosis and other diseases in India: retrospective study of 43000 adult male deaths and 35000 controls. *Lancet* 2003;362: 507-515.
 24. Geetanjali FS, Jose JCV, Kanasabapathy. Lipoprotein (a) phenotype in south Indian patients with coronary heart disease. *Indian Heart J* 2002;54:50-53.
 25. Ghafoorunisa and Kamla-krishnaswamy K. Dietary prescriptions. In: *Diet and heart disease*. National Institute of Nutrition, Hyderabad, India 1994.
 26. Glantz SA, Parmley WW. Passive smoking and heart disease: Mechanism and risk. *JAMA* 1995;273(13):1047-1053.
 27. Goyal A, Yusuf S. The burden of cardiovascular disease in Indian subcontinent. *Indian J Med Res* 2006;124:235-244.
 28. Grodstein F, Stampfer M. The epidemiology of coronary heart disease and estrogen replacement in postmenopausal women. *Prog Cardiovasc Dis* 1995;38:199-210.
 29. Grundy SM, Balady GJ, Criqui MH et al. Primary prevention of coronary heart disease: guidance from Framingham: A statement for healthcare professionals from the AHA task force of risk reduction. *Circulation* 1997; 97:1876-1887.
 30. Guha S, Ghosh A, Chatterjee N, Pal S, Guha S, et al. Risk factors for coronary heart disease in Indians: A case-control study from eastern India. *Indian Heart J* 2005; 57:738-740.
 31. Gupta R, Gupta VP. Meta-analysis of coronary heart disease prevalence in India. *Indian Heart J* 1996; 48: 241-245.
 32. Gupta R, Kaul V, Prakash H, Sarna M, Singhal S et al. Lipid abnormalities in coronary heart disease: A population-based case-control study. *Indian Heart J* 2001;53:332-336.
 33. Gupta R. Burden of coronary heart disease in India. *Indian Heart J* 2005;57:632-638.
 34. Gupta R, Gupta VP, Bhagat N, Rastogi P, Sarna M et al. Obesity is major determinant of coronary risk factors in India: Jaipur Heart Watch Studies. *Indian Heart J* 2008;60:26-33.
 35. Haynes FB, Feinleib M, Kennel WB. The relationship of psychological factors to coronary heart disease in the Framingham study: 3. Eight-year incidence of coronary heart disease. *Am J Epidemiol* 1980;111(1):37-58.
 36. Hossain A, Khan HTA. Risk factors of coronary heart disease. *Indian Heart J* 2007;59:147-151.
 37. Howard BV, Horn LV, Manson JE, Stefanick MI, Kuller LH. Low-fat dietary pattern and risk of cardiovascular disease: the women's health initiative randomized controlled dietary modification trial. *JAMA* 2006;295(6):655-666.
 38. Hu FB, Manson JE, Willet WC. Types of dietary fat and risk of CHD disease a critical review. *J Am Coll Nutr* 2001;20(1):5-19.

39. Hu FB, Willet WC. Optimal diets for prevention of coronary heart disease. *JAMA* 2002;288(20):2569-2578.
40. Jain P, Jain P, Bhandari S, Siddhu A. A case-control study of risk factors for coronary heart disease in urban Indian middle aged males. *Indian Heart J* 2008;60:233-240.
41. Kaaja RJ, Greer IA. Manifestations of chronic disease during pregnancy. *JAMA* 2005;294:2751-2757.
42. Kannel WB, Hjortland MC, McNamara PM, Gordon T. Menopause and risk of cardiovascular disease: the Framingham study. *Ann Intern Med* 1976;85:447-452.
43. Kris-Etherton P, Eckel RH, Howard BV, Bazzarre T. *AHA Science Advisory: Lyon Diet Heart Study. Benefits of Mediterranean style, National Cholesterol Education Program/ American Heart Association Step I Dietary pattern on cardiovascular disease.* *Circulation* 2001;103:1823-1825.
44. Krummel DA. Medical nutrition therapy in cardiovascular disease. In: Mahan K and Escott SS. *Krause's food, nutrition and diet therapy* (11th edition). WB Saunders; 2004: 860-899.
45. Laakso M. Hyperglycemia and cardiovascular disease in type-2 diabetes. *Diabetes* 1999;48: 937-942.
46. Lee MI, Rexrode KM, Cook NR, Manson JE, Buring JE. Physical activity and coronary heart disease in women: Is "no pain, no gain" passé? *JAMA* 2001;285(11):1447-1454.
47. Libby P, Ridker PM: Novel inflammatory markers of coronary risk: Theory versus practice. *Circulation* 1999;100: 1148-1150.
48. Maksoud MA, Sazonov V, Gutkin SW, Hokanson JE. Effects of modifying triglycerides and triglycerides rich lipoproteins on cardiovascular outcomes. *J Cardiovasc Pharmacol* 2008;51(4):331-351.
49. Mancina G, Bombelli M, Corrao G, Facchetti R, Madotto F. Metabolic syndrome in the Pressioni Arteriose Monitorate E Loro Associazioni (PAMELA) study: daily life blood pressure, cardiac damage, and prognosis. *Hypertension* 2007;49:40-47.
50. Mann J. Cardiovascular Disease. In: Gibney NJ, Margetts BM, Kearney JM, Arab L (editors) *Public Health Nutrition*. UK: Blackwell Publishing, 2005; 317-329.
51. Mannien V, Ello MO, Frick MH, Happa K, Heinonen PO et al. Lipid alterations and decline in incidence of coronary heart disease in Helsinki heart study. *JAMA* 1988;260(5):641-651.
52. Manson JE, Hsia J, Johnson KC, Rossouw JE, Assaf AR et al. Estrogen plus progestin and risk of coronary heart disease. *N Engl J Med* 2003;394:523-534.
53. Marckmann P, Gronbaek M. Fish consumption and coronary heart disease mortality: a systemic review of prospective cohort studies. *Eur J Clin Nutr* 1999;53:585.
54. Mohan V, Deepa R, Rani SS, Premlatha G. Prevalence of coronary artery disease and its relationship to lipids in a selected population in south India. *J Am Coll Cardiol* 2001;38(3):682-687.
55. Murray CJ, Lopez AD. *Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease.* *Lancet* 1997;349:1498-1504.
56. Obarzanek E, Sacks FM, Volmer WM, Bray GA, Miller ER et al. Effects on blood lipids of a blood pressure-lowering diet: the Dietary Approaches to Stop Hypertension (DASH) trial. *Am J Clin Nutr* 2001;74:80-89.
57. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA* 2002;288:1723-1727.
58. Okraïnec K, Banerjee DK, and Eisenberg MJ. Coronary artery disease in developing world. *Am Heart J* 2004; 148 (1):7-15.
59. Orth-Gom'er K, Wamala SP, Horsten M et al. Marital stress worsens prognosis in women with coronary heart disease: The Stockholm Female Coronary Risk Study. *JAMA* 2000;284:3008-3014.
60. Pais P, Pogue J, Gerstein H, Zachariah E, Savitha D, Jayprakash S, Nayak PR, Yusuf S. Risk factors for acute myocardial infarction in Indians: a case-control study.

- Lancet 1996;348(9024):358-363.
61. Pasternak R, Grundy SM, Levy D, Thompson PD. Task force 3: spectrum of risk factors for coronary heart disease. *J Am Coll Cardiol* 1996;27:978-990.
 62. Pearson TA, Mensah GA, Alexander RW, Anderson JL, Cannon RO et al. Markers of inflammation and cardiovascular disease application to clinical and public health practices. A statement of healthcare professionals from the Centre for Disease Control and Prevention and American Heart Association. *Circulation* 2003;107:499-511
 63. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, et al. High prevalence of diabetes and impaired glucose intolerance in India: National Urban Diabetes Survey. *Diabetologia* 2001;44:1094-1101.
 64. Rastogi T, Reddy KS, Vaz M, Spiegelam D, Prabhakaran D, et al. Diet and risk of coronary heart disease in India. *Am J Clin Nutr* 2004;79:582-592.
 65. Reddy KS. Cardiovascular diseases in non-western countries. *N Engl J Med* 2004;350:2438-2440.
 66. Rexrode KM, Carey VJ, Hennekens CH, Walters EE, Colditz GA et al. Abdominal adiposity and coronary heart disease in women. *JAMA* 1998;280(21):1843-1848.
 67. Ronnback M, Isomaa B, Fagerudd J, Groop PN et al. Complex relationship between blood pressure and mortality in type 2 diabetic patients: A follow-up of Botnia Study. *Hypertension* 2006;47:168-173.
 68. Rossouw JE, Anderson GL, Prentice RL, LaCroix AZ, Kooperberg C, et al. Risk and benefits of Estrogen plus progestin in healthy post menopausal women. *JAMA* 2002;288(3):321-333.
 69. Sesso HD, Paffenbarger RS, Ha T, Lee IM. Physical activity and cardiovascular disease risk in middle aged and older women. *Am J Epidemiol* 1999; 150(4): 408-416.
 70. Smith CS, Pell JP, Waish D. Pregnancy complications and maternal risk of ischemic heart disease: a retrospective cohort study of 12290 births. *Lancet* 2001; 357:2002-2006.
 71. Steenland K. Passive smoking and the risk of heart disease. *JAMA* 1992;267(1):94-99.
 72. Sunquidist K, Lindstrom M, Malmstrom M, Johansson SE, Sundquist J. Social participation and coronary heart disease: A follow-up study of 6900 women and men in Sweden. *Soc Sci Med* 2004; 58:615-622.
 73. Sytkowski PA, D'Agostino RB, Belanger A, Kannel W. Sex and time trends in cardiovascular disease incidence and mortality: the Framingham Heart Study, 1950-1989. *Am J Epidemiol* 1996;143: 338-350.
 74. Tanis BC, Vanden MAAJ, Kemmeren JM, et al. Oral contraceptives and risk of myocardial infarction. *N Engl J Med* 2001;345:1787-1793.
 75. Tanis BC, Rosendaal FR. Venous and arterial thrombosis during oral contraceptives use: risk and risk factors. *Semin Vasc Med* 2003;3:69-84.
 76. Tribble DL. Antioxidant consumption and risk of coronary heart disease: emphasis on vitamin C, vitamin E, and b-carotene- A statement for healthcare professionals from the American Heart Association. *Circulation* 1999;99:591-595.
 77. Whincup P, Danesh J. Chronic infection and circulating markers of inflammation. In: Marmot M, Eliot P (editors). *Coronary heart disease epidemiology*, New York: Oxford University Press 2005;448-465.
 78. WHO, World Health Organization. Women: a special case. www.who.org (accessed on May 30, 2008).
 79. Wood D. Established and emerging cardiovascular risk factors. *Am Heart J* 2001;141:49S.
 80. Yusuf S, Reddy S, Ôunpuu S, Anand S. Global burden of cardiovascular diseases: Part I: general considerations, the epidemiological transition, risk factors, and impact of urbanization. *Circulation*. 2001; 104 (22):2746-2753.
 81. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A et al, and INTERHEART study investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (The INTERHEART Study): Case control study. *Lancet* 2004;364:937-952.
 82. Zivkovic AM, German JB, Sanyal A. Comparative review of diets of diets for metabolic syndrome: implication for non-alcoholic fatty liver disease. *Am J Clin Nutr* 2007;86:285-300.

Sourya Acharya, Samarth Shukla, S.N.Mahajan, S.K.Diwan, Datta Meghe
Institute of Medical Sciences, J.N. Medical College, Sawangi (Meghe), Wardha

Thyroid nodules are commonly encountered in clinical practice. The prevalence of palpable thyroid nodules are currently estimated to be between 3% to 7%.⁽¹⁾ In a large population study (in Framingham, Massachusetts), clinically apparent thyroid nodules were present in 6.4% of women and 1.5% of men.⁽²⁾ Furthermore, the widespread use of ultrasonography (US) for evaluation of thyroid and non thyroid neck disease has resulted in a dramatic increase of the prevalence to almost near 76% in the general population. And to add to the problem, 20% to 48% of patients with a single palpable thyroid nodule are found to have additional nodules when investigated by US.^(3,4) It will not be wrong to hypothesise that we are encountering an epidemic of thyroid nodules. Although most patients presenting with a thyroid nodule are asymptomatic, a few usually complain of symptoms of hypo or hyperthyroidism with added symptoms specific to compression caused by the nodule like dysphonia, dysphagia, feeling of pressure, and pain in the nodule. Unfortunately symptom free nodules do not rule out a possibility of malignancy, there by increasing the importance of analysing the risk factors for the same.

Diagnostic approach-The conditions that can present as thyroid nodules are listed in (Table-1)^(4,5)

Benign

- Multinodular goiter
- Hashimoto's thyroiditis
- Simple cyst
- Hemorrhagic cysts
- Follicular adenomas
- Subacute thyroiditis

History-The clinical importance of newly diagnosed thyroid nodules, as previously stated, is primarily the exclusion of thyroid malignant lesions.^(1,3,6) Hence, clinical evaluation should first be aimed at detecting symptoms or signs suggestive of malignant disease. Special caution should be taken while analysing the symptoms. Most patients with thyroid nodules have few or no symptoms. Thyroid nodules can grow insidiously for many years and are often discovered incidentally on physical examination, self-palpation, or imaging studies performed for unrelated reasons. Patients should be asked about:

- Onset.
- Duration. (slow, progressive usually malignant)
- Pain (hemorrhage in a cystic nodule).
- Recent increase in size of nodule/neck swelling. (Anaplastic carcinoma, thyroid lymphoma, hemorrhage)
- Symptoms of local compression. (usually nodule in a large goiter)

Malignant

- Papillary carcinoma
- Follicular carcinoma
- Hürthle cell carcinoma
- Medullary carcinoma
- Anaplastic carcinoma
- Primary thyroid lymphoma
- Metastatic malignant lesion

- Symptoms due to compression of surrounding structures.
- Symptoms of hyperthyroidism (toxic nodule which is benign, toxic MNG which can have areas potential for malignant transformation)
- A family history of benign or malignant thyroid disease.
- Familial medullary thyroid carcinoma (MTC), multiple endocrine neoplasia type 2 (MEN2), familial papillary thyroid tumors, familial polyposis coli, Cowden disease, and Gardner's syndrome are rare disorders but should always be considered.⁽⁷⁾
- Previous disease or treatments involving the neck (history of head and neck irradiation during childhood). A slow but progressive growth (during weeks or months) is suggestive of malignant involvement and should prompt further evaluation.

Examination

General- Signs of hyperthyroidism.

Local-Size, consistency (firm/hard nodule suggests malignancy), tenderness, surface, margin, fixicity, signs of retrosternal extension (Pemberton's sign, palpation of trachea in jugular notch), palpation of carotid artery (malignancy may encroach the carotid sheath), and cervical lymphadenopathy.

Symptoms and Signs that Warrant Additional Investigations-The following characteristics may increase the risk of thyroid cancer:

- Prior head and neck irradiation.
- Family history of Medullary Thyroid Carcinoma(MTC) or Multiple Endocrine Neoplasia (MEN2).
- Age <20 years or >70 years.
- Male sex.
- Growing nodule.
- Firm or hard consistency of nodule, ill-defined nodule margins on palpation.
- Cervical adenopathy.
- Fixed nodule on examination.
- History of Dysphonia, dysphagia, and cough.

Ultrasound imaging-High-resolution US is the most sensitive test available to detect thyroid lesions, measure their dimensions accurately, identify their structure, and evaluate diffuse changes in the thyroid gland. US should be performed to accomplish the following:

- Help with the diagnosis in difficult cases (as in Hashimoto's thyroiditis).
- Look for coincidental thyroid nodules.
- Detect US features suggestive of malignant growth and

select the lesions to; be recommended for fine-needle aspiration (FNA) biopsy.

- Choose the gauge and length of the biopsy needle.
- Obtain an objective measure of the baseline volume.
- Characteristics of the lesions that will be assigned to follow-up or medical therapy.

Ultrasound evaluation is not recommended

- As a screening test in the general population.
- Normal thyroid on palpation.
- Low risk of thyroid cancer.

Ultrasound is recommended

- In all patients with a palpable nodule.
- MNG.
- Associated cervical lymphadenopathy.
- Family history of cancer.
- History of irradiation.

Ultrasound reporting criteria's

- To describe position, shape, size, margins, content, echogenic pattern, and whenever possible, the vascular pattern of the nodule.
- To Identify the nodule at risk to be malignant, and stratify the nodule with a risk score based on the US findings.
- Identify the nodules for FNA biopsy.

Ultrasound fine needle aspiration biopsy-Not indicated in nodules < 10mm.

Indications

- Nodules < 10 mm when US features are suspicious.
- High risk history.
- Nodules of any size with history of neck irradiation or

family history of Medullary Carcinoma of Thyroid / Multiple Endocrine Neoplasia (MEN)2.

- Should be based on US features.
- All hypoechoic nodules with irregular margins, intra nodular vascular spots, or microcalcifications.
- Findings of extracapsular growth.
- Metastatic cervical lymph nodes.
- Complex nodules.

Interpretation of fine-needle aspiration cytology diagnosis
Diagnostic/Satisfactory specimen

- Benign (negative)
- Malignant (positive)
- Suspicious (indeterminate)

Nondiagnostic/Unsatisfactory specimen

- Foam cells
- Cyst fluid
- Blood

A satisfactory specimen contains at least a minimum of 6 groupings of well-preserved thyroid epithelial cells, consisting of at least 10 cells per group. Specimens labeled as "nondiagnostic" or "unsatisfactory" have an inadequate number of cells, which can be attributable to cystic fluid, bloody smears, or poor technique in preparing slides. ⁽⁸⁹⁾A benign (negative) cytodagnosis is the most common finding, accounting for approximately 70% of results ⁽⁹⁾. Benign cytology includes,

- Benign colloid nodule.
- Macrofollicular adenoma.
- Lymphocytic thyroiditis.

- Granulomatous thyroiditis.
- Benign cyst.

Malignant (positive) results can be identified reliably by the cytopathologist. The most frequent malignant lesion encountered is Papillary Carcinoma Thyroid (PTC). Aspirates of PTC shows increased cellularity; tumor cells arranged in sheets and papillary cell groups; and typical nuclear abnormalities, including intranuclear holes and grooves. Medullary carcinoma is characterized by hypercellularity, tumor cells that are notably noncohesive, and nuclei that are hyperchromatic and located at the end of an elongated cell body. Amyloid may be found in 50% to 60% of cases, appearing as amorphous background material that is readily stained with Congo red. Other malignant lesions include primary anaplastic carcinoma and high-grade metastatic cancers.⁽¹⁰⁾ Suspicious (indeterminate) results include specimens for which a definite cytologic diagnosis cannot be made. Often these include:

- Follicular neoplasms.
- Hürthle cell neoplasms.
- Papillary cancer.
- Lymphoma.

Nondiagnostic (unsatisfactory) aspirates are those with too few epithelial cells, accounting for 10% to 20% of specimens.^(11,12) About 70% of FNA specimens are classified as benign; in addition, 5% are malignant, 10% are suspicious, and 10% to 20% are nondiagnostic or unsatisfactory.^(10,11,13,14,15) The result of FNA is important in deciding whether to manage the patient

medically or surgically. Some reviews and reports have indicated that the selection of patients for surgical treatment on the basis of FNA results has increased the yield of cancer from 15% to 50%.^(13,16) The sensitivity and specificity of FNA performed by experienced personnel are excellent. Sensitivity is 83 %, Specificity is 92 %, Positive predictive value 75%.^(8,10,11) FNA is now considered safe, useful, and cost-effective. The accuracy of FNA is 95%.

Serum assays

Serum free thyroxine and triiodothyronine assays- If the serum TSH level is within the normal range, the measurement of free thyroid hormones adds no further relevant information. If TSH levels are low, however, measurement of free thyroxine (T4) and free triiodothyronine (T3) levels is necessary to confirm the presence of hyperthyroidism or consider central hypothyroidism, in which both TSH and free T4 levels may be low. In order to limit unnecessary laboratory testing, the following strategy should be followed for most patients with thyroid nodules.^(17,18)

- If Serum TSH level within normal limits- No further testing is advised.
- High serum TSH- Test free T4 and TPOAb to evaluate for hypothyroidism.
- Low serum TSH- Test free T4 and T3 to evaluate for hyperthyroidism.

Antibody assays

- **Thyroid Peroxidase Antibody (TPOAb)** should be measured in patients with high levels of serum TSH.⁽¹⁹⁾

High levels of serum TPOAb and a firm, diffusely enlarged thyroid are very suggestive of autoimmune or Hashimoto's thyroiditis.^(19,20)

- **Occasionally**, a nodular goiter may represent Hashimoto's thyroiditis.
- **Thyroglobuline Assay:** Serum thyroglobulin correlates with the iodine status and the size of the thyroid gland rather than with the nature of a thyroid nodule and adds no further information to the aforementioned tests.
- **Calcitonine Assay:** Calcitonin is a useful serum marker of Medullary Thyroid Carcinoma (MTC) and correlates well with tumor burden.⁽²¹⁾ Routine measurement of calcitonin in patients with thyroid nodules has been recommended⁽²²⁾, But this practice still remains controversial.⁽²³⁻²⁵⁾ MTC is reported to be present in less than 0.5% of the population with thyroid nodules, and large scale studies of nodular thyroid disease have reported a prevalence of MTC ranging from 0.4% to 1.4% of patients.^(19,26,27)

In addition, the risk of false-positive results should be considered; high levels of serum calcitonin can be present in patients with conditions such as impaired renal function or gastroenteric diseases treated with proton pump inhibitors.^(28,29) Calcitonin testing is imperative in those patients with a history of familial MTC or MEN2, but routine testing of serum calcitonin in all patients with unselected

thyroid nodules does not seem to be cost-effective. A baseline serum calcitonin value of 10 to 100 pg/mL is abnormal (normal baseline, <10 pg/mL) and should be followed by further investigations; values that exceed 100pg/mL are highly suggestive of MTC.

Scintigraphy-It is used for assessment of thyroid regional function and detection of areas of autonomously functioning thyroid tissue. On the basis of the pattern of radionuclide uptake, nodules may be classified as hyperfunctioning ("hot") or hypofunctioning ("cold"). Hot nodules almost never represent clinically significant malignant lesions, whereas cold nodules have a reported malignant risk of about 5% to 8%. Because the vast majority (77% to 94%) of thyroid lesions are cold and only a small minority of these are malignant, the predictive value of hypofunctioning nodules for the presence of malignant involvement is low. The diagnostic specificity is further reduced in small lesions (<1 cm), which may not be identified by scintigraphy.^(30,31) The role of scintigraphy in the diagnostic work-up of thyroid nodules is limited, especially in countries with iodine-rich diets, in which serum thyrotropin (thyroid stimulating hormone or TSH) measurement and thyroid US can correctly diagnose autonomous nodules in most of the patients^(30,31) and FNA facilitates accurate diagnosis of a malignant lesion.⁽¹⁶⁾ Moreover, because the resolution of US is considerably greater than that of scintigraphy: Radionuclide scanning has little place in the topographic assessment of

nodular goiter and no place in the measurement of thyroid nodules.

Indications of scintigraphy-Thyroid scintigraphy is indicated in the following settings:

- Single thyroid nodule or MNG and suppressed TSH Level.
- Large MNG, especially with substernal extension.
- In search of ectopic thyroid tissue (for example, strum ovarii or sublingual thyroid).
- In subclinical hyperthyroidism to identify occult hyperfunctioning tissue.
- Some investigators suggest evaluation of follicular neoplasms with a scintiscan to identify a functioning cellular adenoma that may be benign; however, most such nodules turn out to be cold nodules on a scintiscan.

Treatment

Levothyroxine (LT4) therapy-Key recommendations regarding Levothyroxine therapy for thyroid nodules that are negative by fine-needle aspiration.

Use of LT4 therapy may be considered in the following

- Patients from geographic areas with iodine deficiency.
- Young patients with small thyroid nodules
- Nodular goiters with no evidence of functional autonomy

Use of LT4 therapy should be avoided in most cases and especially in the following

- Large thyroid nodules and goiters, particularly in the presence of symptoms or signs of functional autonomy.

- Clinically suspicious lesions or lesions with an inadequate cytologic sample.
- Postmenopausal women and men older than 60 years.
- Patients with osteoporosis.

Recommendations for surgical management in thyroid nodules-Surgical indications in a patient with a thyroid nodule include the following:

- Associated local symptoms.
- Hyperthyroidism from a large toxic nodule, or hyperthyroidism and concomitant MNG.
- Growth of the nodule.
- Suspicious or malignant FNA results.

Modes of surgery-Thyroid lobectomy includes total or near-total lobectomy, with or without isthmectomy. Should the patient require complete thyroidectomy, it is technically easier to perform if the isthmus has previously been resected.

- Solitary benign nodules require- Lobectomy plus isthmectomy
- Bilateral nodules require- Near-total thyroidectomy

A thyroid gland that extends subinternally can almost always be resected through a cervical approach. Only rarely is median sternotomy necessary to accomplish thyroid lobectomy or total thyroidectomy.

PEI (Percutaneous Ethanol Injection)-Recurrent cystic nodules of the thyroid gland after FNA rules out a malignant lesion.^(32,33,34) PEI may be considered only in:

- AFTN (Autonomously Functional Thyroid Nodule) with a large fluid component.
- For a preliminary debulking before radioiodine treatment.
- In small AFTN with incomplete inhibition of the surrounding parenchyma, especially if a fluid component is present.⁽³⁵⁾

The absence of associated scarring, exposure to irradiation, and late hypothyroidism may make this procedure appealing to young patients. PEI is not indicated in cold thyroid nodules because it necessitates repeated treatments, induces unpleasant adverse effects (transient cervical pain), can be complicated by dysphonia attributable to recurrent laryngeal nerve damage, and carries the risk of overlooking thyroid neoplasms.

Radioiodine therapy-Radioiodine is indicated for the treatment of hyperthyroidism attributable to hyperfunctioning adenoma or toxic nodular goiter. The aims of radioiodine treatment are the ablation of the autonomously functioning areas and the achievement of euthyroidism.^(36,37) Autonomous thyroid nodules are usually more radio resistant than diffuse toxic goiters, and high irradiation doses may be needed for successful treatment.⁽³⁸⁾

Efficacy and adverse effects-Radioiodine therapy is successful in 85% to 100% of patients with hyperfunctioning thyroid nodules or toxic MNGs.⁽³⁸⁾ After treatment with ablative doses, the thyroid volume may decrease. After ablation of the autonomous tissue, 80% to 90% of patients

have euthyroidism because of residual normal thyroid function. Moreover, hypothyroidism may follow radioiodine treatment if:

- The mass of normal thyroid tissue is too small.
- If its function is decreased from coexistent autoimmune thyroiditis.⁽³⁹⁾
- Damage consequent to contiguity cross-irradiation from hot nodules.

Immunogenic hyperthyroidism may result in < 1% of cases, from radioiodine treatment of toxic nodular goiter because of induction of TSH receptor autoantibodies⁽⁴⁰⁾.

Indications

- Small goiters (volume <100 mL) without suspected thyroid malignancy.
- In patients previously treated surgically or at risk for surgical intervention.

Radioiodine therapy is not considered to be the first-line treatment

- If compressive symptoms are present
- If the patient has large nodules that require high amounts of radioiodine and which may be resistant to treatment
- If an immediate resolution of thyrotoxicosis is desired.^(36,37)
- The only absolute contraindications to radioiodine treatment are pregnancy and lactation, which should be excluded by performance of a pregnancy test⁽⁴¹⁾

Conclusion-Though thyroid nodules are a common clinical finding, a serious step wise evaluation is mandatory in each

and every case. Again the approach emphasizes the importance of history and a meticulous methodical clinical examination of the thyroid gland including the regional group of lymph nodes and looking for the functional status and signs of retro strnal extention in each case. Then deciding the use of ultrasound, US-FNA, serum assays and lastly scintigraphy that would finally decide the management protocol. The whole exercise requires a holistic approach including physicians, radiologists, cytopathologists and surgeons. The AACE/AME Guidelines are a boon to guide the treating physician/surgeon dealing with thyroid nodules.

References

1. Hegedus L. Clinical practice: the thyroid nodule. *N Engl J Med.* 2004;351:1764-1771.
2. Vander JB, Gaston EA, Dawber TR. The significance of nontoxic thyroid nodules: final report of a 15-year study of the incidence of thyroid malignancy. *Ann InternMed.* 1968;69:537-540.
3. Tan GH, Gharib H. Thyroid incidentalomas: management approaches to nonpalpable nodules discovered incidentally on thyroid imaging. *AnnInternMed.* 1997;126:226-231.
4. Ezzat S, Sarti DA, Cain DR, Braunstein GD. Thyroid incidentalomas: prevalence by palpation and ultrasonography. *Arch Intern Med.* 1994;154:1838-1840.
5. Ross DS. Diagnostic approach to and treatment of thyroid nodules. I. In: Rose BD, ed.

- UpToDate. Wellesley, MA: UpToDate, 2005.
6. Belfiore A, Giuffrida D, La Rosa GL, et al. High frequency of cancer in cold thyroid nodules occurring at young age. *Acta Endocrinol (Copenh)*. 1989;121:197-202.
 7. Loh KC. Familial nonmedullary thyroid carcinoma: a meta-review of case series. *Thyroid*. 1997;7:107-113.
 8. Gharib H. Fine-needle aspiration biopsy of thyroid nodules: advantages, limitations, and effect. *Mayo Clin Proc*. 1994;69:44-49.
 9. Goellner JR, Gharib H, Grant CS, Johnson DA. Fine needle aspiration cytology of the thyroid, 1980 to 1986. *Acta Cytol*. 1987;31:587-590.
 10. Gharib H, Goellner JR. Fine-needle aspiration biopsy of thyroid nodules. *Endocr Pract*. 1995;1:410-417
 11. Castro MR, Gharib H. Thyroid fine-needle aspiration biopsy: progress, practice, and pitfalls. *Endocr Pract*. 2003; 9:128-136.
 12. Chow LS, Gharib H, Goellner JR, van Heerden JA. Nondiagnostic thyroid fine-needle aspiration cytology: management dilemmas. *Thyroid*. 2001;11:1147-1151.
 13. Gharib H, Goellner JR. Fine-needle aspiration biopsy of the thyroid: an appraisal. *Ann Intern Med*. 1993;118:282-52
 14. Caruso D, Mazzaferri EL. Fine needle aspiration biopsy in the management of thyroid nodules. *Endocrinologist*. 1991;1:194-202.
 15. Jeffrey PB, Miller TR. Fine-needle aspiration cytology of the thyroid. *Pathology (Phila)*. 1996;4:319-335.
 16. Hamberger B, Gharib H, Melton LJ III, Goellner JR, Zinsmeister AR. Fine-needle aspiration biopsy of thyroid nodules: impact on thyroid practice and cost of care. *Am J Med*. 1982;73:381-384.
 17. Baloch Z, Carayon P, Conte-Devolx B, et al (Guidelines Committee, National Academy of Clinical Biochemistry). Laboratory medicine practice guidelines: laboratory support for the diagnosis and monitoring of thyroid disease. *Thyroid*. 2003;13:3-126.
 18. Ross DS. Laboratory assessment of thyroid dysfunction. In: Rose BD, ed. *UpToDate*. Wellesley, MA: UpToDate, 2005.
 19. Hegedus L, Bonnema SJ, Bencedbaek FN. Management of simple nodular goiter: current status and future perspectives. *Endocr Rev*. 2003;24:102-132.
 20. Aghini-Lombardi F, Antonangeli L, Martino E, et al. The spectrum of thyroid disorders in an iodine-deficient community: the Pescopagano survey. *J Clin Endocrinol Metab*. 1999;84: 561-566.
 21. Cohen R, Campos JM, Salaun C, et al (Grouped'Etudes des Tumeurs a Calcitonine [GETC]). Preoperative calcitonin levels are predictive of tumor size and postoperative calcitonin normalization in medullary thyroid carcinoma. *J Clin Endocrinol Metab*. 2000;85: 919-922.
 22. Pacini F, Fontanelli M, Fugazzola L, et al. Routine measurement of serum calcitonin in nodular thyroid diseases allows the preoperative diagnosis of unsuspected sporadic medullary thyroid carcinoma. *J Clin Endocrinol Metab*. 1994;78: 826-829.
 23. Thyroid Carcinoma Task Force. AACE/AAES medical/surgical guidelines for clinical practice: management of thyroid carcinoma. *Endocr Pract*. 2001;7:202-220.
 24. Bencedbaek FN, Perrild H, Hegedus L. Diagnosis and treatment of the solitary thyroid nodule: results of a European survey. *Clin Endocrinol (Oxf)*. 1999;50: 357-363.
 25. Bencedbaek FN, Hegedus L. Management of the solitary thyroid nodule: results of a North American survey. *J Clin Endocrinol Metab*. 2000;85:2493-2498.
 26. Niccoli P, Wion-Barbot N, Caron P, et al (French Medullary Study Group). Interest of routine measurement of serum calcitonin: study in a large series of thyroidectomised patients. *J Clin Endocrinol Metab*. 1997;82:338-341.
 27. Elisei R, Bottici V, Luchetti F, et al. Impact of routine measurement of serum

- calcitonin on the diagnosis and outcome of medullary thyroid cancer: experience in 10,864 patients with nodular thyroid disorders. *J Clin Endocrinol Metab.* 2004;89:163-168.
28. Kotzmann H, Schmidt A, Scheuba C, et al. Basal calcitonin levels and the response to pentagastrin stimulation in patients after kidney transplantation or on chronic hemodialysis as indicators of medullary carcinoma. *Thyroid.* 1999;9:943-947.
 29. Erdogan MF, Gullu S, Baskal N, Uysal AR, Kamel N, Erdogan G. Omeprazole: calcitonin stimulation test for the diagnosis, follow-up and family screening in medullary thyroid carcinoma. *J Clin Endocrinol Metab.* 1997;82:897-899.
 30. McHenry CR, Slusarczyk SJ, Askari AT, et al. Refined use of scintigraphy in the evaluation of nodular thyroid disease. *Surgery.* 1998;124:656-661.
 31. Meier DA, Kaplan MM. Radioiodine uptake and thyroid scintiscanning. *Endocrinol Metab Clin North Am.* 2001;30:291-313.
 32. Hamburger JI, Husain M. Contribution of intra operative pathology evaluation to surgical management of thyroid nodules. *Endocrinol Metab Clin North Am.* 1990;19:509-522.
 33. Mandel SJ. Diagnostic use of ultrasonography in patients with nodular thyroid disease. *Endocr Pract.* 2004;10:246-252.
 34. Hagag P, Strauss S, Weiss M. Role of ultrasound-guided fine-needle aspiration biopsy in evaluation of nonpalpable thyroid nodules. *Thyroid.* 1998;8:989-995.
 35. Zingrillo M, Modoni S, Conte M, Frusciante V, Trischitta V. Percutaneous ethanol injection plus radioiodine versus radioiodine alone in the treatment of large toxic thyroid nodules. *J Nucl Med.* 2003;44:207-210.
 36. Meier DA, Brill DR, Becker DV, et al (Society of Nuclear Medicine). Procedure guideline for therapy of thyroid disease with (131)iodine. *J Nucl Med.* 2002;43:856-861.
 37. Dietlein M, Dressler J, Grunwald F, et al. Guideline for radioiodine therapy for benign thyroid diseases (version 3) [article in German]. *Nuklearmedizin.* 2004;43:217-220.
 38. Moser E. Radioiodine treatment of Plummer's disease. *Exp Clin Endocrinol Diabetes.* 1998;106(Suppl 4):S63-S65.
 39. Mariotti S, Martino E, Francesconi M, et al. Serum thyroid autoantibodies as a risk factor for development of hypothyroidism after radioactive iodine therapy for single thyroid "hot" nodule. *Acta Endocrinol (Copenh).* 1986;113:500-507.
 40. Wallaschofski H, Muller D, Georgi P, Paschke R. Induction of TSH-receptor antibodies in patients with toxic multinodular goitre by radioiodine treatment. *Horm Metab Res.* 2002;34:36-39.
 41. Lazarus JH. Guidelines for the use of radioiodine in the management of hyperthyroidism: a summary. Prepared by the Radioiodine Audit Subcommittee of the Royal College of Physicians Committee on Diabetes and Endocrinology, and the Research Unit of the Royal College of Physicians. *J R Coll Physicians Lond.* 1995;29:464-469.

Advances in intravenous anesthesia

Efforts to develop new hypnotic compounds continue, although several have recently failed in development. Propofol has been reformulated in various presentations with and without preservatives. Pharmacokinetic and pharmacodynamic differences exist between some of these preparations, and it is currently unclear whether any have substantial advantages over the original presentation. The use of target-controlled infusion (TCI) has been extended to include paediatric anaesthesia and sedation. Application of TCI to remifentanyl is now licensed. Linking of electroencephalogram (EEG) monitoring to TCI for closed-loop anaesthesia remains a research tool, although commercial development may follow. The availability of stereoisomer ketamine and improved understanding of its pharmacology have increased non-anaesthetic use of ketamine as an adjunct analgesic. It may be useful in subhypnotic doses for postsurgical patients with pain refractory to morphine administration

Review Article

T. Mathiyazhagan, Deeki Nandan

Department of Communication, National Institute of Health & Family Welfare, New Delhi

The terms Information, Education and Communication (IEC) and Behaviour Change Communication (BCC) are defined or explained in different ways by different experts. Also, these two words are often confused or misunderstood. Attempts have been made by several authors to clarify what is IEC? and what is BCC? I am of the view that 'no difference exists between IEC and BCC' because the ultimate goal of both of these activities is to transfer information from one to another to establish commonness among them. Behaviour change of an individual or group does not take place overnight. This is because of individuals' variations in the realization of the need, socio-psychological perception, economical status, educational standards, religion, caste, sex, social participation, exposure to media, willingness to change, traditional practices etc. Therefore, many health and development programmes used behaviour change communication to improve peoples' health and well being; including family planning and reproductive health, maternal and child health and prevention of infectitious diseases. This paper, attempts to discuss how behaviour of a person changes with reference to a new idea or a healthy practice. The behaviour of an individual, in a broad sense, refers to anything the individual

does. Parson and Shils (1965)¹ proposed a theory of action which could serve as a conceptual model for the analysis of human behaviour. According to them behaviour is oriented to the attainment of ends or goals or other anticipated state of affairs and takes place in a situation. It is normatively regulated and involves a lot of energy, effort or motivation. According to Leagans (1961)², behaviour refers to what an individual knows (knowledge), what he can do (skills-mental and physical), what he thinks (attitudes) and what he actually does (action). Behaviour is, therefore, a function of the person in an interaction with the situation. The factors motivating behaviour either in the person or situation are environmental determinant; the internal urge, wish, feeling, emotion, drive, instinct, need, want, desire, demand, purpose, interest, aspiration or motive which give rise to the action and the incentive or goal which attracts or repels an organism.

Behaviour change communication- Centre for Communication Programmes, Bloomberg School of Public Health, Johns Hopkins University, U.S.A. defines BCC is a process that motivates people to adopt and sustain healthy behaviours and lifestyles³. Sustaining healthy behaviour usually requires a continuing investment in BCC as part of an overall health

programme. International Labour Organization, defines behaviour change communication (BCC) is an interactive process for developing messages and approaches using a mix of communication channels in order to encourage and sustain positive and appropriate behaviours⁴. Behaviour change communication (BCC) can also be defined as a process that prevents an individual or group from indulging in high risk behaviour or that refines an individual or group who practices high risk behaviour by application of appropriate communication channels or any communication activity undertaken by anybody (source) which has any influence to change the behaviour of another targeted person (receiver) is behaviour change communication. It is a process or on-going activity which includes a variety of situations right from house to society and nation as a whole. Key places where behaviour change communication activities can take place are both formal and informal. Informal places include family, peer groups, community, public places, fairs and festivals etc. and formal places include schools, colleges, panchayat raj institutions, work place, health care centres, social clubs etc Therefore, to bring about changes in the behaviour of an individual, some sort of interaction or otherwise, education is very crucial.

Education is the process of bringing about desirable changes in the behaviour of human beings. It can also be defined as the process of imparting or acquiring knowledge and habits through instruction or study. If education is effective, it will result in changes in all the behavioural components viz. knowledge and ideas, values and attitudes, norms and skills and understanding and translation⁵. In Behaviour Change Communication, awareness of an individual is put to action. The BCC must be research based, client centred, benefit oriented, service linked and professionally developed. The suggested behaviour must be adoptable in the context of peoples' lives⁶. While classifying the behaviour of farmers with reference to their adoption of an innovation, Rogers called them as innovators, early adopters, early majority, late majority and laggards⁷. The innovators are financially sound with high social class and educated. They are willing to take risk. While the laggards are those who adopt an innovation at last, may be at that time the innovation is outdated. They are socio-economically poor, bound by traditions and have no social contact. Their level of education is also poor. It suggests that socio-economical status and education are found to have positive influence on the behaviour of the person. Further, while talking about adoption process of an idea, Rogers categorises it into five stages viz. Knowledge, Persuasion, decision, implementation and confirmation⁷.

- **Knowledge**-At this stage, an individual is first exposed to

an innovation but lacks information about it.

- **Persuasion**-At this stage, an individual is interested in an innovation and actively seeks information about it.
- **Decision**-At this stage, an individual takes concept of the innovation and weighs the advantages/disadvantages of using the innovation and decides whether to adopt it or reject it.
- **Implementation**-At this stage, an individual employs the innovation to a varying degree depending up on the situation. During this stage, the individual determines the usefulness of the innovation and may search for further information about it.
- **Confirmation** -At this stage, an individual finalises his decision to continue using the innovation, possibly to its fullest potential. The stages mentioned above clearly indicate that adoption of an idea by an individual is not an overnight process but takes place slowly depending up on whether he is an innovator or laggard.

Approaches to behaviour change⁸

- **Dissemination of information**: Efforts can be made to increase awareness by providing information to those who are open to learning about the desired behaviour. In the light of those audience's profile, an appropriate communication strategy may be designed to suit their needs considering whether they are literate or

illiterate, whether they are socio-economically high or low, whether they are residing in rural or urban areas, whether they are having access to media or not, if at all they are having access to media, what are those media etc. So that a larger number of people can be contacted in a shorter span of time with what we want to communicate.

- **Education**- It can be defined as the process of imparting or acquiring knowledge and habits through instruction or study. If education is effective, it will result in changes in all the behavioural components viz. knowledge and ideas, values and attitudes, norms and skills and understanding and translation. Precisely, we are attempting to promote learning, comprehension and the acquisition of skills needed to adopt the new behaviour in those who are motivated to learn. Similarly, when we want to bring about changes in the behaviour of the people who practice high risk behaviour, they need to be motivated to learn about the consequence of such behaviour in a way that they understand and apply it in their life style. So 'education is an important tool for behaviour change.'
- **Persuasion**- t is a form of social influence. It is the process of guiding people and oneself toward the adoption of an idea, attitude, or action by rational and symbolic (though not always logical) means. The whole focus is on

encouraging acceptance of new health beliefs, values and behaviour through rational arguments and emotional appeals from credible sources. Park (2009) in his book on preventive and social medicine says that persuasion is the art of winning friends and influencing people. It is an art that does not employ force or deliberate manipulation. The sole purpose of communication is to influence. Persuasion is “a conscious attempt by one individual to change or influence the general beliefs, understanding, values and behaviour of another individual or group of individuals in some desired way”. Persuasive communication is more effective than coercion or authoritative communication. Persuasion can change life style and modify the risk factors of disease⁹.

- **Dialogue-** It is often useful to contrast Dialogue with discussion. In Dialogue we are interested in creating a fuller picture of reality rather than breaking it down into fragments or parts, as happens in discussion. In Dialogue we do not try to convince others of our points of view. There is no emphasis on winning but rather on learning, collaboration and the synthesis of points of view. Here the efforts are to promote mutual understanding and agreement through interpersonal and group discussions, shared experiences, counselling and social networks.

- **Entertainment-** An entertainment is any activity which provides a diversion or permits people to amuse themselves in their leisure time. Entertainment is typically passive as in watching opera or a movie. Activities which involve participating in games or sports are more often considered to be recreation. Activities such as personal reading or practising a musical instruments are considered as pastimes. In entertainment programme we try to promote enjoyment, emotional stimulation and excitement by exposing the audience to the message through music, drama, dance, comedy, art or some other entertainment media.
- **Compliance -** Compliance refers to the act of responding favourably to an explicit or implicit request offered by others. The request may be explicit, such as a direct request for donations, or implicit, such as an advertisement promoting its products without directly asking for purchase. In all cases, the target recognizes that he or she is being urged to respond in a desired way. The activities attempt to enhance compliance through positive or negative sanctions, threats or incentives, without necessarily changing attitudes.

Stages of behaviour change-

Steps or Stages of Behaviour Change have been explained by several theories and models which have tried to understand the process of adoption of desired behaviour. For example; the

model developed by Prochaska and Diclemente (1983)¹⁰ suggests five stages as given below:

- **Pre-contemplation-**This is the stage at which Individuals do not even consider the idea of a change. Unfortunately, some persons always remain at the stage.
- **Contemplation-**At this stage, People begin to think actively both about the health risk and the actions for reducing the risk. The issue is now on their agenda but action is to be planned.
- **Preparation-** At this stage, contemplation moves into early action such as developing a plan, joining a self help group, collecting health information etc.
- **Action -** This stage is marked by observable changes in the health related behaviour itself. The battle is under way. There may be relapses, but these should be dealt with as part of the change process and not as an excuse to slide back into contemplation. The action stage may go on for about six months. If successful, the person, or group, moves on to the less intense maintenance stage.
- **Maintenance-**At this stage the new health action needs to be firmly consolidated as a permanent life style. Prevention of relapse *to less healthy behaviour is essential.*

It is rare that a person will adopt a new behaviour after hearing about it just once. JHU/CCP/ Advances in Health communication (1996) suggests five steps or stages for behaviour

change of an individual viz: knowledge; approval; intention; practice; and advocacy. Each of which is described below:⁸

- **Knowledge**-The term knowledge is used to mean the confident understanding of a subject with the ability to use it for a specific purpose if appropriate. It involves perception, learning, communication, association and reasoning. In Oxford English dictionary, it has been defined as - expertise and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject; what is known in a particular field or in total; facts and information or; awareness or familiarity gained by experience of a fact or situation. When we want to bring about an improvement in the behaviour of a person who has no knowledge about basic hygiene and sanitation, first of all we should know the current level of his knowledge about it. Secondly, we should know to what extent he is correct and to what extent he is applying it in his own lifestyle. In case, the current level of his knowledge about basic hygiene and sanitation is very low, the duty of the health worker is to help him understand why basic hygiene and sanitation is important, how does it help him and what will be the favourable health consequences. When the person is illiterate and bound by his own traditional values, it becomes more difficult for the health worker

to undertake any educational interventions, but he should not be ignored. He is the person who needs real education for changing his behaviour. At this stage, the person is expected to have knowledge about various issues of basic hygiene and sanitation.

- **Approval**-After gaining knowledge about basic hygiene and sanitation, he may be favourable to adopt certain hygienic practices. It means he is mentally prepared to go for action, however, he may discuss with other family members, friends, neighbours and relatives and health workers to reinforce his decision. At this stage he wants to have others opinion in his decisions. Then, he would finally decide to adopt.
- **Intention**-At this stage, the person recognises that basic hygiene and sanitation can solve his personal health problems to some extent. However, he may like to consult a health care provider. Then he decides to practice basic hygiene and sanitation in his real life situation.
- **Practice** - Whatever the knowledge he has gained about basic hygiene and sanitation, at this stage he would like to put it in action. If need be he may approach the health care workers for information/supplies/services. Then he continues to use the new practice.
- **Advocacy**-Advocacy can be seen as a deliberate process of speaking out on issues of

concern in order to exert some influence on behalf of ideas or persons. Based on this definition, Cohen et al. (2001) states that “ideologues of all persuasions advocate” to bring a change in people’s lives. However, advocacy has many interpretations depending on the issue at stake, which can be different from this initial value-neutral definition.¹¹After having practiced basic hygiene and sanitation measures, the person feels happy about what benefit he has got out of it. Also he talks to others to follow as he practiced basic hygiene and sanitation in his life. He can be a role model for others and can be used by the health workers for propagating messages on basic hygiene and sanitation to other villagers. The steps mentioned above often occur as individuals change their behaviour. They are not, however stages of a linear process which individuals must go through when changing their behaviour. Some individuals may experience all five but not necessarily in the order presented above.

Barriers to behaviour change-Barriers to Behaviour Change communication Programme are really huge in number. A few of the barriers which directly or indirectly affect the BCC programme are described as-

- **Social values**-A person is socially accepted when he behaves following a set pattern approved by the

society. He is always influenced by the natural as well as by the social environments. Here the role of family goes a long way to help, guide and shape him in a way it likes as per the set patterns or norms which the family members learnt from their parents and grandpa-rents. Besides family, there are various other groups in the society which give directions or ideas to the individual to follow as per the set patterns. In this way, the social values of a particular group are being transferred from one generation to another. The set social values do act as barrier to behaviour change.

- **Cultural belief-** Culture is the way of life adopted by a particular group of people-the behaviours, beliefs, values, and symbols that they accept, generally without thinking about them, and that are passed along by communication and imitation from one generation to the next. It varies from one region to another, one religion to another, one country to another and one continent to another. This suggests that culture of a given group of people is a historically created style of living and acts as barrier to behaviour change.
- **Mores** - Mores are the folkways which deal with moral aspect. These are ways of doing and thinking, and if they are violated the group may be divided or disturbed. They are the group-shared understandings about what to do in any situation. They define

the expected types of behaviour for various situations. They guide decisions, usually without conscious thought. Consequently, their behaviour corresponds with what others expect. In such a situation, when we introduce any change, which of course may be correct, but may not be accepted by target audiences as it may have clash with their existing behaviour and will act as barrier to behaviour change.

- **Folkways-**Folkways are the group habits or folkways are the patterns of conventional behaviour in a society that apply to everyday matter. They are the conventions and habits learned from childhood. William Graham Sumner, a known American sociologist is credited with coining the term *folkways* in his monumental work entitled *Folkways*: Folkway remains a technical term in sociology, describing what is usually known as “custom”. Generally, conformity to folkways is ensured by gentle social pressure and imitation. Some examples of folkways or custom in Indian culture include: Namaskar (it is a general salutation that is used to welcome somebody and also for bidding farewell), Tilak (it is a ritual mark on the forehead) Aarti (it is performed as an act veneration and love and also performed as a mark of worship) and Garlanding (flower garlands are usually offered as a mark of respect and honour). Even any good thing is introduced

in a society which is against the custom may not be accepted by the group and custom may pose impediments to behaviour change.

- **Religion-**It is the human response to the apprehension of something of power which is supernatural and super sensory. It is the expression of the manner and type of adjustment affected by people with their conception of the supernatural power. In it, the persons perform the necessary actions which bind them with the supernatural powers. The beliefs and rituals are the two main components of religion everywhere. The concept of the exact nature of the supernatural power as believed by the villagers in India differs from place to place. For some, the supernatural power may be consisted of ghosts and spirits; for others it may be an impersonal power, which pervades everything in this world; for still others, it may be manifested through a pantheon of anthropomorphic gods and goddesses or a single high God and so on. The religious belief of the people may also act as barrier to behaviour change.
- **Literacy-**Literacy is defined differently by different individuals or agencies. The National Literacy Mission defines literacy as acquiring the skills of reading, writing and arithmetic and the ability to apply them to one’s day-to-day life. Literacy as defined by UNESCO is that a literate

person is one who has acquired all the essential knowledge and skills which enable him to engage in all those activities in which literacy is required for effective functioning in his group and community. India is one of the countries (along with the Arab states and sub-Saharan Africa) where the literacy levels are still below the threshold level of 75 percent but gigantic efforts are on to achieve that level, efforts which have been relatively successful after India's literacy rate grew from 42 percent in 1981 to 66 percent in 2001. More than three fourths of the country's male population and above half of the female population is literate. The definitions given above suggest that literacy is one of the important elements to accelerate the behaviour change¹².

- **Socio-Economic status (SES)**-People who are socio-economically high can afford to have better education, hygienic environment, nutrition, health care etc. Studies have highlighted the link between socio-economic status and adherence to medical advice, maternal behaviour, child health, infant mortality etc. It is one of the most important indicators for bringing about desirable changes in the behaviour of the people. Higher the socio-economic status, higher the standard of living. It means, the people with high income may behave very differently as compared to the people of

poor income with reference to health seeking behaviour.

- **Caste**-The Indian caste system describes the social stratification and social restrictions in the Indian subcontinent, often termed as *jatis* or castes. In India, caste system has been categorised into forward, backward, most backward and scheduled caste. As per the stratification of caste system, the upper caste people are more privileged in terms of education, economic status, social status etc. as compared to other backward and scheduled caste. Therefore, Article 46 of the Indian Constitution lays down a directive principle of state policy. It provides "The state shall promote with special care the educational and economic interests of the people and in particular of the scheduled castes and scheduled tribes and their name appears in the schedule of the Indian Constitution. Of late, other backward caste started getting privileges due to their economic conditions. As the variations exist in the castes among the people, followed by poor socio-economic conditions, the process of behaviour change among them can be affected.
- **Access to media**-In his book on Preventive and Social Medicine, Park (2002)¹³ describes the importance of communication for delivery of health care messages to the community. Media have been acting as a tool to deliver the

services, by undertaking awareness generation activities, from health care centre to the beneficiary. While discussing about each of the media, he views that both radio and television have become part of the fabric of modern civilization. However, they alone cannot do justice to change the human behaviour. For launching an effective communication programme to help the beneficiary, the media viz. Inter-personal communication, group communication, mass communication and traditional method of communication can be used in an appropriate combination, though, the power of mass media has been well recognised for sensitisation activities. While launching behaviour change communication programmes emphasis should be laid on whether the target audience has access to media or not. Lack of access to media by the target audiences can hinder their behaviour change.

- **Peer pressure** - Peer Pressure refers to the influence exerted by a peer group in encouraging a person to change his or her attitudes, values, or behaviour in order to conform to group norms. Peer pressure can cause people to do things they would not normally do, e.g. taking drugs, smoking, getting a girlfriend, having a job, going for marriage, getting children, buying expensive items that they really don't need (cars, houses, boats), etc. The peer

pressure could be both positive as well as negative. It is better to understand the kind of peer pressure operating in a particular area before launching a behaviour change communication programme.

Strategic communication design for behaviour change-

While describing the strategic communication design for behaviour change, the author would like to stick to what has been used by the INFO Project (January 2008, Issue No. 16) of Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs, 111 Market Place, Suite 310, Baltimore, Maryland 21202, USA³.

Analysis-This is the first stage of Strategic Communication Design for behaviour change of a particular group of people. At this stage, we should collect baseline information regarding who the audiences are, what are their problems, whether they are indulging in high-risk behaviour, what are the expected and desired behaviours from them, how are they influenced (socially, psychologically, economically and educationally), whether they have access to media, where do they reside, how they have been responding to health interventions, whether the particular area is prone to certain diseases, etc. Here, the question is where are they? and where they have to go? What are the health interventions available to take them to the desired goal?

Strategic design-It should be able to -raise the level of awareness,

knowledge and understanding of the people about their problems and solutions to overcome the same; create an enabling environment for behavioural changes among the people who are indulging in high-risk behaviour through a network of various communication channels; and provide a special communication package for facilitating behaviour change among the people according to their level and area, (situation specific and target audience specific). Expected behaviour, conceptual framework, choice of channels, design of messages, implementation plan and monitoring and evaluation have to be clearly spelt out.

- **Develop objectives:** While formulating a proposal for behaviour change among the people, the communication objective must be specific, measurable, appropriate, realistic and time-bound. The beneficiaries have to be explained in a way that they strategically think to go from an undesirable behaviour to the desirable behaviour, for example quitting smoking and stop indulging in risky sexual behaviour.
- **Position the programme to present a clear benefit:** In line with the objectives, the behaviour change programme has to be presented to the beneficiary in a way that he understands and adopts. To make the programme more effective, the content of the message, relevance of the message, accuracy of the message, the person who gives the message on any of

the media, the language, the time, the manner in which the message presented etc. go a long way in behaviour change communication programme.

- **Selection of media:** In the light of the audience profile, media have to be selected whether inter-personal communication, group communication, mass communication or traditional media of communication. Available findings in the area of the media suggest that the combination of multi-media is more effective as compared to single medium¹⁴. However, before choosing any medium, it has to be seen in the perspective of receiver whether he has access to the media or not, if at all he has access to media, what are those media which should be taken into account for undertaking communication activities for behaviour change.
- **Implementation plan and budget:** Strategic design for behaviour change should give serious thought to this issue indicating what is to be done, when, where, and how, and what is the budget provision?

Message and materials development, pre-testing and production-Behaviour change among the target audience can take place smoothly provided we have enough materials and messages developed and pre-tested based on the problems identified in the analysis stage for undertaking communication activities. As per John Hopkins

University, the message should fulfil at least seven characteristics viz. command attention; cater to heart and head; clarify the message; communicate a benefit; create trust; convey a consistent message and call for action.

Implementation and monitoring -This is one of the crucial steps in behaviour change communication programme. The implementation plan should be realistic for operational purpose. While implementing the programme, the staff involved in the programme need to be co-ordinated and activities are to be closely supervised. The findings of the implementation programme need to be incorporated to take corrective measures in the implementation programme. The budget position, audience response and time factor should be kept in view.

Evaluation-This is the “reaction” of the “action” put in the strategic communication design for behaviour change or it is the impact of the strategic communication design for behaviour change. The evaluation would suggest what are the strengths, weakness, opportunities and threat of the communication design for behaviour change.

Re-planning-Now we are at the stage that outcomes of the strategic communication design for behaviour change are in our hands, we know what have been the successes in the project as well as the failures. Also, we know what went wrong, when, where and how? What kind of mechanism is needed that we are aware of. Having all these

problems and solutions in front, the strategic communication design for behaviour change has to be re-planned.

Conclusion-Behaviour Change Communication is a process that motivates people to adopt and sustain healthy behaviours and life styles. Behaviour change of an individual is a gradual process and takes place step by step. The stages of behaviour change of an individual have been classified differently by different authors; however, they have common views. Realising the problems involved in the process of behaviour change of an individual, an appropriate strategic communication design has to be formulated taking into account the various steps viz: analysis, strategic design, message and materials development, pre-testing and production, implementation and monitoring and evaluation. The factors viz: social values, cultural belief, mores, folkways, religion, literacy, socio-economic status, caste, access to media and peer pressure etc. act as barrier to behaviour change, hence, it is desirable if situation specific and people specific communication strategies are launched to accelerate the process of behaviour change of the people.

References

1. Parsons Talcott and Shils A. Edward (1962), *Toward a General Theory of Action*, Harvard University Press, Cambridge, Massachusetts, USA
2. Leagans, J.P.(1961), *India's Experience with Training in Extension Education for*

Community Development, Cornell University, Ithaca, New York.

3. The INFO Project, Issue No. 16 (2008) Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs, 111 Market Place, Suite 310, Baltimore, Maryland 21202, USA
4. International Labour Organization/Family Health International, *Overview of HIV/AIDS Behaviour Change Communication Programming for the Workplace* (www.ilo.org/public/english/protection/trav/aids/publ/bcc1.pdf)
5. Dahama O.P. and Bhatnagar O.P (1980), *Education and Communication for Development*, Oxford and IBH Publishing Company, New Delhi.
6. Kishore J (2009), *National Health Programs of India: National Policies and Legislations Related to Health*, Century Publications, New Delhi
7. Rogers, Everett M. (2005). *Diffusion of Innovations*, Glencoe: Free Press, p. 403
8. *Advances in Health Communication* (1996), Johns Hopkins Bloomberg School of Public Health, Center for Communication Programs, 111 Market Place, Suite 310, Baltimore, Maryland 21202, USA
9. Park K. (2009), *Textbook of 'Preventive and Social medicine'* M/S Banarsidas

Bhanot, Jabalpur, Madhya Pradesh, India

10. Prochaska J.O and DiClemente C.C (1983) Stages and processes of self-change of smoking: toward an integrative model of change, *Journal of Consulting and Clinical Psychology*
11. Cohen, D., de la Vega R. and Watson G. (2001). *Advocacy for social justice*. Bloomfield, CT: Kumarian Press Inc.
12. National Literacy Mission-Website
13. Park. K. (2002) *Preventive and Social Medicine*, M/S banarsidas Bhanot Publishers, Jabalpur, Madhya Pradesh, India.
14. Mathiyazhagan T., Meshram M.P. and Singh Gyan (2000) *Sources of Information for Couples Regarding Contraceptives and their Level of Adoption, Health and Population – Perspectives and Issues*, Vol. 23(3).

Pain relief during labor

Music -Historical records reveal that the ancient Greeks played soothing instrumental music to women in labour. Music can have a relaxing effect in labour due to its ability to alter mood, reduce stress and promote positive thoughts. It can be used as a trigger for a breathing response or as a cue for relaxation. It may also be used as a distraction although this is a less effective use for music in labour. Music can be

comforting not only for you, but also for your supporters

Heat and cold-Two further simple ways of easing pain and assisting relaxation during labour are through the application of heat and cold. They provide a source of counter-stimulation. Heat can be applied in several ways:

- by taking a hot shower or bath
- via a hot water bottle or hot wet towel over the abdomen
- by applying a hot compress over the perineum

Instead of applying heat to the skin, some women find that cold is more soothing. A cool, damp face-cloth is always refreshing, while an ice pack can easily be applied to the lower back.

Imagery -Creative mental activity, known as imagery, can also be used to encourage relaxation and help women manage their pain during labour. Many people use imagery in everyday situations. For example, when we feel hungry we can often 'see' (visual imagery) and 'taste' (taste imagery) an imagined meal in front of us - even to the extent of making our mouths water. The word imagery (or visualisation) implies that only the visual sense is used. However, all senses (vision, touch, hearing, taste and smell) can be included in this mental activity.

Rhythmical movements-Many women find that rhythmical movement helps to ease pain during labour. This is not surprising because the movement is a common response in other painful circumstances. Likewise, during labour, many women instinctively have a strong urge to

be active. Movement provides a source of counter-stimulation and may stimulate the release of endorphins within the nervous system. For example, rocking the pelvis backwards and forwards during contractions is often found to be soothing. This can be performed while standing, sitting, kneeling, lying down or on hands and knees. Other rhythmical movements include tapping your fingers, rubbing your abdomen, breathing rhythmically and stamping your feet. Some women find it helps to count, sing, shout or howl at the same time!. Whichever manoeuvre appeals to you, the action should be rhythmical and repetitive, and make you feel better.

TENS-Transcutaneous Electrical Nerve Stimulation (TENS) provides yet another form of counter-stimulation and has been used for several years in the management of postoperative and cancer pain. It has been postulated that TENS helps to relieve pain by stimulating the release of endorphins. The TENS equipment consists of a small, battery driven pulse generator, connected to one or two pairs of electrodes which are attached to the skin with adhesive tape. When it is turned on, the TENS machine causes a tingling sensation underneath the electrodes - the strength of which can be adjusted at the generator controls. TENS is most useful during labour in helping to relieve pain. Consequently, the electrodes are usually placed on each side of the lower spine.

P.G. Raman, Tehsin .A. Petiwala, Adnan.Z. Bootwala
Mayur Hospital & Research Centre, Indore

Dengue, the most common and the most important mosquito-transmitted arboviral illness transmitted worldwide, is caused by infection with 1 of the 4 serotypes of dengue virus. Dengue is transmitted mainly by the *Aedes aegypti* mosquito and also by *Aedes albopictus*, and is classified as a major global health threat by the World Health Organization (WHO). Dengue Virus produces from a subclinical infection to a mild self limiting disease, the dengue fever (DF) and a severe disease that may be fatal, the dengue haemorrhagic fever/dengue shock syndrome(DHF/DSS). Prompt diagnosis and effective treatment changes the outcome of this disease remarkably. The WHO estimates some 2.5 billion people, two fifths of the world's population, are now at risk from dengue and estimates that there may be 50 million cases of dengue infection worldwide every year. The first recorded epidemic of clinically dengue-like illness occurred at Madras in 1780 and the dengue virus was isolated for the first time almost simultaneously in Japan and Calcutta in 1943–1944. The first virologically proved epidemic of DF in India occurred in Calcutta (now Kolkata) and Eastern Coast of India in 1963–1964. The disease is now epidemic in more than 100 countries.⁽¹⁾

Pathophysiology-The Dengue virus (DV) is an arbovirus, from genus *Flavivirus*, family *Flaviviridae*. It is a single stranded RNA virus and has four serotypes: DEN-1,2,3,4. Each dengue serotype confers lifelong homotypic immunity and a very brief period of partial heterotypic immunity, but each individual can eventually be infected by all 4 serotypes. Humans serve as the primary reservoir for dengue. Mosquitoes acquire the virus when they feed on a carrier of the virus. Transmission occurs after 8-12 days of viral replication in the mosquito's salivary glands (extrinsic incubation period). The mosquito remains infected for the remainder of its 15- to 65-day lifespan.⁽²⁾ The Dengue virus infects the target dendritic cells and macrophages and multiplies within them. Infection of target cells, primarily those of the reticuloendothelial system, such as dendritic cells, hepatocytes, and endothelial cells, result in the production of immune mediators that serve to shape the quantity, type, and duration of cellular and humoral immune response to both the initial and subsequent virus infections. The major pathognomic feature is increased vascular permeability without morphological evidence of destruction of the endothelium. The resultant effects are

Vasculopathy with increased vascular permeability-Due to Increased anaphylatoxin, released by complement activation causing leakage of intravascular fluid in to serous space. Increase in PGI2 which is the most potent vasodilator and platelet aggregation inhibitor.

Thrombocytopenia - The mechanisms of thrombocytopenia are- Bone marrow hypocellularity due to suppression by cytokines; Destruction by the liver and spleen; Immune-mediated injury by dengue antibody complexes on the platelet surface; Spontaneous aggregation to vascular endothelial cell pre-infected by dengue virus inducing platelet aggregation, causing lysis and platelet destruction.

Platelet dysfunction- Platelet dysfunction is due to- Increased release of beta-thromboglobulin (BTG), PF4 and PGI2; Hypoaggregation stimulated by ADP and defect in ADP-releasing ability.

Coagulopathy - Prothrombin complex deficiency due to liver damage. Consumptive coagulopathy due to the activation by mononuclear phagocytes, PF3 released from platelet aggregation. DIC as seen in prolonged shock cases of DSS.

Leucopenia- Due to direct bone marrow suppression.^(3,4,5,6,7,8)

Theories of pathogenesis of DHF and DSS-Since a single theory is unable to explain the various manifestations of dengue hemorrhagic fever, there are various theories proposed to explain the vasculopathy and bleeding tendencies in DHF.

- **Antibody-mediated pathogenesis or so-called antibody-dependent enhancement** - Previous infection with a heterologous dengue-virus serotype may result in the production of nonprotective antiviral antibodies that bind to the virion's surface and through interaction with the Fc receptor focus secondary dengue viruses on the target cell, the result being enhanced infection. The host is also primed for a secondary antibody response when viral antigens are released and immune complexes lead to activation of the classic complement pathway, with consequent effects. Cross-reactivity at the T cell level results in the release of physiologically active cytokines, including interferon and tumor necrosis factor.^(3,5,8)
- **Cell-mediated pathogenesis** - Monocyte infection mediates rapid activation of complement via the classical pathway and by the alternative pathway resulting in increased vascular permeability and a cascade of coagulation defects, including thrombocytopenia and clotting abnormalities.^(1,5)
- **Cytokine storm phenomenon** - A cascade of antibodies

are formed due to the T cells activation which is termed as "Cytokine Storm".

- **Others**-Individual's Genetic background;Virus strain differences;Nutritional status of the infected individual.⁽⁵⁾

Clinical manifestations-The clinical manifestations of dengue fever range from mild asymptomatic infection to a severe shock syndrome.

- **Fever**- Abrupt onset, rising to 39.5-41.4°C and accompanied by frontal or retro-orbital headache. It lasts 1-7 days, then defervesces for 1-2 days. It has a characteristic biphasic pattern, recurring with second rash but not as high as initially.
- **Rash**-Initial rash is transient, generalized, macular, and blanching; occurs in first 1-2 days of fever. The 2nd rash occurs within 1-2 days of defervescence, lasting 1-5 days and is scarlatiniform, maculopapular, sparing palms and soles.
- **Arthralgia and myalgias**- Usually severe and typically involves the back and other joints (break bone fever).
- **Miscellaneous symptoms**-Nausea and vomiting, Anorexia, Abdominal pain (severe in DHF/DSS), headache are frequently seen.^(9,10,11)
- **Physical findings**-Signs of intravascular volume depletion (Hypotension with narrowed pulse pressure, delayed capillary refill); Hemorrhagic manifestations(Positive tourniquet test, petechiae, purpura, epistaxis,

gum bleeding, GI bleeding, menorrhagia); Rash; Hepatomegaly (tender occasionally); Generalized lymphadenopathy.^(9,10,11)

Suspecting dengue fever, DHF, DSS-Dengue Fever is an acute febrile illness of 2-7 days duration (sometimes with two peaks) with two or more of the manifestations such as-headache, retro-orbital pain, myalgia/arthralgia, rash, haemorrhagic manifestation (petechiae and positive tourniquet test, leukopenia.⁽¹¹⁾

Dengue Hemorrhagic Fever is a probable case of dengue and hemorrhagic tendency evidenced by one or more of the-Positive tourniquet test; Petechiae, ecchymosis or purpura (Bleeding from mucosa mostly epistaxis or bleeding from gums, injection sites or other sites,Hematemesis or melena, Thrombocytopenia (platelets 100,000/cu.mm or less) and Evidence of plasma leakage due to increased capillary permeability manifested by one or more of the following: A >20% rise in hematocrit for age and sex ; A >20% drop in hematocrit following treatment with fluids as compared to baseline; Signs of plasma leakage (pleural effusion, ascites or hypoproteinemia).⁽¹¹⁾

Dengue shock syndrome-All the above criteria of DHF plus signs of circulatory failure manifested by -Rapid and weak pulse;Narrow pulse pressure (< or equal to 20 mm Hg);Hypotension for age;Cold and clammy skin and restlessness.⁽¹¹⁾

Grades of DHF⁽¹¹⁾

DF/DHF	Grade*	Symptoms	Laboratory
DF		Fever with two or more of the following signs: headache, retro-orbital pain, myalgia, arthralgia	Leukopenia occasionally Thrombocytopenia, may be present, no evidence of plasma loss
DHF	I	Above signs plus positive tourniquet test	Thrombocytopenia <100,000, Hct rise ≥ 20%
DHF	II	Above signs plus spontaneous bleeding	Thrombocytopenia <100,000, Hct rise ≥ 20%
DHF	III	Above signs plus circulatory failure (weak pulse, hypotension, restlessness)	Thrombocytopenia <100,000, Hct rise ≥ 20%
DHF	IV	Profound shock with undetectable blood pressure and pulse	Thrombocytopenia <100,000, Hct rise ≥ 20%

Laboratory findings-The lab findings are can be categorised into nonspecific and special tests.

Nonspecific findings-Increased hematocrit ;Increased PCV; Leukopenia; Thrombocytopenia; Mildly elevated AST and ALT levels; Mildly elevated amylase levels. ^(12, 13, 14, 15)

Serological tests-During the stage of fever there is viraemia with presence of NS1 antigens in blood. The presence of virus in blood is detected either by isolation of the virus using infant mice or in tissue culture or by RT-PCR and the NS1 is detected by ELISA. During the post-febrile stage lasting a few weeks, IgM and IgG antibodies are present and are

detected by Capture- ELISA. During primary infection, viraemia and fever coincides, but during a secondary infection (second time infection with DV), the viraemia is present for 2 to 3 days, and NS1 antigens in blood lasts little longer. ⁽¹⁾Five basic serologic tests are routinely used for the diagnosis of dengue infection:

- Haemagglutination-inhibition (HI) — Most frequently used. It is sensitive, easy to perform, requires only minimal equipment, and is very reliable if properly done. A titer of 1:1,280 or greater in an acute-phase serum is

considered a presumptive diagnosis of current dengue infection.

- Complement Fixation (CF) - not widely used for routine dengue diagnostic serology.
- Neutralization Test (NT) - most specific and sensitive serologic test for dengue viruses.
- IgM-capture Enzyme-linked Immunosorbent Assay (MAC-ELISA)
- Indirect IgG ELISA. ^(12, 13, 14, 15)

NS1 antigen test-Artificial NS1 receptors have been implanted on a re-useable microchip that can capture and identify NS1 instantly

and is used for bedside diagnosis of dengue virus infection.⁽¹⁾ It is specific for flavivirus. It is approximately 88-90% sensitive and is used as a rapid screening test.⁽¹⁹⁾

DNA based test- RT-PCR – Using RNA detection. It is the most standard test against which the other tests are compared with.⁽¹⁴⁾

USG findings - The USG findings are relatively specific in a case of dengue fever as it causes polyserositis of different organs leading to various manifestations. These are- Thickening of the gallbladder wall > 3 mm. (sensitivity 94% and specificity of 48%) - >95% ; ascites – 95%; hepatomegaly and hepatic subcapsular effusions – 75%; splenomegaly and splenic subcapsular effusions; pleural effusion – 80%; gall bladder sludge; acalculous cholecystitis; pararenal and perirenal effusions – 77%; pancreatic edema - 40%. Ultrasound of the abdomen is an important adjunct to clinical profile in diagnosing DF and may help to direct further confirmatory investigations. Further diagnosis can be made early in the course of disease compared with other modes of diagnosis. During an epidemic the ultrasound findings of GB wall thickening with or without polyserositis in a febrile patient should suggest the possibility of DF/DHF. One of these studies suggested GB wall thickening as the initial finding in DF (100%). GB wall thickening in DF may be due to decrease in intravascular osmotic pressure. These findings may also occur in other viral infections, enteric fever and leptospirosis, but in other

viral infections the historical profile, symptom complex evolution and physical findings do not mimic those of DF.⁽¹⁶⁾

Complications⁽¹⁴⁾-Dengue fever has many complications as related to the various organ systems it affects. These are-Bleeding diathesis;Encephalitis; Acute liver failure; Acute renal failure; Dual infections (malaria,leptospirosis); Reactivation of herpes 6 virus; Myositis and rhabdomyolysis; Myocarditis

Differential diagnosis-Since dengue is a viral hemorrhagic fever, it carries many common manifestations as other viral and viral hemorrhagic fevers, along with some bacterial and parasitic infestations such as-Influenza; Viral URTI; Malaria; Viral Hepatitis; Rickettsial Infections; Enteric Fever; Leptospirosis; Other Viral Hemorrhagic Fevers; Bacterial Sepsis and DIC.

Treatment⁽¹⁴⁾-The mainstay of treatment is to give adequate fluid therapy and to manage bleeding complications, along with supportive treatment.Avoid any medications that cause or aggravate thrombocytopenia, or cause bone marrow suppression eg.penicillins, cephalosporins, NSAID'S, chloroquine and many others to list a few.Platelet transfusions should be reserved for patients with DF and platelet count (<10,000), or if patient has signs of bleeding from any site, eg.epistaxis, hemoptysis etc.^(15,16)Platelet refractoriness defined as the repeated failure to obtain satisfactory responses to platelet transfusions can be encountered in dengue fever due to alloimmunisation secondary to repeated platelet transfusions.

This may lead to fatal complications like intracranial bleeding.Corticosteroids have showed no benefit in various trials conducted and should not be used inadvertently.⁽¹⁷⁾ The treatment of DHF and DSS differs only in the quantity of fluids infused in the given time period, hereby emphasising on the importance of fluid management in DHF and DSS. See fig.1&2 below.

Vaccine-There is no current dengue vaccine available and the estimated availability is in 5-10 years. Vaccine development is problematic as the vaccine must provide immunity to all 4 serotypes and the lack of dengue animal model makes it difficult to conduct trials. Some live attenuated vaccines are under phase 2 trials. New approaches include infectious clone DNA and naked DNA vaccines.⁽¹⁸⁾

Prevention-Presently the most effective way to prevent dengue is to prevent vector transmission. The various methods proposed by CDC are-The use of mosquito repellents that contain DEET (N, N-diethylmetatoluamide) ; Although it may feed at any time, the mosquito bites humans only between a few hours after dawn until an hour or so after sunset; The mosquito's preferred breeding areas are in areas of stagnant water, such as flower vases, uncovered barrels, buckets, and discarded tires, but the most dangerous areas are wet shower floors and toilet tanks, as they allow the mosquitos to breed right in the residence;Wear long-sleeved clothing and long pants if you are outdoors during the day and evening; Spray

permethrin or DEET repellents on clothing, as mosquitos may bite through thin clothing; Use mosquito netting over the bed if your bedroom is not air conditioned or screened. For additional protection, treat the mosquito netting with the insecticide permethrin; Spray permethrin or a similar insecticide in your bedroom before going to bed.

Conclusions—The etiopathogenesis, clinical features, laboratory findings, complications and management of dengue is described in detail. Prompt diagnosis and accurate management in a tertiary care decreases the mortality rates significantly in this disease.

References

1. Chaturvedi U C and Nagar R 2008 Dengue and dengue haemorrhagic fever: Indian perspective; *J. Biosci.* 33 429–441.
2. Gubler D J. Dengue. In: Monath T P, editor. *Epidemiology of arthropod-borne viral diseases*. Boca Raton, Fla: CRC Press, Inc.; 1988. pp. 223–260
3. Brandt W E, McCown J M, Gentry M K, Russell P K. Infection enhancement of dengue-2 virus in the U937 human monocyte cell line by antibodies to flavivirus cross-reactive determinants. *Infect Immun.* 1982;36:1036–1041.
4. Halstead S B. Dengue hemorrhagic fever—public health problem and a field for research. *Bull W H O.* 1980; 58:1–21.
5. Halstead S B. Pathogenesis of dengue: challenges to molecular biology. *Science.* 1988;239:476–481.
6. Halstead S B, O'Rourke E J. Dengue viruses and mononuclear phagocytes. I. Infection enhancement by non-neutralizing antibody. *J Exp Med.* 1977;146:210–217.
7. Halstead S B, Venkateshan C N, Gentry M K, Larsen L K. Heterogeneity of infection enhancement of dengue 2 strains by monoclonal antibodies. *J Immunol.* 1984;312:1529–1532.
8. Kliks S C, Nisalak A, Brandt W E, Wahl L, Burke D S. Antibody-dependent enhancement of dengue virus growth in human monocytes as a risk factor for dengue hemorrhagic fever. *Am J Trop Med Hyg.* 1989;40:444–451.
9. Hayes E B, Gubler D J. Dengue and dengue hemorrhagic fever. *Pediatr Infect Dis J.* 1992;11:311–317.
10. Waterman S H, Gubler D J. Dengue fever. *Clin Dermatol.* 1989;7:117–122
11. *Dengue hemorrhagic fever: diagnosis, treatment, prevention, and control.* 2nd ed. Geneva: World Health Organization; 1997:1-84
12. Guzman M G, Kouri G. Advances in dengue diagnosis. *Clin Diagn Lab Immunol.* 1996;3:621–627.
13. Vorndam V, Kuno G. Laboratory diagnosis of dengue virus infections. In: Gubler D J, Kuno G, editors. *Dengue and dengue hemorrhagic fever—1997*. London, United Kingdom: CAB International; 1997. pp. 313–334.
14. Guidelines for treatment of Dengue fever/Dengue hemorrhagic fever in small hospitals. WHO; 1999.
15. Dietz V, Gubler D J, Ortiz S, Kuno G, Casta-Velez A, Sather G E, Gomez I, Vergne E. The 1986 dengue and dengue hemorrhagic fever epidemic in Puerto Rico: epidemiologic and clinical observations. *P R Health Sci J.* 1996;15:201–210.
16. P M Venkata Sai, MBBS, DMRD, DNB, FICR, B Dev, MBBS, MD, DNB and R Krishnan, R S MBSS, MD Department of Radiology and Imaging Sciences, Sri Ramachandra Medical College & Research Institute (DU), Porur, Chennai – 600 116, Tamil Nadu, India . Role of ultrasound in dengue fever. *British Journal of Radiology* (2005) 78, 416-418.
17. Panpanich R, Sornchai P, Kanjanaratanakorn K. Corticosteroids for treating dengue shock syndrome. *Cochrane Database of Systematic Reviews* 2006, Issue 3.
18. Dengue Vaccine: The Current Status Maj MS Mustafa, Lt Col VK Agrawal.
19. Dussart P, Labeau B, Lagathu G, Louis P, Nunes MR, Rodrigues SG, Storck-Herrmann C, Cesaire R, Morvan J, Flamand M, Baril L. *Clin Vaccine Immunol.* Evaluation of an enzyme immunoassay for detection of dengue virus NS1 antigen in human serum. 2006 Nov; 13(11):1185-9. Epub 2006 Sept.

Fig.1

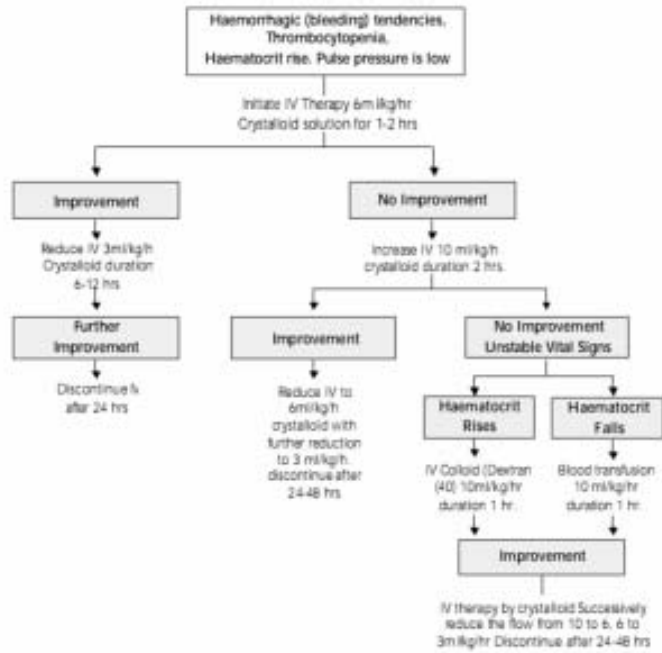
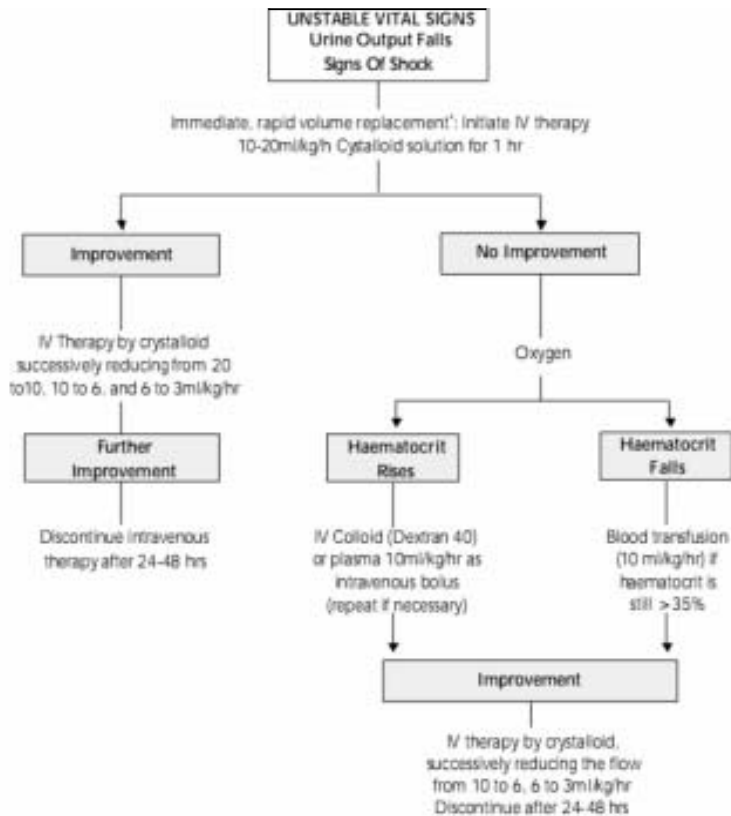


Fig.2



Mapping the Risk Factors of Coronary Heart Disease among Females

(45-65 Years): A Case-Control Study

Radhika Sood, Anupa Siddhu, Pooja Jain, Piyush Jain

Lady Irwin College, Daulat Ram College, Escort Heart Institute and Research Centre, New Delhi

Original
Article

Premature disability from cardiovascular diseases (CVD) is now emerging as a leading community health problem in developing nations. In most industrialized countries, CHD is the most common single cause of death and a major cause of admission to hospital. However, mortality and hospital statistics appreciably underestimate the total morbidity resulting from CHD. It has assumed epidemic proportions in India. CHD has assumed epidemic proportions in India. The disease is more prevalent in urban populations and there is a clear gradient in its prevalence from rural to semi-urban to urban populations. The disease occurs at a younger age in Indian subjects compared to western developed nations. A recent study assumes that by 2010 India would be the home to 60% of world's heart disease burden, nearly four times more than its share of global population. What is more striking is fact that these conditions are now striking at an earlier age. Heart disease is indeed crippling India. Annually over two million people die of coronary disease in India and the country stands to lose \$236 billion in next 10 years due to lost productivity and treatment cost. CVD affects as many women as men, albeit at an older age. Considering all nine risk factors of INTERHEART study, the collective PAR of MI is 96%

in women compared to 93% among men.

The rates of CVD have risen greatly in low-income & middle-income countries, with about 80% of the burden now occurring in these countries. However, most of the risk factors are mostly studied in developed countries. Thus, it is important to map risk factors for CHD among Indian females with case control studies. The present study was undertaken with the aim of establishing the presence of coronary risk factors in angiographically proven cases of CHD and comparing this data with the presence of the same risk factors in age matched healthy controls.

Methodology-The study was conducted in the Department of Preventive and Rehabilitative Cardiology, Escort Heart Institute and Research Centre, New Delhi. The hospital was selected based on rapport with physicians and permission from the management.

Sample selection-The subjects were classified into two categories-cases and controls. The subjects were classified as "case" if they were found to have CHD detected with in past 120 days by set criteria. If they are found to be free from CHD were classified as "controls". The controls were selected from population who visited hospital for preventive health check-up.

The inclusion criteria for cases-females; 25-65 years of

age; diagnosed to have CHD within past 120 days. CHD was suspected from (history of angina; abnormal electrocardiogram, and/ or abnormal stress test). To be confirmed by diagnostic coronary arteriography (CART, angiography)

The inclusion criteria for controls-females; 25-65 years of age, age matched with cases; free from clinical CHD. CHD free status was ascertained by (absence of angina; absence of prior history of heart attack or history of disease; normal electrocardiogram, and normal stress test). Patients suffering from cancer, and pre-existing liver or renal disease were excluded from the study.

All the subjects gave written informed consent to participate in study. The investigator also signed a confidentiality statement on informed consent before recruitment.

Sampling technique and sample size-The subjects were purposively selected from the hospital. All subjects reporting to Cardiology Clinic of Escort Heart Institute and Research Center, between September to December 2008, were enrolled. A total of 95 subjects were enrolled however, the final cohort for analysis consisted of 30 confirmed CHD cases between 45-65 years of age and 30 age and gender matched controls. Matching involved identification of one age matched (± 2 years) control per case. The

study was conducted from the period of August 2008 to January 2009.

Operational definitions

- **Current smokers-** Individuals who smoked any form of tobacco in previous 12 months and included those who had quit within the previous 12 months.
- **Former smokers-** those who had quit more than a year earlier.
- **Current alcohol consumption -** Regular alcohol consumption at least 3 times or more per week.
- **Psychosocial stress-**The factors assessed for psychological stress were depression, financial stress, and life events (stress at work or at home) (Yusuf et al, 2004)¹.
- **Physical activity-** Subjects were judged to be physically active if they (Stand or walk about quite a lot during work; Climb stairs or hill often at work; Perform heavy work or lifts heavy loads routinely at work; Perform vigorous or moderate leisure time (recreational) activity; Perform muscle-strengthening exercises). Vigorous activities were defined as activities that cause heavy sweating or large increases in breathing or heart rate (Jain et al, 2008). Moderate activities (walking, cycling, gardening) or strenuous activities (jogging, football, vigorous activities) had to be performed for 4 or more hours per week (Yusuf et al, 2004)¹. If the physical activity per week was less than 4 hours the subject was considered physically inactive.

- **Family history of premature cardiovascular disease-**If a subject had a first degree relative (father, mother or sibling) who had either - AMI before 65 years of age females; Ischaemic cerebral stroke before 65 years of age females; Sudden cardiac death before 65 years of age females (ATP III2002)².
- **Passive Smoker-** If a non-smoker subject was exposed to passive smoking at home.
- **History of hypertension-** If a subject had been informed by a physician that she had persistently high blood pressure or there was present / past history of antihypertensive drugs.
- **History of dyslipidemia-** If a subject had been told by a doctor that she had dyslipidemia or she had been taking drug treatment for the same in past or presently.
- **History of diabetes mellitus-** If a doctor had told a subject that she had diabetes mellitus of she had been taking drug treatment for the same in past or presently.

Development of tool for data collection-A questionnaire cum structured interview schedule was used for eliciting the information. This method was selected as; it is very flexible, reasonably accurate, simple and less time consuming and easy to administer (Kotler, 1988)³. The designed questionnaire was pretested on 5 subjects in order to enrich the validity and enhance the infallibility of tool by deletion of inconsistent, ambiguous and lengthy items and the addition of essential items. The

questionnaire was then used for data collection. The questionnaire collected following information:

Primary data- Demographic profile (This included the subjects name, age, sex, address, educational qualification, occupation, income, and marital status); Lifestyle factors (Smoking, alcohol intake, psychological stress, sleep pattern and physical activity); Biological traits (History of hypertension, dyslipidemia, diabetes mellitus, and family history of premature CHD, stroke, and sudden cardiac death); Diet assessment (This included structured interview related to typical food habits and 24-hour dietary recall, which was administered for quantitative assessment of diet. A semi quantitative food frequency questionnaire (FFQ) covering all major food groups was conducted for the validation of dietary recall.)

Techniques used for collecting primary data-The techniques used for collecting primary data were:

Diet assessment-Semi quantitative food frequency questionnaire (It assessed the frequency with which food items or food groups are consumed during a specific time period. It was originally designed to provide descriptive qualitative information about usual food-consumption patterns. With the addition of portion-size estimates and introduction of improved computerized self-administered questionnaires, the method has become semi-quantitative, allowing the derivation of energy and selected nutrient intake, Gibson,

2005)⁴. 24-dietary recall (It assessed actual intake of the subjects. The estimate of each food and beverage item consumed were obtained. A set of standardized measuring cups, spoon, and glass were used to assist subject in assessing the portion size of food items consumed)

Physical examination-Physical examination included anthropometric measurements. Anthropometry is the single most universally applicable, inexpensive, and non-invasive method available to assess, proportions, and composition of the human body (WHO, 1995)⁵. It is most frequently used to assess the nutritional status of individuals or population groups. Nutritional anthropometry has been defined by Jelliffe (1989)⁶ as “measurement of variation of physical dimensions and the gross composition of human body at different age, levels and degree of nutrition”.

Anthropometric measurements taken were:

- **Height-** Standing height was measured using non-stretchable microtoise tape, with the sensitivity of 0.1 cm fixed on the wall. The subject was made to stand barefoot and erect. Their feet were kept together, with heels, buttocks, and shoulders touching the wall. The Frankfurt plane was adjusted so that the top of ear and cornea of eye were parallel to the floor. Every fifth measurement was taken in duplicate and mean was calculated.
- **Weight-** Weight was measured in kilograms (kg)

using digital weighing balance (Breuer PS 16), with the sensitivity of 0.1 kg. The machine was calibrated using standard weight of 10 kg on the day of data collection. Weight was taken bare foot and in the minimal clothing. Subjects stood still in the centre of the machine, with the body weight evenly distributed between both feet. They were asked to stand straight and look straight.

- The height and weight measurements were used to calculate body mass index
- **Body Mass Index (BMI)/ Quetlet Index-** It is a measure of the relative body fatness to evaluate risk factors associated with the obesity. BMI is the ratio of weight (kg)/ height² (m²).
- $BMI (kg/m^2) = \text{Weight (kg)} / \text{Height}^2 (m^2)$
- **Circumferences-** The circumferences were measured using fiber glass tape, with the sensitivity of 0.1 cm.

Waist circumference- The subjects were made to stand comfortably with their weight evenly distributed on both feet. The measurement was taken midway between the inferior margin of the last rib and the crest of the ilium, in a horizontal plane. Each palpated landmark was marked, and the midpoint was determined with a tape measure and marked. The investigator sat by the side of the subject and fitted the tape snugly but not so tightly as to compress underlying soft tissues. The circumference was measured to the

nearest 0.1 cm at the end of normal expiration (WHO, 1995)

Hip circumference- The subjects were made to stand erect with arms at the side and feet together. The investigator sat at the side of the subject so that the level of maximum extension of the buttocks could be seen, and the tape was placed around the buttocks in the horizontal plane. The tape snugged against the skin but should not compress the soft tissues. The measurement was recorded to the nearest 0.1 cm (WHO, 1995)⁵.

The waist and hip circumferences were used to calculate waist to hip ratio

Waist to Hip ratio (WHR)- It is the simple method for distinguishing between fatness in lower trunk and fatness in upper trunk.

$WHR = \text{Waist circumference (cm)}$

$\text{Hip circumference (cm)}$

Secondary data

- **Cardiovascular examination -**Based on physical findings of cardiovascular system cardiologist classified the status of the subject as normal or abnormal.
- **Blood pressure-**It was measured by cardiologist using sphygmomanometer by standardized technique. The measurement was taken in a comfortable environment and any kind of stress and discussion were avoided.
- **Biochemical parameters-** **Blood electrolytes** (sodium, potassium and chloride) were measured by potentiometric method using auto-analyzer,

Hitachi-912); Blood glucose(Fasting plasma glucose, 2 hour post prandial and sugar random were measured by glucose oxidase peroxidase method using auto-analyzer, Hitachi-912, 917); Blood lipids (Total cholesterol (TC), triglycerides, HDL-C, and LDL-C were measured by cholesterol esterase oxidase-proxidase method using auto-analyzer (Hitachi-912, 917). VLDL-C was a calculated value by the formula $VLDL-C = TC - (LDL-C + HDL-C)$.

Statistical analysis of data-After age matching by the procedure described earlier, final cohort consisted of 30 cases and 30 controls. All the data was entered onto excel worksheets and transferred to SPSS version 9 and 11 software for analysis.

- **Study variables-**Variables to be selected for analysis were educational status, occupation, income, tobacco use, alcohol intake, physical activity, food habits – vegetarian or non vegetarian, type of milk consumed, cooking oil, staple cereal, number of servings and amounts per day of cereals, pulses, milk and milk products, fruits and fruit juices, vegetables, fats and oils, sugar, consumption of vitamin and mineral supplements, pre existing hypertension, pre existing diabetes mellitus, family history of CHD, BMI, waist-hip ratio, systolic and diastolic blood pressure, fasting plasma glucose, 2 hr post meal plasma glucose, serum total cholesterol, triglycerides, HDL

cholesterol, LDL cholesterol, VLDL cholesterol, hormonal replacement therapy (HRT) and menopausal state, psychosocial stress, and unbroken sleep.

- **Diet related data-**The standardized measures were used to calculate the quantity of raw foods used in recipe. The nutrient content of the food intake was calculated using Nutritive value of Indian foods (ICMR, 1990)⁷. Mean intake of foods from various food groups was also calculated.
- **Biochemical data-**Blood parameters including plasma glucose levels, electrolytes, lipids were classified according to the standard norms
- **Physical examination data-**Blood pressure was classified as normal, pre hypertension, stage 1 hypertension, and stage 2 hypertension (JNC-7, 2004). From the anthropometric data of weight, height, waist circumference, hip circumference. Body mass index and waist to hip ratio indices were calculated, Using IOTF, 2000 and ATP III, 2002 classification respectively.
- **Data analysis-**The means and standard deviations were calculated for each of the variables studied. The means were compared using student's t-test and p value was calculated. The alpha value chosen was 0.05. Odds ratios were calculated to determine the association of CHD and identifiable risk factor, with 95% Confidence Interval (CI). When the 95% CI

extends beyond 1 in both directions than the result was considered to be statistically significant. Multiple logistic regression was performed with CHD as dependent variable and other variables as independent, to calculate independent contributions of each risk factor to the outcome.

- **Risk assessment-**The Framingham risk scores were calculated to assess whether these score discriminated between cases and controls. It estimated 10-year CHD risk by scoring system to identify women at high risk.

Results and Discussion-A hospital based case-control study was undertaken to identify the coronary risk factors among 60 females, in angiographically proven 30 CHD cases by comparing their prevalence in 30 age-matched (± 2 years) and gender-matched healthy controls. The results obtained from the study are discussed in the following sections.

Demographic profile of the subjects

- **Age-**The subjects identified in the study were from 45-65 years. Mean age of the cases was 55.2 ± 6.1 years and among matched controls it was 55.1 ± 6.0 years. A study by Joshi et al (2007)⁸ reported that, in India female cases of acute myocardial infarction were 6.3 years older than male cases (57.3 ± 11.6 years vs 51.0 ± 10.4 years).
- **Educational status-** Eleven (36.6%) of the cases and 7 (23.4%) of the controls were

graduates. About 26.7% (8) cases and 20% (6) were educated up to secondary school or less. For comparison subjects were divided into two groups. Group1: senior secondary school or less (secondary school or less, and senior secondary), and group 2: bachelor's degree or above (bachelor's, masters, professional, doctoral and vocational degree). Nearly 56.6% (17) cases and 60% (18) controls received bachelor's degree or more. Epidemiological studies in India have reported, uneducated and less educated men and women in rural India have a higher prevalence of CHD (Gupta et al, 1994)⁹. In the present study, difference in educational status between the two groups was not found to be significantly associated with CHD (OR-1.31, 95% CI 0.47-3.66).

- **Occupational status-** Majority of the women among cases and controls were housewives (73.3%). For the purpose of comparison occupational status was divided into two groups. Group1: managerial (office jobs, and small scale business) and group 2: non-managerial (retired and housewife). About 23.3% (7) cases and 16.7% (5) controls belonged to group 1 and 76.6% (23) cases and 83.3% (25) controls were in group 2. The contribution of occupational status to CHD risk was insignificant (OR-1.52, 95% CI-0.69-2.13).

- **Marital status-** Majority of the cases 27 (90%) and controls 29 (96.7%) were married. Only 3 (10%) of cases and 3.3% (1) control females were in the category of widow.

- **Monthly family income-** 8 (26.7%) cases had monthly family income between Rs20,001-30,000, whereas 20% control each belonged to Rs10,001-20,000 and Rs30,001-40,000 category. The other categories of the two groups were more or less similar. The difference in monthly family income of cases and controls was statistically insignificant (p=0.61). Studies have reported that patients in middle income and high-income group are at lower risk for combination of cardiovascular death and non-fatal AMI than those in lower income groups (Laszlo and Janszky, 2008)¹⁰.

- **Modification of dietary habits-** Twenty-one (35%) of the total subjects had modified their diet prior to the study. Majority of the subject's i.e, 66.7% of cases and 63.3% of the controls had not modified their diets in recent past. The subjects who modified their dietary habits did so on the advice of doctor (4 cases and 3 controls) and 3 of cases and controls modified their diets on the advice from dietician. The controls were given dietary advice by doctors and dieticians when they had visited hospital for preventive health check up.

Factors related to lifestyle-The INTERHEART Study has reported that major cardiovascular risk factors are important in populations with high as well as low cardiovascular risk and in South Asians, who have one of the highest risk of premature AMI, these lifestyle and metabolic risk factors are equally important (Yusuf et al, 2004)¹. This study shows increasing trends in multiple cardiovascular risk factors in the Indian urban female population.

- **Smoking-** Individuals who smoked any form of tobacco in previous 12 months including those who had quit within the previous 12 months were considered to be current smokers. In the present study none of the subjects in the two groups had ever smoked. About 6.7% (2) cases and 3.3% (1) control chewed tobacco. The mean years of tobacco chewing among cases were 7.5 3.53 years and 20 years for the single control. There was no significant difference in the prevalence of tobacco chewing between cases and controls (p=0.55, OR-2.07, 95% CI 0.17-24.14). Tobacco use is heavily influenced by the historical context of communities and cultural norms, and in most societies women have smoked less than men. Tobacco use clearly explains part of the lower rate of MI in younger women compared to that in men (Rich-Ewards et al, 1995)¹¹. However, in some societies, smoking is increasing in young women, which may remove

some of the relative advantage that women have over men in avoiding or delaying CHD. A study by Pais et al (1996)¹² found that, the most important predictor of AMI was current smoking (OR-3.6, $p < 0.01$) of cigarettes or beedis. According to INTERHEART study, former smoking among men was significantly associated with higher PAR than among women [PAR-18.1 vs 3.5; OR-1.61 (95% CI 1.49-1.74) vs 1.04 (95% CI 0.88-1.22)]. The impact of current smoking on CHD was higher in women < 60 years ($n=2467$) (OR-4.40, 95% CI 3.54-5.48) compared to women > 60 year ($n=4320$) (OR-2.29, 95% CI 1.85-2.82) (Anand et al, 2008)¹³. A case-control study done in east India concluded smoking is a significant risk factor of CHD (Gupta, 2005)¹⁴. If a non-smoker was exposed to passive smoking at home, she was considered as passive smoker. Out of the total subjects 13.3% (4) each of case and controls were passive smokers. But the OR for CHD among the passive smokers was statistically insignificant (OR-1.00, 95% CI 0.22-4.43). A review paper of nine epidemiological studies concludes an individual male never smoker living with a current or former smoker is estimated to have an approximately 9.6% chance of dying of IHD by age of 74 years, compared with 7.4% chance for a male never smoker living with a non smoker. The corresponding lifetime risk for

women is 6.1% and 4.9% (Steenland 1992)¹⁵.

- **Alcohol consumption**-In the present study none of the subjects in the two groups consumed alcohol. However, studies have reported mild to moderate alcohol consumption has been associated with lowered rates of CVD events (Mukamal et al, 2003)¹⁶. However, INTERHEART South Asia study reported that alcohol was not associated with MI in any of the South Asian countries (OR-1.06, 95% CI 0.85-1.30) (Yusuf et al, 2004)¹. A Delhi based study by Jain et al (2008)¹⁷ showed that, alcohol intake in males was not associated with CHD.
- **Physical activity**-The subjects were judged to be physically active if they stand or walk about quite a lot during work; climb stairs or

hill often at work; perform heavy work or lift heavy loads routinely at work; perform vigorous or moderate leisure time (recreational) activity; perform muscle-strengthening exercises. Vigorous activities were defined as activities that cause heavy sweating or large increases in breathing or heart rate (Jain et al, 2008)¹⁷. Moderate activities (walking, cycling, gardening) or strenuous activities (jogging, football, vigorous activities) had to be performed for 4 or more hours per week (Yusuf et al, 2004)¹. If the physical activity per week was less than 4 hours the subject was considered physically inactive. The mean time spent in strenuous activities, exercise, and yoga by controls was significantly higher than that spent by cases ($p=0.05$, 0.01, 0.02 respectively).

Table-1, Mean time spent (in minutes) in activities per day by cases and controls (n=60)

Activity	Cases n=30	Controls n=30	p value
Sleeping	524.0 ± 63.9	501.0 ± 57.3	0.14
Sitting	355.3 ± 96.7	327.3 ± 99.5	0.27
Standing	240.1 ± 74.7	202.6 ± 82.2	0.70
Strenuous	14.6 ± 33.2 (n=13)	29.1 ± 56.9 (n=18)	0.05
Household chores	300.5 ± 78.2	328.3 ± 79.0	0.17
Exercise	3.3 ± 11.0 (n=3)	15.0 ± 21.9 (n=11)	0.01
Yoga	5.5 ± 13.6 (n=5)	19.0 ± 29.2 (n=14)	0.02

The data on occupational and non-occupational activities that described subject's daily activities was also collected. On this basis OR for occupational (OR-1.72, 95% CI 0.61-4.84) and non-occupational activity (OR-0.20, 95% CI 0.66-0.52) was found to be statistically insignificant between the two groups. The subjects were classified as physically active or physically inactive based on the above mentioned criteria. About 76.7% (23) cases and 40% (12) controls were physically inactive. Physical inactivity status contributed to the increased risk of CHD among cases ($p=0.002$, OR-4.92, 95% CI 1.61-15.07). A recent hospital-based case-control study from two urban centers in India suggested that daily moderate intensity physical activity (e.g., the equivalent of briskly walking 35- 40 min per day) is associated with a 55 % lower risk for CHD (Rastogi et al, 2004)¹⁸. Lee et al (2001)¹⁹ concluded that even light-to-moderate activity is associated with lower CHD rates in women. At least 1 hour of walking per week predicted lower risk. The inverse association with physical activity was also present in women at high risk for CHD, including those who were overweight, had increased cholesterol levels, or were smokers. A comparative study by Joshi et al (2007)⁸ found that, protective factors of moderate- or high-intensity exercise were lower in South Asian controls than in controls from other countries (6.1% vs 21.6%). A strong inverse association between leisure time physical activity and CVD mortality or non-fatal MI among postmenopausal women was

found in the Iowa Women's Health Study and Group Health Cooperative enrollees (Sesso et al, 1999)²⁰.

Dietary factors-As mentioned in earlier section 33.3% cases and 36.7% controls had modified their diets in recent past. Thus, the two groups were similar.

- **Vitamin and mineral supplements**-About 12 (40.0%) cases and 13 (43.3%) controls consumed vitamin and mineral supplements. Among the subjects 11 cases and 11 controls consumed vitamin and mineral supplements occasionally, whereas 1 case and 2 controls consumed it regularly. The consumption of supplements was not found to be statistically associated with CHD in the subjects ($p=0.79$, OR-0.87, 95% CI 0.31-2.41).

- **Food Habits**- Out of the total subjects ($n=60$), 60% of the subjects were vegetarians and 40% were non-vegetarians (includes eggitarian also). There were 18 (60%) cases and the same number controls that belonged to the vegetarian group. There was no significant difference between the two groups ($p=1.00$, OR-1.00, 95% CI 0.35-2.80) with respect to food groups. However, a study by Pais et al (1996)¹² reported that vegetarianism had a protective effect from CHD ($p=0.006$, OR-0.55, 95% CI 0.35-0.85).

- **Non-vegetarian food consumption**-In the present study 11 cases and 10 controls were non-vegetarians (eggitarians not included). Eight out of 11 cases and 6 out of 10 controls consumed non-vegetarian food once a week. Only one case and 3 controls consumed non-vegetarian food daily. The type of

non-vegetarian food consumed consisted of multiple responses. Majority of cases (9) and controls (8) consumed chicken. Only 5 cases and 3 controls consumed beef or mutton or pork. Fish was being consumed by 8 (72.7%) cases and 4 (36.4%) controls. A study reported replacement of red meat with fish reduces the risk of CHD (Hu et al, 1999)²¹. In comparative study women who ate fish < 1 time per month had higher risk of CHD compared to women consuming fish twice or more per week (Hu et al, 2002)²³. According to Ghafoorunissa and Krishnaswamy (1994)²², a regular intake of 100-200 g of fish twice a week is recommended as a preventive dietary approach for heart diseases.

- **Egg consumption**-Ten cases and 11 controls consumed whole egg. Seven (70%) of cases and 5 (45.5%) controls consumed egg 2-3 times per week. Consumption of whole egg showed no significance difference between the two groups ($p=0.78$). One of the case in study consumed egg white only. A study by Dawber et al (1982)²⁴ showed that those men in highest tertile of egg consumption (average=10.6 eggs/ week) had 1.3 times rate of CHD as compared to men in lowest tertile of egg consumption (average=1.4/ week). In women those in higher tertile, averaging 7.3-eggs/ week, had 1.3 times the rate of CHD than women in lowest tertile averaging 0.7-eggs/ week. These differences were statistically insignificant. A prospective study by Hu et al (1999)²¹ concluded that consumption of up to one egg

per day is unlikely to have substantial overall impact on the risk of CHD or stroke among healthy men and women.

● **Dietary intake of subjects-** The dietary intake for the subjects was obtained using semi-quantitative FFQ and 24-hour dietary recall. Semi quantitative questionnaire was validated with questions asked on average serving of foods per day and was converted to gram per portion. The obtained data was then compared with balanced diet for adult sedentary women guidelines given by ICMR, 1998²⁵. In the present study only fruit intake by subjects was higher than ICMR 1998 guidelines and all other food group intake was lower.

● **Cereals-** The staple cereal of the majority of cases (90%) as well as controls (80%) was wheat and there was no significant difference between the two groups ($p=0.28$). About 76.7% (23) of the cases and control each consumed < 200 g cereals. Only 10% (3) cases and 13.3% (4) controls consumed 200 g cereals. Rest 13.3% (4) cases and 10% (3) controls consumed > 200g of cereals. Mean daily intake of cereal was 168.66 ± 32.66 g and 160.00 ± 48.4 g for cases and controls, respectively. The mean consumption of cereals between the two groups was statistically insignificant

($p=0.42$). However, a hospital based case control study showed inverse relation of cereal intake and CHD, i.e; cereal intake was associated with lower CHD risk (Rastogi et al, 2004)¹⁸.

● **Pulses-** About 86.7% (26) case and 66.7% (20) controls consumed < 60 g of pulse/day. Only 13.3% (4) cases and 33.3% (10) controls consumed 60g of pulse daily. Both the cases and controls consumed less pulses compared with the balanced diet guidelines (ICMR, 1998)²⁵. The mean intake of pulse per day was 42.33 ± 17.94 g and 34.00 ± 10.37 g among cases and controls

Table-2, Daily food intake of cases and controls (n=60)

Food	Balanced diet for sedentary adult women (ICMR, 1998)	Cases n=30	Controls n=30	p value
Cereal (g)	200	168.66 ± 32.66	160.00 ± 48.40	0.42
Pulse (g)	60	42.33 ± 17.94	34.00 ± 10.37	0.03
Meat & meat products (g)	-	23.53 ± 17.39 (n=12)	19.58 ± 13.78 (n=12)	0.61
Milk & milk products (mL)	300	180.00 ± 51.86	176.66 ± 58.32	0.76
Vegetable (g)	300	210.00 ± 48.06	207.66 ± 60.78	0.87
GLV's (g)	100	81.24 ± 46.59	73.79 ± 36.78	0.40
Fruits (g)	100	133.33 ± 47.94	141.00 ± 95.49	0.69
Sugar (g)	20	13.50 ± 11.68 (n=20)	13.16 ± 10.70 (n=21)	0.90
Visible fat/oil (g)	20	26.16 ± 8.27	28.00 ± 8.46	0.40

respectively. The higher consumption of pulses by CHD cases was statistically significant ($p=0.03$). However, a study by Jain et al (2008)¹⁷ on males showed the higher mean consumption of pulses among controls was statistically significant ($p=0.01$) and could have protective effect on CHD.

- **Meat and meat products-** Chicken, meat, pork, fish or egg intakes were included in the study. The mean daily intake of meat and meat products was 23.53 ± 8.27 g and 19.58 ± 13.78 g among cases and controls respectively. The difference in mean consumption of meat and meat product between the two groups was insignificant ($p=0.61$). According to Ghafoorunissa and Krishnaswamy (1994)²² 40-60 g meat intake, 100-200 g fish, and one egg consumption 2-3 times per week are beneficial in chronic diseases.
- **Milk and milk products-** About 93.3% (28) of the cases and controls each consumed less 300 mL of milk and milk products. Only 6.7% (2) cases and controls each consumed 300 mL of milk and milk products daily. The mean consumption of milk and milk products by cases was 180.00 ± 51.86 mL and controls was 176.66 ± 58.32 mL, which was lower than the ICMR (1998)²⁵ guidelines. The difference in mean consumption of two

groups was statistically insignificant ($p=0.76$). In a study by Gupta et al (2006)²⁶ a significant correlation of CVD mortality and milk and milk products was observed. About 46.7% (14) of the cases and 50% (15) of the controls consume toned milk, 43.3% (13) cases and controls each consumed full cream milk, and skimmed milk was being consumed by 10% (3) cases and 6.7% (2) controls. The difference in type of milk consumption between cases and controls was statistically insignificant ($p=0.88$). For the purpose of determining the risk of CHD, type of milk consumption was divided into two categories: full cream milk and low fat milk. The type of milk consumption did not influence CHD risk among subjects ($p=1.00$, OR-1.00, 95% CI 0.36-2.77).

- **Vegetables-** The consumption of roots and tubers and other vegetables were combined together under vegetable category. About 83.3% (25) cases and 76.6% (23) controls daily consumed <300g of vegetables, and 16.7% (5) cases and 23.4% (7) controls consumed 300 g of vegetable. The mean daily intake of vegetables for the two groups was 210.00 ± 48.06 g and 207.66 ± 60.78 g in cases and controls respectively. The difference in consumption of vegetables between the two groups was

statistically insignificant ($p=0.87$).

- **Green leafy vegetables-** Consumption of green leafy vegetables per day was < 100 g in 60% (18) cases and controls each. About 23.3% (7) cases and 30% (9) consumed 100 g green leafy vegetables per day. Only 16.7% (5) cases and 10% (3) controls consumed > 100g green leafy vegetables daily. The mean consumption of green leafy vegetables per day was 81.24 ± 46.59 g by cases and 73.79 ± 36.78 g by controls. The difference between the two groups was found to be statistically insignificant ($p=0.40$). In the present study both cases and controls had equally low intake of vegetables and green leafy vegetables. A study by Rastogi et al (2004)¹⁸ concluded higher intake of vegetables and green leafy vegetables lowers the risk of IHD. The association was stronger for green leafy vegetables.
- **Fruits-** The mean fruit intake in cases (133.33 ± 47.94 g) and controls (141.00 ± 95.49 g) was higher than the recommendation of 100 g. However, the difference between the two groups was statistically insignificant ($p=0.69$). The rates of consumption of fruits and vegetables are surprisingly lower in South Asians compared to other countries despite vegetarianism being common among Indians

(Joshi et al, 2007)⁸. According to INTERHEART study daily consumption of fruits and vegetables was associated with 30% reduction in relative risk of CHD (Yusuf et al, 2004)¹. A 5-year prospective study of female health professionals, also found an inverse association between fruit and vegetable intake (6.1 servings/ day) and risk of CVD (Liu et al, 2000)²⁷.

- **Sugars**-In the present study 20 cases and 21 controls consumed sugar. Two cases and 3 controls consumed sugar free, and 8 cases and 6 controls did not consume sugar in any form. Out of those subjects who consumed sugar, 10 cases and 7 controls consumed > 20 g sugars per day. Only 3 cases and 4 controls consumed 20 g sugar daily. Seven cases and 10 controls consumed < 20 g sugar daily. The mean daily sugar consumption of cases and controls was 13.50 ± 11.68 g and 13.16 ± 10.70 g respectively. The difference in consumption of sugar between two groups was statistically insignificant (p=0.90).
- **Visible fat / oil**-The FFQ revealed that about 73.3% (22) cases 83.3% (25) controls consumed > 20g visible fat/ oil. Only 10% (3) each cases and controls consumed 20g, 16.7% (5) cases and 6.7% (2) controls consumed < 20g. The mean daily intake of visible fat/ oil was 26.16 ± 8.27 g in

cases and 28.00 ± 8.46 in controls. The mean consumption of visible fat/ oil did not differ significantly between CHD cases and healthy controls (p=0.4)

- **Type of Visible fat / oil consumption**- In the present study type of oil/ fat consumption had no significant effect on CHD risk. The higher consumption of mustard oil (OR-2.00, 95% CI 0.71-5.61) and cotton or sunflower or safflower oil (OR-1.64, 0.52-5.11) in cases was not statistically related to CHD risk. A study by Jain et al (2008)¹⁷ on urban males concluded similar results that, both type of fat and total fat intake in cases and controls did not show significant difference. However, a hospital based case-control study in India did not find a difference in total fat intake between cases and controls, though use of mustard oil was found to be associated with lower CHD risk than sunflower oil (Rastogi et al, 2004)¹⁸

Per month intake of visible fat/ oil-On eliciting general information on fat procurement per month consumption of fat was computed. The mean consumption of vegetable oil was 568.00 ± 284.13 g per month and 669.50 ± 312.29 g per month among cases and controls. The difference in vegetable oil consumption between cases and controls was statistically insignificant (p=0.19). Mean consumption of ghee (clarified

butter) among cases was 213.60 ± 180.73 g per month and controls was 197.50 ± 146.51 g per month. The difference between groups was found to be insignificant (p=0.70). Table 3.15 depicts type of fat intake per day from FFQ did no bring out any significant difference between daily ghee consumption of cases and controls. The mean intake of butter did not differ significantly between CHD cases and controls (p=0.36). Several lines of evidence have indicated that the types of fat have more important role in determining risk of CHD than total amount of fat in the diet. Metabolic studies have long established that type of fat, but not amount of fat predicts serum cholesterol levels. Epidemiological studies and controlled clinical trials indicate replacing saturated fat with unsaturated fat is more effective in lowering CHD risk than reducing total fat consumption (Hu et al, 2002)²³.

Nutrient intake of the subjects

A 24-hour dietary recall was done to calculate nutrient intake of the subjects. The mean daily intake of the nutrients: energy, protein, carbohydrate, fat, iron, crude fibre, total dietary fibre, vitamin C, free folate, and total folate were calculated for all the subjects and were compared to RDA (ICMR, 1990)²⁸. Table-3, shows the mean intake of various nutrients by cases and controls. The intake of energy, protein, vitamin C, total dietary fibre, and free folate was higher in cases when compared with controls.

Table-3, Nutritional content of the diets of cases (n=30) and controls (n=30)

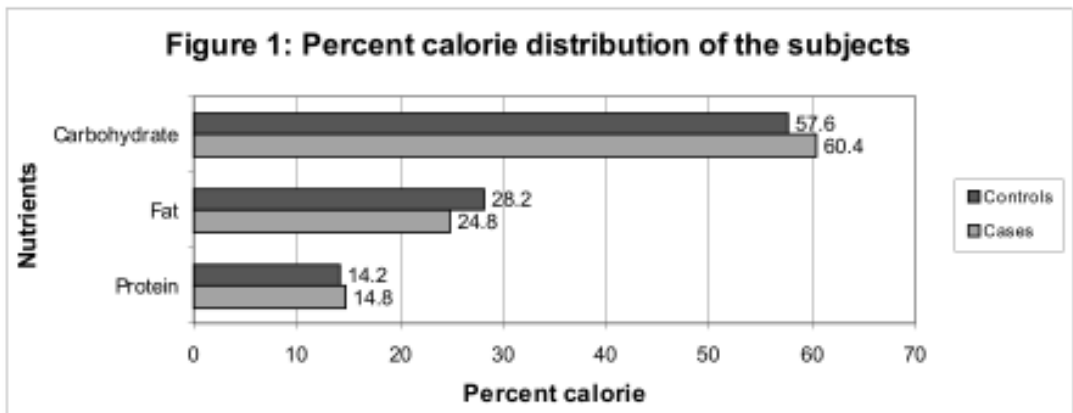
Nutrients	RDA ^a for sedentary adult women	Mean \pm SD	Nutritional adequacy of the requirements(%)	p value
Energy (kcal) Cases Controls	1875	1720 \pm 267 1599 \pm 248	91.7 85.8	0.08
Protein (g) Cases Controls	50	59.3 \pm 8.4 52.4 \pm 10.2	118.6 104.8	0.002
Fat (g) Cases Controls	20	47.4 \pm 11.6 49.9 \pm 11.0	237.0 249.5	0.38
Carbohydrate (g) Cases Controls	-	258.2 \pm 46.2 230.5 \pm 42.4	— —	0.01
Iron (mg) Cases Controls	30	16.6 \pm 4.1 16.8 \pm 8.1	55.3 56.0	0.92
Vitamin C (mg) Cases Controls	40	134.3 \pm 71.4 123.1 \pm 77.9	335.7 307.7	0.56
Crude fibre (g) Cases Controls	12	8.2 \pm 1.7 8.2 \pm 3.1	68.3 68.3	0.89
Total dietaryfibre (g) Cases Controls	40	22.92 \pm 10.4 18.8 \pm 7.8	57.3 47.0	0.09
Free folate (mcg) Cases Controls	100	223.2 \pm 63.8 178.8 \pm 65.0	223.2 178.8	0.01
Total folate (mcg) Cases Controls	-	86.0 \pm 31.4 66.5 \pm 25.1	— —	0.01

^a ICMR (1990)

Energy-The mean calorie intake of cases was 1720 \pm 267 kcal and control was 1599 \pm 248 kcal and it was lower than the RDA for both the groups. Percentage nutritional adequacy of mean daily energy intake was lower for controls

(85.82%) when compared with cases (91.76%). The difference between two groups was found to be insignificant (p=0.08). Figure 3.1 shows the composition of diet of the cases and controls. Carbohydrate provides 60.4%

calorie in cases and 57.6% calories in controls. Fat provides 24.8% calories and 28.2% calories among cases and controls respectively. Protein distribution was 14.8% calories in cases and 14.2% calories in controls.



- Protein**-The mean intake of protein in cases and controls was 59.3 ± 8.4 g and 52.4 ± 10.2 g respectively, which was higher than the RDA (50 g), in both the groups. The difference between the two groups was found to be statistically significant ($p=0.002$).
- Fat**-The average fat consumption was 47.4 ± 11.6 g and 49.9 ± 11.0 g in cases and controls respectively. The calculated mean was found to be double the RDA of fat (20 g), in both cases and controls. The difference between the cases and controls was statistically insignificant ($p=0.38$). The studies have shown that type of fat instead of total fat is associated with CHD risk. In a randomized control trial in postmenopausal women, dietary intervention of reduced total fat, and increased intakes of vegetables, fruit, and grains did not significantly reduce the risk of CHD (Howard et al, 2006)²⁹.
- Carbohydrate**-The mean carbohydrate intake was 258.2 ± 46.2 g and 230.5 ± 42.4 g among cases and controls respectively. In the present study difference in carbohydrate intake between two groups was statistically significant ($p=0.01$) According to the observations of Yagalla et al (1996)³⁰ on the nutrient profile of Asian Indians settled in USA, there might be a threshold for the daily carbohydrate intake, equaling 282 g. Increasing the carbohydrate intake beyond this limit resulted in high serum levels of triacylglycerol, particularly in those with insulin resistance. The females in the present study do not exceed this particular limit of the carbohydrate intake.
- Iron**-The mean consumption of iron was 16.6 ± 4.1 g and 16.8 ± 8.1 g in cases and controls respectively. The iron intakes of the subjects were almost the half the RDA (30 mg) and the difference between the groups was insignificant ($p=0.92$).
- Vitamin C**-The mean vitamin C intake of the subjects was three times the RDA (40mg). The average consumption was 134.3 ± 71.4 mg and 123.1 ± 77 mg in cases and controls respectively. The difference between the two groups was statistically insignificant ($p=0.56$). Considerable evidence suggests that oxidants are involved in development and clinical expression of CHD and antioxidant especially vitamin C, Vitamin E, and b-carotene can contribute to disease resistance (Tribble, 1999)³¹.
- Fibre**-The intakes of crude fibre and total dietary fibre were calculated. The mean intake of crude fibre was 8.2 ± 1.7 g and 8.2 ± 3.1 g for cases and controls respectively. The difference between cases and controls was statically insignificant ($p=0.89$). The mean total dietary fibre intake of cases was 22.9 ± 10.4 g and 18.8 ± 7.8 g for controls. The total dietary fibre consumption in both cases and control were less than 40 g RDA. The total dietary fibre intake difference between two groups was statistically insignificant ($p=0.09$). A study

by Misra et al (2001)³² on males and females of urban slums concluded that intake of fruit and vegetable is poor, amounting to fibre content of only 6 ± 8 g/ day, much lower than the RDA. An important reason for lower intakes of fruit in the people of low socio-economic strata is its high prices, making it beyond the reach of most individuals.

- **Folate** - The mean consumption of free folate and total folate for all the subjects were calculated. The free folate intake was 223.2 ± 63.8 mcg and 178.8 ± 65.0 mcg in cases and controls respectively. The free folate intake was two times the RDA. The mean total folate was 86.0 ± 31.4 mcg for cases and 66.5 ± 25.1 mcg for controls. The difference of total folate ($p=0.01$) and free folate ($p=0.01$) intake between two groups was statistically significant. The studies have shown supplementation of diet above the RDA with folate alone, or in combination of vitamin B₁₂ and vitamin B₆, reduces the homocysteine levels (Rimm et al, 1998)³³. Internationally it has been urged to increase the RDA to 400 mcg to minimize the risk of CHD, and neural tube defects (Oakley, 1997)³⁴. American Heart Association (AHA)³⁵ also recommends folate intake of 400 mcg in CVD.

Biological traits

Data related to biological traits was collected with the help of

questions on history of blood pressure, dyslipidemia, diabetes mellitus, and family history of CVD.

- **History of hypertension** - A subject was considered to be hypertensive if she had been informed by a physician that she had persistently high blood pressure or there was present / past history of antihypertensive drugs. The history of hypertension was present in 90% of the cases and 70% of the controls and the difference between the groups was statistically significant ($p=0.05$). However the contribution of history of hypertension to CHD risk was insignificant (OR-3.85, 95% CI 0.92-16.04). The results were not found to be consistent with other case-control studies, which showed that history of hypertension is a significant risk factor of CHD (Pais et al, 1996⁹; Yusuf et al, 2004¹; Guha et al, 2005³⁶). According to Anand et al (2008) history of hypertension was more strongly associated with MI among women (OR-2.95, 95% CI 2.66-3.28) than in men (OR-2.32, 95% CI 2.16-2.48) in INTERHEART study. However, a similar study with males in Delhi (Jain et al, 2008)¹⁷ also found no association between history of hypertension and CHD
- **History of dyslipidemia** - A subject was considered to have history of dyslipidemia if a doctor had told her that she had dyslipidemia or she had been taking drug treatment for the same in past or presently. The history of dyslipidemia was present in 12 (40%) of the cases and 13 (43.3%) of the controls. The prevalence of history of dyslipidemia in CHD cases was statistically insignificant ($p=0.79$, OR-0.87, 95% CI 0.31-3.43). A Delhi based case-control study on males showed similar results (Jain et al, 2008)¹⁷
- **History of diabetes mellitus** - If a doctor had told a subject that she had diabetes mellitus or she had been taking drug treatment for the same in past or presently, she was considered to have history of diabetes mellitus. Nearly 53.3% of the cases compared to 23.3% of the controls had history of diabetes mellitus. The higher prevalence of history of diabetes mellitus among CHD cases was statistically significant ($p=0.01$, OR-3.75, 95% CI 1.23-11.38). Other studies have also reported that history of diabetes mellitus is an independent risk factor of MI or CHD (Pais et al, 1996¹²; Joshi et al, 2007⁸; Jain et al, 2008¹⁷). In the INTERHEART study history of diabetes mellitus was more strongly associated with MI in women than in men (Anand et al, 2008)¹⁰.
- **Family history of CVD** - A family history consisted of information about the disorders that a patient's direct blood relative had suffered from (Rich et al, 2004)³⁷. Family history of pre-mature

CVD was present if a subject had a first degree relative (father, mother or sibling) who had one of the-AMI before 55years of age males or 65 years of age females; Ischaemic cerebral stroke before 55years of age males or 65 years of age females; Sudden cardiac death before 55years of age males or 65 years of age females. The overall family history of diseases was reported by 80% (24) cases and 73.3% (23) controls. But the family history of diseases was not found to be associated with CHD risk (OR-1.21, 95% CI 0.35-4.10). The higher prevalence of family history of CHD in cases was statistically insignificant ($p=0.19$, OR-1.96, 95% CI 0.70-5.47). In other Indian studies, however, family history was associated with CHD (Chadha et al, 1990)³⁸. In INTERHEART study family history of CHD was associated with an OR of 1.55 (95% CI 1.44-1.67). Family history seemed to be slightly more important in young compared with old individuals (Yusuf et al, 2004)¹.

- **Menstrual and menopausal history-** Three out of 5 controls had regular periods. The age range of menstruating women was between 45-52 years and for postmenopausal women was 45-65 years. Two of cases and 1 control consumed Oral contraceptive pill (OCP). A study by Tanis et al (2001)³⁹ concludes that OR for CHD among oral contraceptive users who smoked was 13.6, among

diabetic women was 17.4, and those with dyslipidemia was 24.0. About 90% cases and 83.3% controls had attained menopause. Menopausal history did not contribute to risk of CHD in cases in the present study ($p=0.44$, OR 1.8, 95% CI 0.38-8.33). One case and one control had undergone HRT. Prospective studies at Framingham indicated a prompt loss of resistance to CHD in women undergoing menopause, compared to those of the same age that remained premenopausal (Kannel, 1987)⁴⁰.

- **Psychosocial risk factors-** The factors assessed for psychosocial stress were depression, financial stress, and life events (stress at work or at home). About 83.3% of the cases and 73.3% of controls were experiencing psychosocial stress. Psychological stress was reported by higher number of cases but the difference was not statistically significant ($p=0.34$, OR-1.81, 95% CI 0.51-6.30). Reasons given for psychosocial stress were statistically insignificant ($p=0.45$). In the INTERHEART study the proportion of women (86.4%) and men (88.8%) under psychosocial stress were similar. The psychosocial stress in women and men was significantly related to AMI (Anand et al, 2008)¹³. Twenty (66.7%) cases and 24 (80%) of the controls had 7-8 hours of unbroken sleep daily. Unbroken sleep did not contribute to CHD in cases ($p=0.24$, OR 0.50, 95%

0.15-1.61). However, a prospective study on women observed short duration sleep (< 8 hours) and long duration sleep (> 8 hours) are associated with increased incidence of CHD (Ayas et al, 2003)⁴¹. In a community based cohort study compared with sleep duration of 7 hours, sleep duration of 4 hours or less was associated with increased mortality from CHD for women (Ikehara et al, 2009)⁴². About 6 (20%) cases and 2 (6.7%) controls consumed sleeping pills. The difference between the two groups was statistically insignificant ($p=0.21$, OR-3.5, 95% CI 0.64-18.98). Mean years of consumption of sleeping pills among cases and controls were 2.5 ± 1.8 years and 2.0 ± 1.41 years, respectively.

Physical examination findings- Data on anthropometric measurements and blood pressure was included in physical examination.

Anthropometric measurements - Anthropometric measurements included height, weight, and waist and hip circumferences.

- **BMI-** The subjects were classified on the basis of their BMI according to the classification given by IOTF/IASO/WHO, 2000. Obese I and II were 83.3% in controls and 86.3% in cases. Mean BMI was $28.72 \pm 3.07 \text{ kg/m}^2$ and $28.64 \pm 3.65 \text{ kg/m}^2$ for cases and controls respectively. All the subjects were at moderate risk of obesity related comorbidities according to IOTF/IASO/WHO, 2000

classification. BMI was found to be statistically insignificant risk factor of CHD in the study (p=0.93).

Circumferences-The mean of waist circumference was 94.41 ± 6.46 cm for cases and 95.92 ± 8.03 cm for controls. There was no significance difference between the two groups (p=0.42). According to ATP III (2002), desirable waist circumference in women is < 88 cm. However, all the subjects (100%) in the study present had waist circumference > 88 cm. The mean hip circumference was 99.46 ± 5.69 cm and 101.71 ± 8.35 cm among cases and controls, respectively. The mean waist to hip ratio (WHR) was 0.94 ± 0.02 in cases and 0.93 ± 0.03 in controls. The desirable WHR is < 0.85 (ATP III, 2002). All the subjects were centrally obese as their mean WHR was > 0.85. The difference between WHR of cases and controls was found to be statistically insignificant (p=0.63). On comparing the anthropometric data of the entire sample with desirable values, it can be said that all subjects exhibited high risk of CHD. Increasing trends in obesity and truncal obesity in middle-aged Indian subjects correlate significantly with escalating major cardiovascular risk

factors like hypertension, high cholesterol, metabolic syndrome, and diabetes (Rexrode et al⁴³, 1998; Gupta et al, 2008⁴⁴). Truncal obesity has emerged as an important cardio-metabolic risk factor. Multiple mechanisms are involved and studies have reported that prevalence of hypertension, dyslipidemia, diabetes, and the metabolic syndrome correlate more strongly with truncal obesity than with generalized obesity (Kragelund and Omland, 2005)⁴⁵. Yusuf et al (2005)⁴⁶ analyzed findings from the INTERHEART study and reported that truncal obesity characterized by increased WHR was more predictive of the first myocardial infarction as compared to BMI. BMI showed a modest and graded association with myocardial infarction (OR-1.44, 95% CI 1.32–1.57) that was attenuated after adjusting for multiple cardiovascular risk factors. On the other hand, WHR showed a stronger association (OR-2.52, 95%CI 2.31–2.74) that was maintained after adjusting for multiple risk factors. It was suggested that for the assessment of risk associated with obesity, the WHR and not BMI should be a preferred measure.

- **Blood pressure** -The mean recorded systolic blood pressure (SBP) of cases was 133.93 ± 16.25 mm Hg and 125.80 ± 14.89 mm Hg for the controls. There was significant difference in SBP among cases and controls (p=0.04). The mean recorded diastolic blood pressure (DBP) was 81.83 ± 7.71 mm Hg and 77.93 ± 9.86 mm Hg for cases and controls respectively. The difference between the two groups was found to be statistically insignificant (p=0.09). It can be attributed to small sample size. All the subjects were classified as pre hypertensive (BP=120-139/80-89 mm Hg) (JNC-7, 2004).

Biochemical estimations

- **Blood glucose**-The mean fasting plasma glucose (FPG) was 136.50 ± 71.03mg/dL and 100.70 ± 36.45mg/dL among cases and controls respectively. The difference in the two groups was found to be statistically significant (p=0.01). The mean 2-hour post prandial plasma glucose was 194.40 ± 96.41mg/dL in cases and (139.33 ± 41.35 mg/dL) for controls. The difference in mean of 2-hour post prandial plasma glucose for cases and controls was statistically significant (p=0.006). The sugar random was estimated for some of the subjects only. The plasma glucose level was found to be higher among cases (213.40 ± 65.71 mg/dL) as compared to controls (150.26 ± 64.55 mg/

Table-4, Anthropometric measurements and blood pressure of cases and controls (n=60)

Measurements	Cases (n=30)	Controls(n=30)	p value
BMI (kg/m ²)	28.72 ± 3.07	28.64 ± 3.65	0.93
Waist circumference (cm)	94.41 ± 6.46	95.92 ± 8.03	0.42
Hip circumference (cm)	99.46 ± 5.69	101.71 ± 8.35	0.22
WHR	0.94 ± 0.02	0.93 ± 0.03	0.63
SBP (mm Hg)	133.93 ± 16.25	125.80 ± 14.89	0.04
DBP (mm Hg)	81.83 ± 7.71	77.93 ± 9.86	0.09

dL). The difference between the groups was found to be statistically significant ($p=0.005$). The present study concludes diabetes mellitus is one of the important risk factors for CHD. This finding was found to be consistent with other Indian studies (Guha et al, 2005³⁶; Kumar et al, 2006⁴⁷; Joshi et al, 2007)⁸.

- **Blood lipids-** There was no significant difference in mean total cholesterol (TC) ($p=0.24$) of cases (177.36 ± 35.35 mg/dL) and controls (187.06 ± 28.42 mg/dL) ($p=0.24$). Mean triglycerides (TG) were 149.70 ± 41.39 mg/dL among cases and 137.50 ± 33.90 mg/dL for controls. The difference between the groups was found to be insignificant ($p=0.21$). The mean HDL-C levels for cases were 41.40 ± 7.81 mg/dL and 47.60 ± 7.08 mg/dL for controls. The HDL-C levels were found to be significantly higher among controls ($p=0.002$). The mean LDL-C levels were 101.06 ± 27.71 mg/dL in cases and 105.63 ± 23.67 mg/dL in controls and this difference

between the two groups was insignificant ($p=0.49$). The mean very low density lipoprotein cholesterol (VLDL-C) levels were 36.76 ± 19.51 mg/dL and 34.43 ± 17.05 mg/dL among cases and controls respectively. There was no difference between the two groups ($p=0.62$). The mean TC: HDL-C ratio in cases (4.41 ± 1.26) was higher compared to controls (3.91 ± 0.86), but this difference was found to be insignificant between the two groups ($p=0.07$). Asian Indians have low HDL-C, which could be one of the risk factors for CAD (Enas et al, 1996)⁴⁸. The present study confirms that mean HDL-C is low in cases and is a risk factor of CHD ($p=0.00$). High levels of HDL-C emerged as an anti-risk factor in males (Jain et al, 2008)¹⁷. Another study shows total cholesterol, LDL-C, and triglycerides were higher in younger subjects with premature CAD (Tewari et al, 2005)⁴⁹. However, the present study shows no association of total

cholesterol, LDL-C, and triglycerides with CHD. Studies by Mohan et al (2001)⁵⁰, and Pais et al (1996)¹² did not find any association of lipids with CAD.

For few subjects lipoprotein (a) was estimated. The mean Lipoprotein (a) levels were high (i.e. >30 mg/dL) for both cases [46.58 ± 16.65 mg/dL ($n=7$)] and controls [68.00 mg/dL ($n=1$)]. Elevated Lp (a) levels confer thrombotic and atherosclerotic risk (Sawhney and Mantri, 2002). Studies have shown an elevated level of Lp (a) is an independent predictor of stroke, death from vascular diseases and death from any cause in men but not in women (Nguyen et al, 1997)⁵¹; Ariyo et al, 2003)⁵².

Homocysteine was not estimated for the patients because of high cost of the estimation. The published data reveals that elevated homocysteine is at most a modest independent predictor of IHD and stroke risk in healthy population (Clarke et al, 2002)⁵³.

- **Blood electrolytes-** About 11 (36.7%) cases and 26 (86.7%) controls had normal serum sodium levels ($136.0-146.0$ mEq/L). Nineteen (63.3%) cases and 4 (13.3%) controls were having sodium levels <135.0 mEq/L. The mean serum sodium levels were 139.76 ± 5.70 mEq/L and 132.83 ± 7.82 mEq/L among controls and cases respectively. The higher mean serum sodium level in controls was statistically significant ($p=0.001$).

Table-5, Mean of blood lipid of cases and controls (n=60)

Parameters	Cases(n=30)	Controls (n=30)	p value
Serum TC (mg/ dL)	177.36 ± 35.35	187.06 ± 28.42	0.24
Serum TG (mg/ dL)	149.70 ± 41.39	137.50 ± 33.90	0.21
Serum HDL-C (mg/ dL)	41.40 ± 7.81	47.60 ± 7.08	0.002
Serum LDL-C (mg/ dL)	101.06 ± 27.71	105.63 ± 23.67	0.49
VLDL (mg/ dL)	36.76 ± 19.51	34.43 ± 17.05	0.62
TC: HDL-C	4.41 ± 1.26	3.91 ± 0.86	0.07

Table-6, Mean blood electrolytes levels of cases and controls (n=60)

Parameters	Case (n=30)	Control (n=30)	p value
Na (mEq/L)	132.83 ± 7.82	139.76 ± 5.70	0.001
K (mEq/L)	3.93 ± 0.63	4.26 ± 0.51	0.03
Cl (mEq/L)	101.16 ± 4.77	102.50 ± 5.21	0.30

Potassium homeostasis is essential for normal myocardial function, and low serum potassium may cause fatal arrhythmias. A study has reported serum potassium < 4 mEq/L increases the mortality and morbidity in heart failure (Ahmed et al, 2007). In the present study serum potassium levels were found to be normal range (3.5-5.5mEq/L) for 22 (73.3%) cases and 26(86.7%) controls. And < 3.5 mEq/L serum potassium levels for 8(26.7%) cases and 2(6.7%). The mean serum potassium level was 3.93 ± 0.63 mEq/L and 4.26 ± 0.51 mEq/L among cases and controls respectively. The higher levels of serum potassium in controls were statistically significant (p=0.03). Twenty-four (80%) cases and 26 (86.7%) controls had chloride levels in the normal range (96.0-106.0 mEq/L). Two (6.7%) cases and 1 (3.3%) control had chloride levels < 96 mEq/L. Higher levels of chloride (i.e., >106 mEq/L) were found in 4(13.3%) cases and 1(3.3%) control. Mean chloride values were 101.16 ± 4.77 mEq/L and 102.50 ± 5.21 mEq/L for cases and controls respectively and the difference was statistically insignificant (p=0.30).

Predicting the risk of CHD using Framingham risk scores- Framingham risk score estimates 10-year CHD risk by scoring

system to identify women at high risk. The risk score among cases and controls was 1.86 ± 1.69 and 2.5 ± 1.63, respectively and the difference was statistically insignificant (p=0.14). The risk of CHD among the female subjects in the present study was found to be low (<10%).

Determining the independent risk factors of CHD- Risk factors derived from odds ratio and significance value were used to perform multiple logistic regression to calculate independent contribution of each risk factor to CHD in females. The variables investigated were- Physical inactivity; History of diabetes mellitus; SBP; 2-hour post prandial plasma glucose; Fasting blood glucose; Sugar random; HDL-C; Serum sodium; Serum potassium; Pulse consumption per day. Findings of multiple logistic regression show that, lower HDL-C (p=0.01), and serum sodium levels (p=0.01) in cases were significant associated with CHD. However, in the present study none of the risk factors emerged as an independent risk factor of CHD in females. It is possible that the association of the identified risk factors with CHD in subject to confounding by the effect of other factors. This result can be attributed to small sample size. However, Jain et al (2008)¹⁴,

identified low educational status (OR-2.41, 95% CI 1.26-4.61), full cream milk consumption (OR-2.11, 95% CI 1.18-3.80), history of diabetes mellitus (OR-4.93, 95% CI 2.32-10.49), and family history of CVD (OR-1.81, 95% CI 1.06-3.08) to increase the risk of CHD independently. High HDL-C (OR-1.06, 95% CI 1.03-1.09) and fruit/ fruit juice intake (OR-1.47, 95% CI 1.02-2.13) emerged as anti-risk factors among urban males in Delhi. The present study identifies the risk factors of CHD in females that were found to be consistent with current studies. In present case-control study physical inactivity, history of diabetes mellitus, SBP, FPG, 2 hour PG, low serum sodium, low serum potassium, intake of selected nutrients (protein, carbohydrate, and folate), pulse intake were found to be significantly higher among cases. Exercise, strenuous activities, yoga, and HDL-C seemed to be protective factors in CHD. The risk could not be attributed to occupation, education, food habits, nutrient intake (fat, fibre, vitamin C, and iron), type of fat, milk, sugar, low fruit and GLV's intake, meat and meat products, time spent in sleep, psychosocial factors, smoking, BMI, WHR, lipid profile, family history of diseases, menopausal status, and intake of OC. The small sample size led to identification of only few risk factors. The present study suggests that, India being a heterogeneous country, more data is needed from different geographic and income clusters. Mapping risk factors in large female samples across large age

range will help identify other risk factors as well as emerging risk factors in Indian females.

Conclusions-Premature disability from cardiovascular diseases (CVD) is now emerging as a leading community health problem in developing nations. In most industrialized countries, CHD is the most common single cause of death and a major cause of admission to hospital. However, mortality and hospital statistics appreciably underestimate the total morbidity resulting from CHD. CHD has assumed epidemic proportions in India. CVD affects as many women as men, albeit at an older age. Considering all nine risk factors of INTERHEART study, the collective PAR of MI is 96% in women compared to 93% among men. The present study assessed the significance of dietary practices, biological traits, and lifestyle related factors in causation of CHD among females. A pre-tested questionnaire was used to collect the information on demographic profile, lifestyle factors, biological traits, psychosocial stress, and dietary habits of the subjects. Physical examination was done to collect data on weight, height, waist circumference, hip circumference, and blood pressure using standardized techniques. Blood examination was done to determine blood sugar, blood lipids, and blood electrolytes. A 24-hour dietary recall was used to determine nutrient intake of the subjects. A semi quantitative food frequency questionnaire was used to determine dietary intake according to food groups. The present study identifies the risk factors of CHD in females that

were found to be consistent with current studies. In present case-control study physical inactivity, history of diabetes mellitus, SBP, FPG, 2 hour PG, low serum sodium, low serum potassium, intake of selected nutrients (protein, carbohydrate, and folate), pulse intake were found to be significantly different among cases. Exercise, strenuous activities, yoga, and HDL-C seemed to be protective factors in CHD. The risk factor could not be attributed to occupation, education, food habits, nutrient intakes (fat, fibre, vitamin C, and iron), type of fat, milk, sugar, low fruit and GLV intake, meat and meat products, time spent in sleep, psychosocial factors, smoking, BMI, WHR, lipid profile, family history of diseases, menopausal status, and intake of OC. The small sample size lead to identification of only few risk factors. The present study suggests India being a very heterogeneous country more data is needed from different geographic and income clusters and mapping risk factors in large female sample across large age range to identify other risk factors as well as emerging risk factors in Indian females.

References

1. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A et al, and INTERHEART study investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (The INTERHEART Study): Case control study. *Lancet* 2004;364:937-952.

2. ATP III. The third report of NCEP Expert Panel on Detection, Evaluation, and Treatment of high blood cholesterol in adults (ATP III): Final report. NIH publication no. 02-5315;2002
3. Kotler P. The marketing management process and market planning in marketing management. Prentice hall of India. New Delhi. 6th edition; 1988:114-117.
4. Gibson RS. Principle of nutrition assessment. Oxford University Press. 2nd edition; 2005.
5. WHO, World Health Organization. Physical status: the use and interpretation of anthropometry. Report of WHO Expert Committee. WHO technical report series no. 854. WHO Geneva 1995.
6. Jelliffe DD, Jelliffe EFP, Zenas A, Neumover KJ. Community nutritional assessment with special references to less technically developed countries. Oxford University Press, 1989.
7. ICMR, Indian Council of Medical Research. Nutrient requirements and recommended dietary allowances for Indians, 1990.
8. Joshi P, Islam S, Pais P, Reddy KS, et al. Risk factors for early myocardial infarction in South Asia compared with individuals in other countries. *JAMA* 2007;297(3):286-294.
9. Gupta R, Gupta VP, Ahluwalia NS. Educational status, coronary heart disease, and coronary risk factor prevalence in rural population of India. *BMJ* 1994;309:1332-1336.

10. Laszlo KD, Janszky I. Income and recurrent events after coronary events in women. *Eur J Epidemiol* 2008;23: 669-680.
11. Rich-Edwards JW, Manson JE, Hennekens CH, Buring JE. The primary prevention of coronary heart disease in women. *N Engl J Med* 1995; 332:1758-1766.
12. Pais P, Pogue J, Gerstein H, Zachariah E, Savitha D, Jayprakash S, Nayak PR, Yusuf S. Risk factors for acute myocardial infarction in Indians: a case-control study. *Lancet* 1996;348(9024):358-363.
13. Anand S, Islam S, Rosengren A, Franzosi MG, et al. Risk factors for myocardial infarction in women and men: insights from INTERHEART study. *Eur Heart J* 2008;29:932-940.
14. Gupta R. Burden of coronary heart disease in India. *Indian Heart J* 2005;57:632-638.
15. Steenland K. Passive smoking and the risk of heart disease. *JAMA* 1992;267(1):94-99.
16. Mukamal KJ, Conigrave KM, Mittleman MA, Camargo CA, Stampfer MJ, Willett WC, et al. Roles of drinking pattern and type of alcohol consumed in coronary heart disease in men. *N Engl J Med* 2003; 348 : 109-18.
17. Jain P, Jain P, Bhandari S, Siddhu A. A case-control study of risk factors for coronary heart disease in urban Indian middle aged males. *Indian Heart J* 2008;60:233-240.
18. Rastogi T, Reddy KS, Vaz M, Spiegelam D, Prabhakaran D, et al. Diet and risk of coronary heart disease in India. *Am J Clin Nutr* 2004;79:582-592.
19. Lee MI, Rexrode KM, Cook NR, Manson JE, Buring JE. Physical activity and coronary heart disease in women: Is "no pain, no gain" passé? *JAMA* 2001;285(11):1447-1454.
20. Sesso HD, Paffenbarger RS, Ha T, Lee IM. Physical activity and cardiovascular disease risk in middle aged and older women. *Am J Epidemiol* 1999; 150(4): 408-416.
21. Hu FB, Stampfer MJ, Manson JE, et al. Dietary saturated fat and their food sources in relation to the risk of coronary heart disease in women. *Am J Clin Nutr.* 1999;70:1001-1008.
22. Ghafoorunisa and Kamla-krishnaswamy K. Dietary prescriptions. In: *Diet and heart disease*. National Institute of Nutrition, Hyderabad, India 1994.
23. Hu FB, Willett WC. Optimal diets for prevention of coronary heart disease. *JAMA* 2002;288(20):2569-2578.
24. Dawber TR, Nickerson RJ, Brand FN, Pool J. Eggs, serum cholesterol, and coronary heart disease. *Am J Clin Nutr* 1982;36:617-625.
25. ICMR, Indian Council of Medical Research. *Dietary guidelines for Indians: A manual*, National Institute of Nutrition, 1998.
26. Gupta R, Misra A, Pais P, Rastogi P, Gupta VP. Correlation of regional cardiovascular disease mortality in India with lifestyle and nutritional factors. *Int J Cardiol* 2006;108:291-300.
27. Liu S, Manson JE, Lee IM, Cole SR, Hennekens CH, Willett WC, et al. Fruit and vegetable intake and risk of cardiovascular disease: the women's health study. *Am J Clin Nutr* 2000;72:922-928.
28. ICMR, Indian Council of Medical Research. *Nutrient requirements and recommended dietary allowances for Indians*, 1990.
29. Howard BV, Horn LV, Manson JE, Stefanick MI, Kuller LH. Low-fat dietary pattern and risk of cardiovascular disease: the women's health initiative randomized controlled dietary modification trial. *JAMA* 2006;295(6):655-666.
30. Yagalla MV, Hoer SL, Song WO, Eurs A, et al. Relationship of diet, abdominal obesity and physical activity of plasma lipoprotein levels in Asian Indians: Indian physicians residing in United States. *J Am Diet Assoc* 1996;96:257-261.
31. Tribble DL. Antioxidant consumption and risk of coronary heart disease: emphasis on vitamin C, vitamin E, and b-carotene- A statement for healthcare professionals from the American Heart Association. *Circulation* 1999;99:591-595.
32. Misra A, Sharma R, Pandey RM, Khanna N. Adverse

- profile of dietary nutrients, anthropometry and lipids in urban slum dwellers in north India. *Eur J Clin Nutr* 2001;55:737-734.
33. Rimm EB, Willet WC, Hu FB, Sampson L, Colditz GA, et al. Folate and vitamin B₆ from diet and supplements in relation to risk of coronary heart disease among women. *JAMA* 1998;279:359-364.
 34. Oakley GP. Let's increase folic acid fortification and include vitamin B₁₂. *Am J Clin Nutr* 1997;65:1889-1890.
 35. AHA, American Heart Association. www.americanheart.org. (accessed on March 16th 2009).
 36. Guha S, Ghosh A, Chatterjee N, Pal S, Guha S, et al. Risk factors for coronary heart disease in Indians: A case-control study from eastern India. *Indian Heart J* 2005; 57:738-740
 37. Rich EC, Burke W, Heaton CJ, Hage S et al. Reconsidering family history in primary care. *J Gen Intern Med* 2004;19: 273-280.
 38. Chadha SL, Radhakrishnan S, Ramachandran K, Kaul U, Gopinath N. Epidemiological study of coronary heart disease in an urban population of Delhi. *Indian J Med Res* 1990;92:424-430.
 39. Tanis BC, Rosendaal FR. Venous and arterial thrombosis during oral contraceptives use: risk and risk factors. *Semin Vasc Med* 2003;3:69-84.
 40. Kannel WB. Metabolic risk factors for coronary heart disease in women: Perspective from Framingham study. *Am Heart J* 1987;114(2):413-419.
 41. Ayas NT, White DP, Manson JE, Stampfer MJ, Speizer FE, et al. A prospective study of sleep duration and coronary heart disease in women. *Arch Intern Med* 2003;163:205-209.
 42. Ikehara S, Iso H, Date C, Kikuchi S, Watanabe Y, et al. association of sleep duration with mortality from cardiovascular disease and other causes for Japanese men and women: the JACC study. *Sleep* 2009;32:295-301.
 43. Rexrode KM, Carey VJ, Hennekens CH, Walters EE, Colditz GA et al. Abdominal adiposity and coronary heart disease in women. *JAMA* 1998;280(21):1843-1848.
 44. Gupta R, Gupta VP, Bhagat N, Rastogi P, Sarna M et al. Obesity is major determinant of coronary risk factors in India: Jaipur Heart Watch Studies. *Indian Heart J* 2008;60:26-33.
 45. Kragelund C, Omland T. A farewell to body mass index? *Lancet* 2005;366:1589-1591.
 46. Yusuf S, Hawken S, Ounpuu S, Bautista L, Franco MG, Commerford P et al. Obesity and risk of myocardial infarction in 27,000 participants from 52 countries: a case-control study. *Lancet* 2005;366:1589-1591.
 47. Kumar R, Singh MC, Ahlawat SK, Thakur JS, Srivastava A, et al. Urbanization and coronary heart disease: A study of urban-rural differences in Northern India. *Indian Heart J* 2006;58: 126-130.
 48. Enas EA, GARG A, Davidson MA, Nair VM, Heut BA, et al. Coronary heart disease and its risk factors in first generation immigrant Asian Indians to United States of America. *Indian Heart J* 1996;48:343-353.
 49. Tewari S, Kumar S, Kappor A, Singh U, Agarwal A, et al. Premature coronary artery disease in North India: an angiography study of 1971 patients. *Indian Heart J* 2005;57:311-318.
 50. Mohan V, Deepa R, Rani SS, Premlatha G. Prevalence of coronary artery disease and its relationship to lipids in a selected population in south India. *J Am Coll Cardiol* 2001;38(3):682-687.
 51. Nguyen TT, Ellefson RD, Hodge DO, Bailey KR, Kottke TE, et al. Predictive value of electrophoretically detected lipoprotein (a) for coronary heart disease and cerebrovascular disease in community based cohort of 9936 men and women. *Circulation* 1997;96:1390-1397.
 52. Ariyo AA, Thach C, Tracy R. Lipoprotein, Vascular disease, and mortality in elderly. *New Eng J Med* 2003;349:2108-2115.
 53. Clarke R, Collins R, Donald A, Lewington S, et al. Homocysteine and of risk ischemic heart disease and stroke. *JAMA* 2002;288(16): 2015-2022.

Study of the Universal Precautions Practices in High Risk Areas of a Super-Specialty Tertiary Care Hospital

Original Article

Amit Lathwal, Sanjay Kumar Arya, I.B.Singh, D.K.Sharma

Department of Hospital Administration, All India Institute of Medical Sciences, New Delhi

The need to prevent infections in health care settings has been known to humans since long and there efforts to prevent these infections have been recorded in various historical texts. These efforts started from hygiene and isolation practices and progressed to principles of antisepsis, hand washing, and personal protective equipments. The period after the discovery of the antibiotic penicillin brought a misplaced sense of complacency among the health care workers (HCWs) regarding these age-old antiseptic and aseptic precautions and it even began to be suggested that the threat of infectious diseases would soon become an artifact of history. The emergence of life threatening viral infections like HIV, HBV, HCV and reemergence of diseases like malaria, T.B, Dengue and plague have effectively destroyed the illusion of safety with which HCWs comforted themselves. The emergence of these new viral diseases has brought the focus once again on basic preventive measures like hand washing, use of gloves and use of other protective barriers. It was against this background that the CDC, Atlanta, defined the Universal Precautions¹ and these are basic protective measures to prevent to prevent parenteral, mucous membrane and non-intact skin exposure of Health care worker to blood borne

pathogens. Universal blood and body fluid precaution guidelines were also notified by the Ministry of Health and Family Welfare (MOHFW), Government of India (GOI) in 1992² to be followed in the care of all patients by all HCWs. Although Universal precautions have been in existence for almost two decades and the risk of transmission of blood borne infections to health care workers is very real, the implementation of these precautions is still far from satisfactory. Implementation of Universal precautions will reassure both Health care workers and patients attending hospitals regarding reduced risk of accidental transmission of blood borne pathogens, especially HIV, HBV and HCV and the risk of Nosocomial transmission of HIV, HBV and other blood borne pathogens can be minimized if HCWs use Universal Precautions. The aim of the study was to study the practice of Universal precautions in high risk areas of a super-specialty tertiary care hospital.

Methodology- This study was conceived to study the practice of Universal precautions in high-risk areas of a super-specialty tertiary care hospital in four categories of HCWs viz doctors, nurses, technical staff and housekeeping staff. The study is descriptive and cross-sectional in nature. High-risk areas were those departments

or wards where probability of exposure to blood and body fluids is higher due to either increased handling or large number of interventions performed and thus six areas were selected which were blood bank, Main laboratory, Main OT, Main ICU, Emergency services and Dialysis Unit. Discrete observations of the four group of HCWs were made by the researcher against a predesigned checklist as a non-participant observer to study the practice of various components of Universal precautions. Potential opportunities for hand washing, proper disposal of sharps and use of personal protective equipment (PPE) and their actual performances were recorded on a data-recording sheet. Discrete observations of the four groups of HCWs were made in each of the six study units. Four observations each lasting for a minimum of 40 minutes were made in each of the six study units i.e. a total of 24 observations were made during 2 month period of April and May 2007. However observations were prolonged where some patient care episode observed extended beyond 40-minute observation period until completion of that patient care episode³. Observations were analyzed by working out percentages, calculated by dividing frequency of actual practice of various components

of Universal precautions with their potential opportunities that arose as per the guidelines.

$$\text{Compliance (\%)} = \frac{\text{No. of performances of Universal precautions}}{\text{Potential opportunities of Universal precautions}} \times 100$$

The study population of different categories of health care workers was 255+126+101+87= 569 out of which health care workers observed to determine the current practices of Universal precautions were 38+ 25+ 43+ 26 = 132 (23.20%).

Results & discussion-There were a total of 132 health care workers

majority of HCWs in technical staff and house-keeping staff working are male. Of the 132 HCWs 17 (12.88%) were from the blood bank which included 2 doctors, 2 nurses, 10 technical staff and 3 house keeping staff, 26 (19.70%) were from the Main lab which include 3 doctors, 17 technical staff and 6 house keeping staff, 24 (18.18%) were from the Main OT which included 12 doctors, 4 nurses, 4 technical staff and 4 house keeping staff, 20 (15.15%) were from the Main ICU which included 8 doctors, 4 nurses, 5 technical staff and 3 house

The findings in the study reveal that overall, the compliance to the practice of hand washing by all the four categories of HCWs taken together was 48%, the overall use of gloves was 66%, the overall use of masks was 87%, the overall use of gowns was 94%, the overall use of eye shields was 18% and the overall proper disposal of sharps was 72%. The reason for the findings could be that components of Universal precautions which are to be practiced more frequently like hand washing are followed less as compared to the components which are to be practiced less frequently like use of gowns,

Table-1, Sample selected from each study unit for observation

HCW	Doctors		Nurses		TechnicalStaff		House keeping staff	
	E (N)	S (n)	E (N)	S (n)	E (N)	S (n)	E (N)	S (n)
Blood Bank	4	2	2	2	22	10	7	3
Main Laboratory	12	3	0	0	46	17	17	6
Gynae OT	48	7	5	2	2	2	6	2
Surgery OT	38	5	8	2	2	2	4	2
Total Main OT	86	12	13	4	4	4	10	4
Main ICU	60	8	35	4	12	5	12	3
Emergency Services	77	11	69	13	10	3	35	8
Dialysis Unit	16	2	7	2	7	4	6	2
Total	255	38	126	25	101	43	87	26

E= Existing population in the study units,S= Selected sample

(HCWs) included in the study to assess the practice of Universal precautions. These comprised of 38 doctors, 25 nurses, 43 technical staff and 26 house keeping staff. Out of the 132 HCWs, 94 (71.21%) were males and 38 (28.79%) females. The reason for male preponderance is that

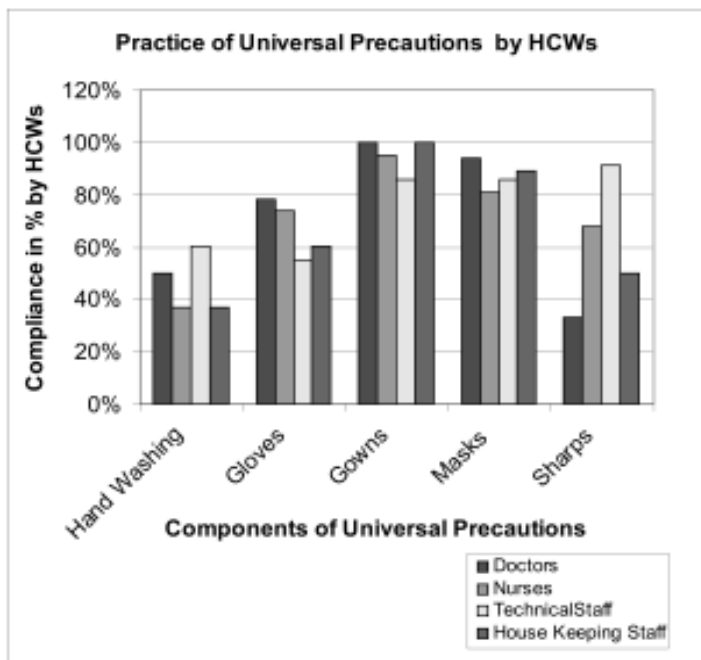
keeping staff, 35 (26.52%) were from the emergency services which include 11 doctors, 13 nurses, 3 technical staff and 8 house keeping staff, 10 (7.58%) were from the dialysis unit which included 2 doctors, 2 nurses, 4 technical staff and 2 house keeping staff.

masks except the use of eye shields. The findings are similar to that of a study conducted by Pittet D¹. to determine compliance to hand washing by different Categories of HCWs in a teaching hospital in Switzerland in which he found that average compliance to hand washing

practices was 48% and non-compliance was higher in ICU but the findings in the present study are better than in the study conducted by Albert RK² in which he observed that the practice of hand washing in HCWs is only in 33% of the circumstances in which it is indicated.

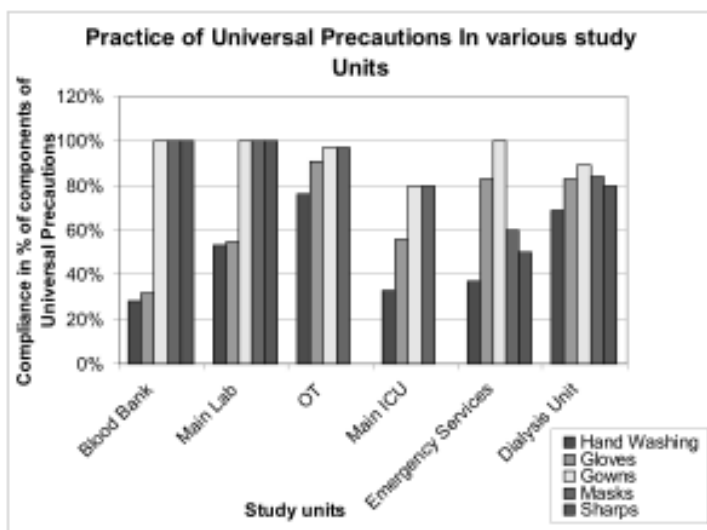
matter of concern, as sharps are the causes of injuries and reason for transmission of blood borne infections in the hospital. In a study conducted in a large Swiss hospital¹ to determine doctor's hand washing practices showed that doctors cleansed their hands 57% of the times. These findings

disposal of sharps was satisfactory but they are the most common cause of injuries and infection transmission in the hospital thus; this practice needs further improvement. The poor practice of hand washing in nurses is a matter of concern as hands are involved in Nosocomial transmission of infection and nurses are most involved in patient care activities. In case of technical staff, the overall practice of hand washing in all the six study units taken together was 60%, overall use of gloves was 55%, overall use of masks and gowns was 86%, overall use of eye shields was 0% and the overall proper disposal of sharps was 91%. The technical staff thus was good in the use of gowns, masks and proper disposal of sharps but was bad in the use of gloves and hand washing which needs improvement. Their hand washing practice was best among all the categories of HCWs but there is a scope of lot more improvement. In case of house keeping staff, the overall practice of hand washing in all the six study units taken together was 37%, overall use of gloves was 60%, overall use of masks was 89%, overall use of gowns was 100%, and the overall proper disposal of sharps was 50%. The house keeping staff was good in the use of gowns and masks and satisfactory in the use of gloves but was bad in hand washing and disposal of sharps.



In case of doctors, the overall practice of hand washing in all the six study units taken together was 50%, overall use of gloves was 78%, overall use of masks was 94%, overall use of gowns was 100%, overall use of eye shields was 12% and the overall proper disposal of sharps was 33%. The doctors thus were good in the use of gowns, masks and gloves but they were bad in the proper disposal of sharps and hand washing. The bad practice of disposal of sharps in doctors is a

were slightly better than the present study in which the practice of hand washing among doctors was 50%. In case of nurses, the overall practice of hand washing in all the six study units taken together was 37%, overall use of gloves was 74%, overall use of masks was 81%, overall use of gowns was 95%, and the overall proper disposal of sharps was 68%. The nurses thus were good in the use of gowns, masks and of gloves but were bad in the practice of hand washing. Their



In blood bank the overall practice of hand washing by all the four categories of HCWs taken together was 28%, the overall use of gloves was 32%, the overall use of masks was 100%, the overall use of gowns was 100% and the proper disposal of sharps was 100%. In Main laboratory the overall practice of hand washing by all the four categories of HCWs taken together was 53%, the overall use of gloves was 55%, the overall use of masks was 100%, the overall use of gowns was 100% and the proper disposal of sharps was 100%.

The findings in the present study are better than in the study conducted by Mishra UB et al¹ to determine the practice of use of personal protective methods in laboratory workers. Their findings showed that that usage of gloves was 30%, of gowns was 31% and of facemasks was 1%. Their findings on the practice of hand washing showed that it was practiced on 56% of the occasions, which is slightly better than in the present study. In a

study by Gumodoko B et al² conducted in nine hospitals in Mwanza region of Tanzania in 1997 showed that use of gloves among among laboratory staff was a dismal 6%. In Main OT the overall practice of hand washing by all the four categories of HCWs taken together was 76%, the overall use of gloves was 91%, the overall use of masks was 97% and the overall use of gowns was 97%. In Main ICU the overall practice of hand washing by all the four categories of HCWs taken together was 33%, the overall use of gloves was 56%, the overall use of masks was 80%, the overall use of gowns was 80% and the proper disposal of sharps was 0%. The findings thus reveal that practice of Universal precautions in the ICU were deficient and it is a matter of concern as the most sick patients and immunocompromised patients are admitted there. These patients because of their underlying morbidity are more prone to transmission of nosocomial infections if proper precautions are not taken. In

Emergency services the overall practice of hand washing by all the four categories of HCWs taken together was 37%, the overall use of gloves was 83%, the overall use of masks was 60%, the overall use of gowns was 100% and the proper disposal of sharps was 50%. The findings also reveal a similar pattern of deficient practice of universal precautions in the emergency services. This is a matter of grave concern as the sickest of patients with injuries and life threatening conditions are treated there. Thus the areas which are critical and require the most stringent of compliance to the practice of universal precautions were found lacking in their practice. In dialysis unit the overall practice of hand washing by all the four categories of HCWs taken together was 69%, the overall use of gloves was 83%, the overall use of masks was 84%, the overall use of gowns was 89% and the proper disposal of sharps was 80%.

The above findings thus reveal that Main OT and dialysis unit had consistently high levels of practice of all of the components of Universal precautions as compared to other study units in which practice of some components was good and of some was bad. The reason for this could be due to the better discipline and departmental culture in these areas.

Conclusion-Although Universal precautions have been in existence for almost two decades and the risk of transmission of blood borne infections to health care workers is very real, the implementation of some components of these precautions is still far from satisfactory. The

practice of three components was unsatisfactory, these being hand washing, use of eye shields and use of gloves. The proper disposal of sharps by health care workers was 72%, which appears to be good but due to the reason that sharp injuries are the causes of Nosocomial transmission of blood borne infections, there practice needs to be further improved. The practice of use of masks and gowns was good as there practice was observed to be 87% and 94% respectively.

References

1. CDC. Recommendations for Prevention of HIV Transmission in Health-care Settings. MMWR.1987; 36(SU02):001-017.
2. Shrinivas. Hospital-Acquired Infections: guidelines for control. GOI. MOHFW. Nirman Bhavan. New Delhi. 1993.
3. Pittet D, Mourouga P, Perneger TV, Members of the infection control program; compliance with hand washing in a teaching hospital; Annals of internal medicine; 1999 January; 130(2); 126-130
4. Pittet D, Mourouga P, Perneger TV, and Members of infection control program; Compliance with hand washing in a teaching Hospital; Annals of Internal Medicine; 1999 Jan; 130(2); 153-155.
5. Albert RK, Condie F, Hand washing patterns in Medical intensive care units; N Engl J Med; 1981; 304; 1465-6.
6. www. Annals.org; 12th October 2006
7. Mishra UB, Matwankar SKP, Aggarwal AK, Study of

observance of Universal precautions and other safety aspects by workers at large microbiology laboratories; J of Academy of hospital Administration; 1998 July; 10(2); 17-20

8. B.Gumodoka, I.Favot, Z.A. Berege & W.M.V. Dolomans, Occupational exposure to the risk of HIV infection among health care workers in Mwanza region, United Republic of Tanzania; Bulletin of the WHO; 1997; 75(2); 133-140

Hippocrates contribution to medicine

Tradition knows seven physicians named Hippocrates, of whom the second is regarded as the most famous. Of his life we know but little. He was born at Cos in 460 or 459 B.C., and died at Larissa about 379. How great his fame was during his lifetime is shown by the fact that Plato compares him with the artists Polycletus and Phidias. Later he was called "the Great" or "the Divine". The historical kernel is probably as follows: a famous physician of this name from Cos flourished in the days of Pericles, and subsequently many things, which his ancestors or his descendants or his school accomplished, were attributed to him as the hero of medical science. The same was true of his writings. What is now known under the title of "Hippocratis Opera" represents the work, not of an individual, but of several persons of different

periods and of different schools. It has thus become customary to designate the writings ascribed to Hippocrates by the general title of the "Hippocratic Collection" (Corpus Hippocraticum), and to divide them according to their origin into the works of the schools of Cnidus and of Cos, and of the Sophists. How difficult it is, however, to determine their genuineness is shown that even in the third century before Christ the Alexandrian librarians, who for the first time collected the anonymous scrolls scattered through Hellas, could not reach a definite conclusion. For the development of medical science it is of little consequence who composed the works of the school of Cos for they are more or less permeated by the spirit of one great master. The secret of his immortality rests on the fact that he pointed out the means whereby medicine became a science. His first rule was the observation of individual patients, individualizing in contradistinction to the schematizing of the school of Cnidus. By the observation of all the principles were gradually derived from experience, and these, uniformly arranged, led by induction to a knowledge of the nature of the disease, its course, and its treatment. This is the origin of the famous "Aphorismi", short rules which contain at times principles derived from experience and at times conclusions drawn from the same source.

Original Article

Reduction of Neonatal Mortality under Integrated Management of Neonatal and Childhood Illness (IMNCI) strategy: Role of Behavior Change Communication

M. Parashar, J. Kishore, T. Mathiyazhagan

Department of Community Medicine, Maulana Azad Medical College, and Department of Communication National Institute of Health and Family Welfare, New Delhi

Of the estimated 130 million infants born each year worldwide,¹ 4 million die in the first 28 days of life. Therefore, efforts to achieve the UN Millennium Development Goal 4 of reducing childhood mortality by two-thirds by 2015 are focused on reducing neonatal deaths in high-mortality countries. India is home to the highest number of both births and neonatal deaths in the world.² A staggering 26 million babies are born in India every year, of these 1.2 million die in the first 28 days of life accounting for 30 percent of the global burden of newborn deaths.³ So, nowadays improving newborn survival is a national priority in child health. Neonatal mortality rate of 44 per thousand live birth in India accounting for nearly two third of infant mortality,⁴ out of which more than half may die during the first week of birth.⁵ so, early neonatal care should be an essential component of any neonatal health intervention.⁶ World Health Organization has estimated that direct causes of neonatal death globally are: infection (32%), asphyxia (29%), prematurity (29%), congenital anomalies (10%) and others including hypothermia (5%), and can be averted if we deliver some of the low cost and time tested interventions to those children who need them at right time.⁷ Besides these other factors that

contribute to illness are poor living conditions like lack of safe water supply, poor hygiene, overcrowding; inability of parents to recognize danger signs; delay in seeking treatment and harmful traditional practices. Problem is further compounded by the poor quality of care provided at the health care facilities⁸ that is a challenge for the medical community. Poor health seeking behaviour and harmful traditional practices with direction causes such as hypothermia, infection, asphyxia are deadly combination. This is why there is an urgent need of improving their behavior. For the past two decades there has been an awakening to the need for child health programs to move beyond single diseases, since many children present with overlapping signs and symptoms of diseases making a single diagnosis difficult, often not feasible nor appropriate for management. Another need was of standardisation of treatment so that all practitioners at all levels could follow standard practices to ensure quality of care. Integrated Management of Childhood Illness (IMCI) was a response to this global challenge. In India, a national consultations of the adaptation task force in 2000, rechristened the strategy as Integrated Management of Neonatal and Childhood Illness (IMNCI). The management guidelines were made consistent

with the current policies of Ministry of health and family welfare, Department of women and child development and National Vector Borne Disease Control Program.⁹ Health worker modules were developed and separate training materials, e.g. training module, chart booklet, photo booklet, and video were developed for the health and nutrition workers and the physicians.¹⁰ The training materials for the health workers were also translated in Hindi, Marathi, Gujarati, and Tamil. IMNCI includes both preventive and curative interventions. The strategy has the following three components:¹¹

- **Health-worker component:** For the improvements in the case-management skills of health staff through the provision of locally adapted guidelines
- **Health-service component:** For the improvements in the overall health system required for effective management of neonatal and childhood illness
- **Community component:** For the improvements in family and community health care practices.

The strategy recommends standardized case management procedures based on two age categories: (i) up to two months (ii) two months to five years. Here, only a limited number of carefully

selected clinical signs are considered, based on their sensitivity and specificity to detect the disease. A combination of these signs helps in arriving at the child's classification that indicates the severity of the condition, rather than a diagnosis. The classifications are color coded: "pink" suggests hospital referral or admission, "yellow" indicates initiation of treatment by health worker at health center, and "green" calls for home treatment. A sick young infant up to two months of age is assessed for possible bacterial infection, jaundice, and diarrhea. A sick child aged two months to five years is assessed for general danger signs and major symptoms like cough or difficult breathing, diarrhea, fever, and ear problems. All the children are also routinely assessed for nutritional, immunization and feeding problems, besides other potential problems.¹⁴The management procedures in IMNCI involve the use of only a limited number of essential drugs in order to promote their rational use. The mother is given clear instructions on how to give oral drugs and to treat the child at home when hospital admission is either not required or is not possible. She is also directed to return for follow-up visits as per the IMNCI strategy. ¹⁴Strategy provides for home-based care for newborns and young infants. The home care component for newborns aims to promote exclusive breast feeding, prevent hypothermia, improve recognition of illnesses by parents, and reduce delays in seeking care. Health worker has to make at least three home visits for all newborns; the first visit should be within 24

hrs of birth, second on day 3-4 and third at day 7-10. Three additional visits are scheduled for newborns with low birth weight at day 14, 21, and 28.¹¹ IMNCI strategy promotes the accurate identification of childhood illnesses in outpatient setting and ensures appropriate combined treatment of all major illnesses, strengthens counseling of caretakers, and speeds up the referral of severely ill children. To implement IMNCI strategy all health manpower need to be oriented and trained in skills required to effective management of neonatal and childhood illnesses.

Training-The training under IMNCI is focused on applied skill development. Around 50% of training time is spent on building skills by "*hands-on training*" involving actual case management and counseling, the remaining 50% is spent in classroom sessions, building theoretical understanding of essential health interventions. In all training programs how to bring behavior change through communication is the integral component. There are two types of training for health manpower:

- *Service Training:* For teaching of doctors, nurses, ANM's, LHV's and others
- *In-service training:* For existing staff in the districts, given in a phased manner. Training mainly, focus on communication and counseling skills, and locally adapted recommendation for infant and young child feeding.¹²

For training of the district staff it would be essential to have adequate number of trainers

within the districts. The trainers at district level include all pediatricians in the district, selected medical officers from CHCs and block PHCs, selected staff nurses and LHV's and CDPO's and Mukhiya Sevikas from ICDS. For the national level training of the faculty of Medical Colleges of different States are organised at Delhi. Positive aspect of the strategy includes involvement of the Departments of Pediatrics and Preventive and Social Medicine of the medical colleges and Nursing and ANM, AWW Training schools that is of paramount importance. Major strength of the strategy is that it would allow flexibility in treatment but specify scientific methods to assess which child would need immediate hospitalization and is also modified for Indian needs and RCH II programs. The management procedures in IMNCI involve the use of only a limited number of essential drugs in order to promote their rational use. The mother is given clear instructions on how to give oral drugs and to treat the child at home when hospital admission is either not required or is not possible. She is also directed to return for follow-up visits as per the IMNCI protocol. ^{11,12}Along with strengths, critical appraisal of the strategy also revealed that the strategy have not addressed the issues of home deliveries, training of traditional birth attendants, creating facilities for a triage system of primary, secondary and tertiary care, a referral system with linkages between these levels, urban newborn care and specially the care of the urban slum population. Besides this newborn is still not

considered an appendage of the mother. The exclusion of the ever-growing private sector as a partner in public health delivery system further compounds the problems. Thus, there is a need to rethink on all these issues. Besides this one of the major challenges is feasibility of expanding or extending it to include training of traditional birth attendants, urban child health particularly the urban slum population with focus on newborns and to strengthen the health care facilities from grass root to apex hospitals and institutions.^{13,14}With regard to the training, initial training is the greater challenge than the follow-up and monitoring of the trained personnel to provide on-job supervision and training. The training must have behaviour change communication package so that workers can effectively implement and bring change in the community.

Behaviour Change Communication- Behaviour Change Communication (BCC) is a process that motivates people to adopt and sustain healthy behaviors and life styles. Behaviour change of an individual is a gradual process and takes place step by step. Different authors have classified the stages of behaviour change of an individual differently, however, they have common views. To bring about changes in the behaviour of an individual, some sort of interaction or otherwise, education is very crucial. Education is the process of bringing about desirable changes in the behaviour of human beings. It can also be defined as the process of imparting or acquiring knowledge and habits

through instruction or study. If education is effective, it will result in changes in all the behavioral components viz. knowledge and ideas, values and attitudes, norms and skills along with understanding and translation! In BCC, awareness of an individual is put to action. The BCC must be research based, client centered, benefit oriented, service linked and professionally developed. The suggested behaviour must be adoptable in the context of peoples' lives¹⁵Changes in peoples' behavior also require a process of transmitting and sharing correct information, which would motivate other people in the community to adopt new best practices.¹⁵ So behavior change communication strategy is used in the IMNCI strategy to promote and adopt behavior, which would improve their health and discontinue behavior that is deleterious to health. Communication is not limited to generation of awareness only, but effective communication, leads to change in the receiver's behavior. In IMNCI package for health worker large number of neonates is captured at home, who otherwise never reach health facilities, by mandated three or more home visits during the first month of life. During these visits health workers have ample opportunity to bring change in their behavior for neonatal care. However they must be aware of barriers so that proper measures can be adopted to overcome them.

These barriers include lack of information regarding available facilities and service delivery, lack of information regarding the risk and failure to recognize danger sign and promptly seek care, lack of recognizing acute respiratory

infection as risk to child survival and lack of priority to get attention to girls. We can overcome these barriers only by setting following communication priorities:

- Information and education to mother on risks, danger sign and availability of services
- Importance of vaccination against tetanus and anemia prophylaxis
- Benefits of exclusive breast feeding
- Simple management of cord infection
- Home based management of hypothermia
- Improvement of knowledge-base service provider regarding risks of acute respiratory infection
- Home based treatment of diarrhea
- Persuasion of family and community to end unequal treatment of girls and boys

Behavior Change Communication: An experience in the community-All components of IMNCI require thorough understanding and proper implementation by the health workers. BCC plays an important role in achieving these objectives. In one of our community based intervention studies¹⁶ carried out in the resettlement colony of Delhi it was determined that there was inadequate knowledge about the neonatal care in baseline study. In spite of the fact that most of the mothers were literate, harmful newborn care practices were common. This could be attributed largely to Dais because most of deliveries were conducted at home and harmful traditional practices were observed most often in these cases. Even women

delivered in institutions some of the adverse practices continued because of traditions and cultural practices prevalent in the community. For this, it was realized that there was a need to educate mothers and train health care providers including traditional birth attendants and Aanganwadis workers on newborn and early neonatal care. BCC package was designed to improve knowledge and practices of mothers for neonatal care. The package was delivered for importing education using: counseling, demonstration of correct method of breast feeding, posters and flip chart. Although there was significant improvement in knowledge of mothers regarding neonatal care some neonatal practices had not changed due to some strong cultural beliefs and influence of mother in-law and elderly females of the family as majority belonged to the joint family systems. There was a significant improvement in behavior of mothers in relation to exclusive breast-feeding was seen. However, harmful practice of pre-lacteal feed could not be changed despite education. This might be because of influence of elderly females and lucrative advertisement in mass media regarding pre-lacteal feed (local commercial name of pre-lacteal feed is *janam gbutti* 555).¹⁷ This suggested us that BCC package needs to be delivered continuously to bring maximum benefit. It is concluded that BCC package under the IMNCI could be effective tool to avert the high neonatal mortality and morbidity.

References

1. WHO (2005). *World Health Report 2005: Make every mother*

- and child count*. Geneva: World Health Organization.
2. Black, R.E., Morris, S.S., Bryce, J (2003). Where and why are 10 million children dying every year? *Lancet*; 361: 2226-34.
 3. Government of India (2000). Ministry of Health and Family Welfare, Child Health Division, New Delhi.
 4. Census of India (2001). Provisional population totals. Registrar General & Commissioner, India.
 5. Park, J.E (2005). *Park's Text book of Preventive & Social Medicine*. 18th Edition. Jabalpur (India): Banarsidas Bhanot Publisher's: pp 416.
 6. Zupan, J. and Aahman, E (2005). Perinatal Mortality for the year 2000 estimate developed by WHO. Geneva: World Health Organization.
 7. World Health Organization (1996). Essential newborn care. Report of technical working group (Trieste, 25-29 April 1994). Geneva: WHO, Division of Reproductive Health (Technical Support).
 8. WHO (1997). Improving Child health, the integrated approach. Division of Child Health and Development; WHO/CHD/97.12 Rev.2. WHO: 1997. p. 2-7.
 9. Ministry of Health and family Welfare (2006). *Child Health Programme in India - Major milestones in Child Health*. Available from: <http://mohfw.nic.in/dofwebsite/childhealthrti.pdf>. [Last accessed on 2006 Jun 3].
 10. Ramji, S (2006). Integrated management of neonatal and childhood illness (IMNCI): implementation challenges in India. *Indian Pediatrics*; 43(12): 1029-1031.
 11. Bhattacharya P (2007). Health of children in India in the last decade, Available from: www.shvoong.com/tags/imnci/ - 2007. [Last accessed on 2008, NOV. 11]
 12. MOHFW (2006). Operational Guidelines for Implementation of Integrated Management of Neonatal and Childhood Illness (IMNCI). Available from: <http://www.mohfw.nic.in>.
 13. Ingle G.K., Malhotra, C (2007). Integrated management of neonatal and childhood illness: An overview. *J Indian Comm. Med*; 32:108-110
 14. Aggarwal, S.P. Towards achieving millennium development goals in the health sector in India. *J Indian Acad Clin Med* 2005;6:268-74.
 15. Kishore, J (2009). National Health Programs of India: National Policies and Legislations Related to Health, Century Publications 2009:174-176 New Delhi.
 16. Dahama, O.P. and Bhatnagar, O.P (1980). *Education and Communication for Development*, Oxford and IBH Publishing Company, New Delhi.
 17. Parashar, M (2007). Impact of Behavior change communication among pregnant women regarding neonatal care in a resettlement colony of Delhi. (MD Thesis submitted to Delhi University).

S.S.Yadav, Abhishek Kumar

Department of Orthopedics, Mirpur Institute of Medical Sciences, Mirpur, Rewari

Infected non-union is one of the most difficult clinical situations, despite major advances in the fixation technique, soft tissue management and antibiotic therapy. Furthermore, a non-union that is associated with an infection is almost always also associated with deformity, limb-length discrepancy, joint stiffness, disuse osteoporosis and soft tissue atrophy. We have been constantly getting such cases coming from all over neighboring areas. Patients present to us with history of multiple operations still with pouring of pus and signs of infected non-union.

Material and methods-The present prospective cum retrospective study was conducted on 50 patients who were admitted in department of orthopedics Mirpur Institute of Medical Sciences, Mirpur, Rewari, Haryana between Jan 2004 - Jan 2009.

Inclusion criteria-Patients of various age groups of both male and female were included. Infected non-union of long bones was considered. There were both clinical as well as radiological signs of infected non-union at the time of presentation for at least 6 months from injury. Frank and established infection of fracture site was present at time of admission. Diagnosis of infected non-union was established in each case clinically, radiologically and if needed by culture. Treatment was highly individualised based on the

needs, but the basic principle was to control infection by thorough debridement, give adequate stability at non-union site and stimulate union by bone grafting (60 %) if needed. The implant if found loose or in presence of severe infection was removed (15 patients) and débrided. We have used long-twin-intramedullary k-wires in 29 patients supported by pop cast with window to stabilize the fracture site. Other methods include external fixators (4 patients), only pop cast with window (12 patients). In other 4 patients with previous stable osteosynthesis and minimal infection implants were continued.

In 4 patients where bone gap was present fibular strut was used. Additional procedures like flap rotation and skin grafting was done to cover the naked bone. Patients were followed at monthly intervals by clinical and radiological evaluation

Assessment of final outcome - We have used criteria laid by D.Paley et. al 20 (1989) and further refined as ASAMI 17 criteria, (Table-1)

Results-In 46 males and 4 females aged 11 to 60 years (mean 34.8 years) mainly farmers and manual labourers were from lower socio-economic status. The commonest cause was open fractures (43 patients), tibia being involved in 35 cases. On an average it took 12.5 weeks (range 3-24 wks) for

infection to subside. Overall union rate was 88 percent at an average duration of 8.4 months. Final result analysis was done based on criteria laid by Paley et al. We have achieved 9 excellent, 21 good, 14 fair and 6 poor bone results and 12 excellent, 27 good, 5 fair and 6 poor functional results, (Table -2 and Table-3).

Discussion-Considerable judgment is required when dealing with infected non-union of long bones. The fracture site at non-union becomes sclerotic with blockage of medullary canal and rest of bone becomes osteoporotic due to disuse and non weight bearing. Any internal fixation in such a situation, in presence of infection becomes a contraindication. Although intramedullary nailing after removal of sequestrae and proper reaming has been tried, but the infection travels along the implant throughout the medullary cavity and persist for a longer time inhibiting union and leads often to implant failure. Ilizarov's external fixator with bone transport has an answer to all these problems of infected non-unions, but is easier said than done. We are working in rural set-up where most of the patients belong to poor socio-economic status. Most of the patients can't afford ilizarov's fixator and are not enough educated to understand the way to handle it at home. Ilizarov's fixators have got its own

problems like pain, pin tract infection joint stiffness, vascular and neurological injury described by D.Paley (1990) 20 as *problems, obstacles and complications*. Thus keeping in mind the above mentioned problems, the present series tries to develop a guideline for management of infected non-union of long bones in rural setting. We have used conventional method of treatment with an object to reduce the infection along with stability at fracture site and then aim at union which may require a primary or secondary bone grafting. With keeping in mind that infection will lead to non-union and these further increases the infection, a vicious cycle needs to be broken by trying to reduce infection by a good olden method called debridement. Thorough debridement was required. Stabilization of fracture site after debridement was the next basic step in our treatment strategy. We have used long (18 inches, 2.5 cm) twin intramedullary k-wires supported externally by cast, external fixators and plaster of Paris cast only as method of stabilization. In 4 cases where there was minimal infection and previous osteosynthesis was stable we have continued with previous implant to give stability at non-union site. Out of these methods we have used twin k-wires in 29 patients. these k-wires are easy to apply, easy to remove (in opd), it acts as minimal implant so would not flare up the infection, like intramedullary nails they would not spread infection from one end to other, excessive reaming is not required so preventing

damage to endosteal blood supply, as they are technically easy to apply operative time can be reduced so further prevents infection. K-wires can used in rural settings as it is cost effective and easy to apply for a lesser trained surgeon. Long and thick intramedullary k-wires give enough stability required, which is further strengthened by external pop cast with window applied once the skin condition improves. Stabilization only with pop cast and window for dressing was used in 12 cases where there was very severe infection with pouring of excessive pus from the fracture site. In such a situation even k-wire application or external fixator application was not safe. After debridement fracture site was kept in splint and once skin condition improves appropriate cast with window for dressing was applied. External fixators were used in 4 cases where quality of bone was good enough to hold the pins of fixators. it is easy to take care of skin with simple fixators and stiffness of joints is also minimized as compared to ilizarov's and these are easier to apply in rural settings. In patients where previous implants were stable, we have continued with implant and done primary cancellous bone grafting (2 patients) when infection was minimal or waited for infection to subside after debridement and done a secondary cancellous bone grafting (2 patients). Similar strategy was used by Meyer (1975) 19 in 10 of his 64 patients where previous implant if found stable was left in place and eradication of infection was attempted.

Once the infection subsides or becomes minimal, an attempt for union should be made. If there was no bone gap cancellous bone grafting (taken from iliac crest) was done in 30 of our patients. In presence of bone gap fibular strut graft was used in 4 patients. Mayer attempted cancellous bone grafting in 38 patients in his series. A naked bone will resist union, so every attempt should be made to cover the bone. In most cases bone gets covered when granulation tissue is formed from inside. Local flap rotation was done in 4 patients and skin grafting was required in 2 patients, all in order to cover the bone. Micro vascular flap rotation was used by L Gordon and EJ Chiu 4(1988) in 14 patients of infected non-union successfully. On an average it took 12.5 weeks for infection to subside or become minimal (range 3 wk to 24 wk). Infected non-unions are often misleading so one should be very sure about the presence or absence of infection. Mean duration in which union took place was 8.4 months (range 3 months to 24 months). Mean duration in study by Madhusudhan, Balasundaram et.al 26.(n=22)2008 was 8.5 months with union rate of 81.8 % Union must be assessed both clinically and radiologically. Sometimes radiologically bone looks united and if not assessed carefully may lead to refracture of callus. In 6 patients we could not achieve union despite of our sincere efforts and are considered as failures. In 44 patients we have achieved both clinical and radiological union. Results were 100 % union in mean duration

of 7 months in study by Z. S. Kundu, S. S. Sangwan et.al²⁴.(n=17) 2004 None of the patients had to undergo amputations and there were no deaths in our series which is quite an achievement when dealing with infected non-unions. Most of the authors have used these criteria to assess their results and holds good in this series as well. We have achieved 9 excellent, 21 good, 14 fair and 6 poor bone results and 12 excellent, 27 good, 5 fair and 6 poor functional results. In their study, Z.S.Kundu, S.S.Sangwan et.al²⁴.(n=17) 2004 achieved 13 excellent, 2 good, 2 fair and 0 poor bone result and 11 excellent, 4 good, 2 fair and 0 poor functional results, while Madhusudhan, Balasundaram et.al.(n=22)2008 26 achieved 4 excellent, 6 good, 8 fair and 4 poor bone result and 3 excellent, 5 good, 9 fair and 5 poor functional results

Conclusion-Prevention of infection in bone is the best treatment of infected non-unions of long bones. All compound fractures must be treated in a conventional fashion by a thorough surgical toilet; these are age old procedures but still hold good. Delay in initial debridement should be minimized. Choice of implant plays a key role. Intramedullary interlocking nails or plating devices should be avoided in open fractures. Implant should be minimal just to provide adequate stability as rigid fixation is not required. The biology of bone and soft tissues should be respected and maintained. Duration of surgical procedure should not be compromised to get radiological excellence. General condition of the patient must be improved before, during and after

surgery for better healing. Conventional method to treat infected non-unions aims at eradication of infection by thorough debridement and post-operative antibiotics. Provide adequate stability to non-union site. Attempt to stimulate union by bone grafting once infection subsides. Long twin k-wires are minimal implants which provide adequate stability without flaring up the infection.

References

1. Agarwal AK: Social classification: The need to update in the present scenario. *Indian J Community Med* 2008, 33:50-1.
2. Boyd HB: Congenital pseudarthrosis: treatment by dual bone grafts, *J Bone Joint Surg* 23:497, 1941.
3. Cattaneo R, Villa A, Catagni M, Tentori L. Treatment of septic or non septic diaphyseal pseudoarthroses by Ilizarov's monofocal compression method. *Rev Chir Orthop Reparatrice Appar Mot* 1985; 71:223-9.
4. Chiu J Leonard Gordon, M.D.t, and Elaine J. Treatment of Infected Non-Unions and Segmental Defects of the Tibia with Staged Microvascular Muscle Transplantation and Bone Grafting. *J.Bone Joint Surg Am.* 1988;70:377-386.
5. Cierny G, Zorn KE. Segmental tibial defects: Comparing conventional and Ilizarov methodologies. *Clin Orthop Relat Res* 1994; 301:118-23.
6. Dendrinos GK, Kontos S, Lyritsis E. Use of the

7. Faisal Al-Saati, R. M. Lifeso the treatment of infected and uninfected non-union 1984 British Editorial Society of Bone and Joint Surgery
8. Freeland AE, Mutz SB: Posterior bone grafting for infected ununited fracture of the tibia. *J Bone Joint Surg* 1980; 62A: 1039-57.
9. Green SA. Skeletal defects: A comparison of bone grafting and bone transport for segmental skeletal defects. *Clin Orthop Relat Res* 1994;301:111-7.
10. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty five open fractures of long bones: a retrospective and prospective analysis. *J Bone Joint Surg* 1976; 58:453-8.
11. Huntington T W, use of a segment of fibula to supply a defect in tibia *Ann Surg* 1905;41:249-51
12. Ilizarov GA. The transosseous osteosynthesis. Theoretical and clinical aspects of the regeneration and growth of tissue. Springer-Verlag: New York; 1992
13. Jain AK, Mams MS, Sinha S. Infected non-union of the long bones. *Clin Orthop* 2005; 431: 57-65.
14. Judet R, Patel A: Muscle pedicle bone grafting of long bones by osteoperiosteal

- decortication, *Clin Orthop* 87:74, 1972
15. Magadam MP, CM Basavaraj Yadav, MS Phaneesha, LJ Ramesh Acute compression and lengthening by the Ilizarov technique for infected nonunion of the tibia with large bone defects *Journal of Orthopaedic Surgery* 2006;14(3):273-9
 16. Maini L, Chadha M, Vishwanath J, Kapoor S, Mehtani A, Dhaon BK. The Ilizarov method in infected nonunion of fractures. *Injury* 2000;31:509-17
 17. Maurizio C. Classification and treatment of Nonunion. In : Operative principles of Ilizarov's by ASAMI group. Williams and Wilkins: Baltimore, Maryland, USA: 1991. p. 190-8.
 18. McKee MD, Wild LM, Schemitsch EH, Waddell JP. The use of an antibiotic impregnated, osteoconductive, bioabsorbable bone substitute in the treatment of infected long bone defects: early results of a prospective trial. *J Orthop Trauma*. 2002; 16:622
 19. Meyer S, Weiland AJ, Willeneger H. The treatment of infected nonunion of fractures of long bones. *J Bone Joint Surg* 1975; 57A: 836-42.
 20. Paley D. Problems, obstacles and complications of limb lengthening. *Clin Orthop Relat Res* 1991;6:152-72.
 21. Patzakis M.J.C. G. Zalavras, R. E. Marcus, L. S. Levin, Management of open fractures and subsequent complications. *J. Bone Joint Surg. Am.*, April 1, 2007; 89-90
 22. REC Rose, W St O Palmer, The Ilizarov Method in Infected Non-union of Long Bones, *West Indian Med J* 2007; 56 (3): 246
 23. Ring D, Jupiter JB, Gan BS, Israeli R, Yaremchuk MJ. Infected nonunion of the Tibia. *Clin Orthop Relat Res* 1999; 369:302-11.
 24. Sangwan SS ZS Kundu,, Sanjeev Jain, Rajeev Mittal, RC Siwach, Gaurav Bhardwaj Infected non-unions of tibia - management by simple fixator – compressor *Indian J Orthop* 2004;38:162-5
 25. Sangwan SS Goel A, Siwach RC, Ali AM. Percutaneous bone marrow grafting for the treatment of tibial non-union. *Injury*. 2005 Jan;36(1):203-6.
 26. Thayur R Madhusudhan, Balasundaram Ramesh, KS Manjunath, Harshad M Shah, Dabir C Sundaresh and N Krishnappa Outcomes of Ilizarov ring fixation in recalcitrant infected tibial non-unions – a prospective study *Journal of Trauma Management & Outcomes* 2008, 2:6 doi:10.1186/1752-2897-2-6
 27. Toh CL, Jupitar JB. The infected nonunion of tibia. *Clin Orthop Relat Res* 1995;315:170-91.-
 28. Tuli S.M. Bridging bone defects by massive bone grafts in osteomyelitis. *clin orthop* 1972;87:60-73
 29. Urist MR, Silverman BF, Buring K, Dubuc FL, Rosenberg JM. The bone induction principle. *Clin Orthop*, 1967;53: 243-83.
 30. Yadav S S dual fibular grafting for massive bone gaps in lower extremity *jbjs* 1990;72-A:486-94

Table-1, Criteria for assessment of out come

Bone Result	Functional Result
Four criteria: union, infection, deformity and leg length discrepancy.	Five criteria: significant limp, equinus rigidity of ankle, soft tissue dystrophy, pain, inactivity
Excellent-union ,no infection, deformity < 7 degree, LLD < 2.5 cms	Excellent-active individual with none other 4 criteria
Good-union ,any two of the above	Good-active with one or two of 4 criteria
Fair-union, any one of the above	Fair-active with three or four criteria
Poor-non-union	Poor-inactive patient

Table-2, Results after treatment

Bone Results	No. of Patients	Percentage
Excellent	9	18
Good	21	42
Fair	14	28
Poor	6	12

Table-3, Functional results after treatment

Table Functional Results	no. of patients	percentage
Excellent	12	24
Good:	27	54
Fair	5	10
Poor	6	12

Table-4, Distribution of cases by duration in which infection subsided

Duration in which infection to subside (wks)	No. of Patients	Percentage
0 to 4	3	6
5 to 8	9	18
9 to 12	20	40
13 to 16	5	10
17 to 20	2	4
21 to 24	4	8
>24	2	4
Still persists	5	10

Figure-1, X-ray of showing surgical procedure done



Table-5 Distribution of cases as per number of months taken for union

No. of months for union	No. of Patients	percentage
0 to 3	3	6
4 to 6	13	26
5 to 9	11	22
10 to 12	10	20
13 to 15	3	6
16 to 18	1	2
19 to 21	0	0
22 to 24	1	2
>24	2	4
failure	6	12

Figure-2, X-ray after healing



Accidental Dural Puncture with Epidural Needle – What To Do Next?

Spinal and epidural blocks are two methods of central neuraxial blocks. While in epidural regional block 1-2 ml/spinal segment of local anesthetic is required to achieve central neuraxial block, spinal block requires only a total 1-3 ml of local anesthetic to achieve the desired effect. This difference is based on fundamental fact that epidural space is a dead space where target nerve roots are sleeved with dural layer, hence requiring larger volume of local anesthetic to reach desired nerve roots. On the other hand subarachnoid space is filled with naked nerve roots floating in Cerebro Spinal Fluid (CSF), hence smaller volume of local anesthetic is required. It is important that whole of the local anesthetic injected intrathecally should reach nerve roots and get fixed there adequately before any further CSF mixed with local anesthetic, is lost causing interruption of this sequence.

We are reporting two different cases posted for orthopaedic lower limb surgery who had accidental dural puncture. First case was a 28 year old male of fracture both bone leg posted for open reduction and internal fixation. While trying for combined spinal-epidural anaesthesia with CSE set (16G), the dura got accidentally

punctured at L3-L4 interspace, resulting into free flow of CSF. After this accidental dural puncture, the possible options were either to remove the needle & try again in different space or to inject drug intrathecally through same epidural puncture & insert catheter in separate interspinous space with separate 16 G Tuohy's needle. We followed the second technique based on reports in literature that injection of local anesthetic through epidural needle which had accidentally punctured the dura, will lead to lower chances of post dural puncture headache¹. On withdrawing the stellate of epidural needle gush of CSF was noted, a 25 µg of injection fentanyl and 10 mg of injection bupivacaine heavy & removed the needle immediately after intrathecal injection. An epidural catheter was placed at L2-L3 interspace. After cleaning and draping the surgery was allowed to proceed. But the patient had poor quality of neuraxial block. Subsequently epidural injection was immediately supplemented. In the second case, a 25 year old male posted for anterior cruciate ligament repair, an accidental dural tap at L3-L4 interspace resulted. In this case a similar amount of drug combination was injected but this time epidural needle was kept in place with stellate in situ for five minutes. This allowed injectate drug to get fixed on the target nerve roots. This time the quality of neuraxial block was very

good. An epidural catheter was placed at L2-L3 interspace in this case also, with separate 16G Tuohy's needle. None of the above case had reported post dural puncture headache in the postoperative period. Difference in quality of block can be explained on the fact that, an immediate removal of 16 G epidural needle after the injection of local anaesthetic lead to the leakage of CSF mixed with local anaesthetic thus causing inadequate block. On the other hand in the second case, where needle was kept for 5 minutes, the drug (local anaesthetic) was available in sufficient amount to act on the nerve roots. In a prospective audit of 100 parturients who experienced accidental dural puncture by a Tuohy needle, deliberate cannulation of the subarachnoid space with an epidural catheter at the time of dural puncture was reported for continuous spinal analgesia or anaesthesia. However, it did not affect the incidence of post dural puncture headache². It was observed that after intentional dura perforation with the Tuohy Needle, the epidural catheter was seen to pass through this hole and enter the subarachnoid space in 9 of 20 recordings of epiduroscopy³. Based on our observation of these two cases, it can be recommended that in case of accidental dural puncture with epidural needle, the intrathecal local anesthetic should be injected

from same puncture site but the epidural needle must be kept for a minimum of five minutes, along with stellate in place, to avoid spontaneous leak of local anesthetic through dural puncture site. But it must be ensured that the operative site should be dependent, as hyperbaric drug acts on the dependent site. It is also advisable that epidural catheter should be inserted in a space higher than the space of dural puncture site to eliminate the possibility of epidural catheter getting accidentally migrated into intrathecal space³.

References

1. Cohen S, Amar D, Pantuck EJ Decreased incidence of headache after accidental dural puncture in caesarean delivery patients receiving continuous postoperative intrathecal analgesia: *Acta Anaesthesiol Scand.* 1995 Nov;39(8):1140.
2. M Paech, S Banks, L Gurrin An audit of accidental dural puncture during epidural insertion of a Tuohy needle in obstetric patients: *International Journal of Obs Anesth.* 2001 jul;10(3):162-7.
3. B Holmstrom, N Rawal, K Axelsson, PA Nydahl Risk of catheter migration during combined spinal epidural block: percutaneous epiduroscopy study *Anesth anal* 1995 80, 747-753

**Deepak Narang,
Ravinder Kumar Batra**

Department of Anaesthesiology
All India Institute of Medical
Sciences, Ansari Nagar,
New Delhi

Childbirth techniques

Childbirth has been associated with pain since the beginning of time, and throughout history measures have been introduced to help relieve it. Various exorcisms can be found in the records from the ancient civilisations of Babylon, Egypt, China and Palestine. Primitive attempts to help relieve pain were based mainly on suggestion and distraction. The former embraced the use of rings, necklaces, amulets and other magical charms; while the latter included counter-stimulation i.e. the infliction of a painful stimulus sufficient to detract from a natural one. In the Middle Ages various herbal concoctions based on extract of poppy, mandragora, henbane and hemp were introduced. There is evidence that alcohol was also used in labour. At the beginning of the nineteenth century other 'remedies' were introduced. In 1806 a thesis by Miller, entitled "Means of Lessening Pain of Parturition", recommended vigorous exercise, bloodletting and a variety of medications designed to induce vomiting. One can imagine that treatments such as these would have been quite effective in distracting women from their pain!

Medical history abounds with episodes where new treatments have been embraced with well-intended but misplaced enthusiasm. The introduction of anaesthesia and pain relief in

childbirth in the nineteenth and early twentieth centuries was no exception. Some practitioners were so seduced with the powerful effects of the new drugs available to them (chloroform, opioids, 'Twilight Sleep'), that they used them indiscriminately. However, when revolutionary new remedies are promoted uncritically, they invariably lead to counter-revolution. The excessive use of sedative and analgesic drugs used during labour at the beginning of this century was a prelude to the so-called Natural Childbirth Movement. The origins of this movement go back to 1914 when Behan wrote: "Like menstruation, childbirth should be a painless process. It is only as culture advances that the labour becomes painful, for in women of primitive races pain is absent." Dr Grantly Dick-Read proposed the same argument in 1933. Later, various modifications of the Dick-Read philosophy were introduced in other countries. Psychoprophylaxis was first described in 1947 by a Russian psychiatrist, Velvovski, and was modified by Lamaze and Vellay in Paris in 1952. Antenatal education, breathing patterns and relaxation also play a prominent role with this technique. More recently, Le Boyer has introduced a somewhat different approach - but based on similar concepts. Like the Twilight Sleep movement, most of the above approaches to childbirth have been consumer led.

Betsy Varughese, Rani Kuma, Manoj Dhingra, Renu Dhingra

Department of Anatomy, All India Institute of Medical Science,
New Delhi and Department of Health, Institute of clinical Research of India, New Delhi

Preeclampsia, (the disease of multiple theories) is a multifactorial disease whose pathogenesis is not solely vascular, genetic, immunologic, or environmental but a complex combination of factors. It is the *de novo* occurrence of hypertension and proteinuria after the twentieth week of gestation that continues to exert an inordinate toll on mothers and children alike. The maternal and fetal signs can appear suddenly at any time from midtrimester until term hence the term “Preeclampsia”_ (Greek-sudden flash or development) ¹. Although the outcome for most of these pregnancies is good, women with preeclampsia have an increased risk of developing serious problems, such as kidney failure, liver failure, abnormalities of the clotting system, stroke, premature birth (birth before 37 completed weeks), stillbirth or death of the baby in the first few weeks of life ². Prompt diagnosis and intervention are of vital importance in reducing maternal mortality and guide the development of antenatal care facilities for regular monitoring of maternal blood pressure and early detection of proteinuria. When preeclampsia threatens to lead to severe maternal complications, urgent delivery of the fetus and placenta are often undertaken to preserve maternal health. In the developed world, where safe emergent cesarean delivery is

available, the burden of morbidity and mortality due to preeclampsia is on the neonate. Many of the infants born to preeclamptic pregnancies require costly support in the form of specialized Neonatal ICU. Preeclampsia is associated with placental hypoperfusion, which can lead to intrauterine growth restriction and oligohydramnios. Abruptio placentae complicate about 4% of cases of severe preeclampsia³. Neonatal morbidity is most often due to the sequelae of prematurity and low birth weight, including prolonged neonatal intensive care unit stays, respiratory distress, necrotizing enterocolitis, intraventricular hemorrhage, sepsis, and death⁴. The burden of preeclampsia on health care resources is therefore substantial and more importantly recurring. There is no useful screening method available till date for this. Increased attention has recently been focused on angiogenetic factors like placental growth factor (PlGF) and vascular endothelial growth factor (VEGF) ⁵. Measuring the angiogenetic factors in serum may predict the risk of preeclampsia. This review describes one of the critical factors which plays an important role in its pathogenesis and is the role of circulating angiogenetic factors in the pathogenesis of preeclampsia, which would thus provide a rationale for potential future prophylactic and

therapeutic interventions for preeclampsia.

Clinical features and epidemiology of preeclampsia-

Preeclampsia is characterized by the new onset of hypertension and proteinuria after the twentieth week of gestation. It is also associated with hyperuricemia and edema. The clinical onset of preeclampsia is often insidious and asymptomatic, but may include headache, visual disturbances, epigastric pain, weight gain, and edema of the hands and face. These early signs and symptoms are important to recognize clinically, since they may herald progression to a more severe and often life-threatening disease. Severe complications of preeclampsia can include acute renal failure; cerebral edema, cerebral hemorrhage, seizures (eclampsia), pulmonary edema, thrombocytopenia, hemolytic anemia, coagulopathy; and liver injury, including HELLP, the syndrome of hemolysis, elevated liver enzymes and low platelets. The HELLP syndrome has been associated with a 10–20% incidence of perinatal mortality, attributable largely to premature delivery⁶. Severe preeclampsia may also lead to SGA babies. Although antihypertensive medications help to lower blood pressure and magnesium sulfate is effective in seizure prophylaxis⁷, delivery remains the only definitive treatment. The

epidemiology of preeclampsia provides clues about the pathophysiology that scientists are still deciphering. Although most preeclampsia occurs in healthy nulliparous women, several risk factors are reminiscent of cardiovascular risk factors, including chronic hypertension⁸, renal disease⁹, diabetes mellitus¹⁰, high body mass index, obesity^{11,12} and family history of cardiovascular disease¹³. The importance of cardiovascular risk factors has strengthened the hypothesis that preexisting maternal vascular dysfunction or susceptibility may have a pathologic role in at least some cases of preeclampsia.

Preeclampsia: pathogenesis-

The pathogenesis of preeclampsia may involve abnormal cytotrophoblast invasion of spiral arterioles, decreased uteroplacental perfusion and decreased production of prostaglandin I₂, increased oxidative stress, disordered endothelin metabolism or endothelial dysfunction. During normal placental development, cytotrophoblast invade the maternal spiral arterioles and completely remodel the maternal spiral arterioles into large capacitance vessels with low resistance¹⁴. This process is called pseudovasculogenesis. The endovascular cytotrophoblast invades not only the endothelium but also the highly muscular tunica media. During normal differentiation, invasive trophoblasts alter their adhesion molecule expression from those that are characteristics of epithelial cells (integrin α_6/α_3 , α_w/α_3 and E-cadherin) to those of endothelial cells (integrin α_1/α_1 , α_w/α_3 , platelet

endothelial cell adhesion molecule and vascular endothelial-cadherin). This process of pseudovasculogenesis is defective in preeclampsia¹⁵. In preeclampsia, there is a shallow placental cytotrophoblast invasion of uterine spiral arterioles, leading to reduced placental perfusion and placental insufficiency which can affect fetoplacental unit, causing IUGR¹⁶. The molecular pathways that regulate pseudovasculogenesis may involve a vast array of transcription factors, growth factors and cytokines¹⁷. Considerable attention has recently been focused on angiogenesis related gene products such as vascular endothelial growth factor and its receptors.

Vascular endothelial growth factor and its receptors-Vascular endothelial growth factor (VEGF) is an endothelial – specific mitogen that plays an important role in promoting angiogenesis. It is a disulfide linked homodimeric 34-42 KDa, heparin binding glycoprotein that promotes endothelial cell proliferation, migration¹⁸ and survival¹⁹. It was originally described as “vascular permeability factor”²⁰ and as “vascular endothelial cell growth factor”²¹. Further studies have shown that these two factors are encoded by the same gene. VEGF has six isoforms (VEGF₁₂₁, VEGF₁₄₅, VEGF₁₆₅, VEGF₁₈₃, VEGF₁₈₉ and VEGF₂₀₆) and these isoforms are generated by alternative splicing of the VEGF mRNA²¹. Usually the VEGF₁₂₁ and VEGF₁₆₅ isoforms are predominant, but expression of

the VEGF₁₈₉ isoform could also be seen in most VEGF-producing cell types²². In contrast VEGF₁₄₅ expression seems to be more restricted, and it is found to be expressed in cells derived from reproductive organs²³. VEGF has a family of receptors and it exerts its biological effect through the most important two high affinity receptor tyrosine kinases: Vascular endothelial growth factor receptor-1 (VEGFR-1)/ fms-like tyrosine kinase 1 (Flt1) and Vascular endothelial growth factor receptor-2/ Kinase domain receptor, (KDR)/ (flk-1). The VEGFR-1 has an extracellular domain having seven immunoglobulin ligand binding domains, a transmembrane and an intracellular domain (Fig.1). The VEGF binding site is located at the second and third immunoglobulin-like loops and the two VEGFR-1 receptors are linked by a VEGF bridge. It is also reported that the fourth immunoglobulin like domain contains a receptor dimerization domain²⁴. VEGFR-1 has two isoforms: a transmembranous form and a soluble form. The soluble form is generated by a splice variant of the VEGFR-1 gene and contains the extracellular ligand binding - domain although lacking the signal tyrosine kinase domain²⁵. This truncated form after being secreted, becomes soluble and antagonizes VEGF and PlGF in the circulation by binding and preventing their interaction with their endothelial receptors²⁶ (Fig.2). The regulation of Flt1 splicing to produce full Flt1 receptor versus the truncated sFlt1 remains unknown. Although

placenta is the major source of circulating sFlt-1 during pregnancy²⁷, sFlt1 is produced in small amounts by other cells also (endothelial cells and monocytes)²⁸.

Role of angiogenic factors in placental development- Placenta has a high expression of VEGF ligands and receptors in the first trimester¹⁶. Thus it is hypothesized that placental vascular development might be regulated by a local balance between pro- and anti-angiogenic factors, and that excess sFlt1 in early gestation could contribute to inadequate placental vasculogenesis. Circulating sFlt1 levels are relatively low in early pregnancy and begin to rise distinctly in the third trimester. The reason for this increase is unclear; it may be due to an anti-angiogenic shift in the placental milieu toward the end of pregnancy, corresponding to the vasculogenic phase of placental growth. In preeclampsia, the elevation of sFlt1 production is earlier and exaggerated. Apart from sFlt1, circulating concentration of free PlGF levels is altered well before the twentieth week of gestation, in preeclamptic patients. This early alteration in the angiogenic balance may therefore contribute to inadequate vascular cytotrophoblast invasion in the early stages of pregnancy, and its overflow into the circulation may produce endothelial dysfunction in the third trimester. Recent studies suggest that circulating sFlt1 may cause preeclampsia²⁹. Additional synergistic factors that are elaborated by the placenta are yet to be identified which may play a role in the generalized endot-

helial dysfunction noted in the pathogenesis of preeclampsia.

Circulating angiogenic factors and their antagonist-An increased placental expression and secretion of soluble fms-like tyrosine kinase-1 (sFlt-1) has recently been demonstrated. In addition, circulating levels of pro-angiogenic factors (VEGF & PlGF) are found to be decreased in conjunction with elevated anti-angiogenic factors (sFlt-1) in the blood stream at the time of disease presentation³⁰. *In vitro* studies confirm that excess placental sFlt-1 production induces an anti-angiogenic state in the serum of preeclamptic women that ultimately leads to endothelial dysfunction²⁸. The administration of excess sFlt-1 to pregnant rat induces albuminuria, hypertension, and renal pathologic changes of glomerular endotheliosis by antagonizing circulating VEGF and PlGF²⁸. Moreover the loss of a single VEGF allele from the glomerulus in genetically modified mice resulted in glomerular endotheliosis and proteinuria. It is interesting that even though the circulating levels of VEGF were not affected, the dramatic endothelial defects were observed, which emphasizes that tight local regulation of VEGF signaling seems to be critical for endothelial function. This observation suggests that excess sFlt-1 may play a causal role in the pathogenesis of the maternal syndrome in preeclampsia by neutralizing VEGF and PlGF.

Conclusion-In summary, preeclampsia is a state of endothelial dysfunction secondary to excessive amounts of

circulating anti-angiogenic factors (sFlt-1) of placental origin. Currently, there is no useful and preventive treatment for preeclampsia. Researchers are currently analyzing of various pharmacologic agents to counteract the effects of sFlt-1, as a therapeutic option for preeclampsia. If such agents are effective in alleviating the manifestations, the delivery could then be safely be postponed for even a few weeks, which would have a significant impact on neonatal morbidity and mortality. A multi factorial approach is thus required to deepen the existing knowledge about preeclampsia; as more and more studies are progressing on the molecular and genetic levels, there is a hope that these new interventions may improve the management of this enigmatic disease in the near future.

References

1. DiFederico E, Genbacev O, Fisher S J, Preeclampsia is associated with wide spread apoptosis of placental cytotrophoblasts with in the uterine wall. *Am J Pathol.* 1999; 155: 293-301.
2. Duckitt K, Harrington D, Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. *BMJ.* 2005; 330: 565.
3. Sibai BM, Mercer BM, Schiff E, Friedman SA, Aggressive versus expectant management of severe preeclampsia at 28 to 32 weeks' gestation: a randomized controlled trial. *Am J Obstet Gynecol.* 1994; 171:818-822.

4. Sibai BM, Taslimi M, Abdella TN, Brooks TF, Spinnato JA, Anderson GD, Maternal and perinatal outcome of conservative management of severe preeclampsia in midtrimester. *Am J Obstet Gynecol.*1985; 152:32–37.
5. Thadhani R, Mutter WP, Wolf M et al, First trimester placental growth factor and soluble fms-like tyrosine kinase 1 and risk of preeclampsia. *J Clin Endocrinol Metab.* 2002; 89:770-775.
6. Roelofsen AC, van Pampus MG, Aarnoudse JG, The HELLP-syndrome; maternal-fetal outcome and follow up of infants. *J Perinat Med.* 2003; 31:201–208.
7. Sibai BM, Diagnosis and management of gestational hypertension and preeclampsia. *Obstet Gynecol.*2003; 102:181–192.
8. Sibai BM, Diagnosis and management of gestational hypertension and preeclampsia. *Obstet Gynecol.*2003; 102:181–192.
9. Sibai BM, Mercer BM, Schiff E, Friedman SA, Aggressive versus expectant management of severe preeclampsia at 28 to 32 weeks' gestation: a randomized controlled trial. *Am J Obstet Gynecol.*1994; 171:818–822.
10. Sibai BM, Taslimi M, Abdella TN, Brooks TF, Spinnato JA, Anderson GD, Maternal and perinatal outcome of conservative management of severe preeclampsia in midtrimester. *Am J Obstet Gynecol.*1985; 152:32–37.
11. Roelofsen AC, van Pampus MG, Aarnoudse JG, The HELLP-syndrome; maternal-fetal outcome and follow up of infants. *J Perinat Med.* 2003; 31:201–208.
12. Sibai BM, Ewell M, Levine RJ, Klebanoff MA, Esterlitz J, Catalano PM, Goldenberg RL, Joffe G, Risk factors associated with preeclampsia in healthy nulliparous women. The Calcium for Preeclampsia Prevention (CPEP) Study Group. *Am J Obstet Gynecol.* 1997; 177: 1003–1010.
13. Mostello D, Catlin TK, Roman L, Holcomb WL Jr, Leet T, Preeclampsia in the parous woman: who is at risk? *Am J Obstet Gynecol.* 2002; 187:425–429.
14. Sibai BM, Risk factors, pregnancy complications, and prevention of hypertensive disorders in women with pregravid diabetes mellitus. *J Matern Fetal Med.* 2000; 9:62–65.
15. Weiss JL, Malone FD, Emig D, Ball RH, Nyberg DA, Comstock CH, Saade G, Eddleman K, Carter SM, Craigo SD, Carr SR, D'Alton ME, FASTER, Research Consortium. Obesity, obstetric complications and cesarean delivery rate—a population-based screening study. *Am J Obstet Gynecol.* 2004; 190:1091–1097.
16. Thadhani R, Stampfer MJ, Hunter DJ, Manson JE, Solomon CG, Curhan GC, High body mass index and hypercholesterolemia: risk of hypertensive disorders of pregnancy. *Obstet Gynecol.* 1999; 94:543–550.
17. Ness RB, Markovic N, Bass D, Harger G, Roberts JM, Family history of hypertension, heart disease, and stroke among women who develop hypertension in pregnancy. *Obstet Gynecol.* 2003; 102:1366–1371.
18. Gerretsen G, Huisjes HJ, Elema JD, Morphological changes of the spiral arteries in the placental bed in relation to pre-eclampsia and fetal growth retardation. *Br J Obstet Gynaecol.* 1981;88:876-881.
19. Zhou Y, Damsky CH, Fisher SJ, Preeclampsia is associated with failure of human cytotrophoblast to mimic a vascular adhesion phenotype. *J Clin Invest.* 1997; 99: 2152-2164.
20. Zhou Y, McMaster M, Woo K et al, Vascular endothelial growth factor ligands and receptors that regulate human cytotrophoblast survival are dysregulated in severe preeclampsia and hemolysis, elevated liver enzymes, and low platelets syndrome. *Am J Pathol.*2002; 160:1405-1423.
21. Zhou Y, Genbacev O, Fischer SJ, The human placenta remodels the uterus by using a combination of molecules that govern vasculogenesis or leukocyte extravasation. *Ann NY Acad Sci.* 2003;995:73-83.
22. Ferrara N, Gerber HP, LeCouter J, The biology of VEGF and its receptors. *Nat Med.* 2003; 9:669-676.
23. Gerber HP, McMurtrey A, Kowalski J et al, Vascular endothelial growth factor regulates endothelial cell survival through the phosphatidylinositol 3'-kinase/Akt signal transduction pathway. Requirement for Flk-1/KDR activation. *J*

Biol Chem. 1998; 273:30336-30343.

24. Senger DR, Galli SJ, Dvorak AM, Perruzzi CA, Harvey VS, Dvorak HF, Tumor cells secrete a vascular permeability factor that promotes accumulation of ascites fluid. *Science*. 1983; 219:983-985.

25. Leung DW, Cachianes G, Kuang WJ, Goeddel DV, Ferrara N. Vascular endothelial growth factor is a secreted angiogenic mitogen. *Science*. 1989; 246:1306-1309.

26. Bacic M, Edwards NA, Merrill MJ, Differential expression of vascular endothelial growth factor (vascular permeability factor) forms in rat tissues. *Growth Factors*. 1995; 12:11-15.

27. Poltorak Z, Cohen T, Sivan R et al, VEGF145, a secreted vascular endothelial growth factor isoform that binds to extracellular matrix. *J Biol Chem*. 1997; 272:7151-7158.

28. Wiesmann C, Fuh G, Christinger HW, Eigenbrot C, Wells JA, de Vos AM. Crystal structure at 1.7 Å resolution of VEGF in complex with domain 2 of the FLT-1 receptor. *Cell*. 1997; 91 : 695-704.

29. Chaiworapongsa T, Romero R, Espinoza J et al, Evidence supporting a role for blockade of the vascular endothelial growth factor system in the pathophysiology of preeclampsia. Young Investigator Award. *Am J Obstet Gynecol*. 2004; 190:1541-1547.

30. Kendall R L, Wang G, Thomas KA, Identification of a natural soluble form of the vascular endothelial growth factor receptor, FLT-

1, and its hetero dimerization with KDR. *Biophys Res Commun*. 1996; 226: 324-328.

31. Nagamatsu T, Fujii T, Kusumi M et al, Cytotrophoblasts up-regulate soluble fms-like tyrosine kinase-1 expression under reduced oxygen: an implication for the placental vascular development and the pathophysiology of preeclampsia. *Endocrinology*. 2004; 145: 4838-4845.

32. Maynard SE, Min JY, Merchan J et al, Excess placental soluble fms-like tyrosine kinase 1 (sFlt1) may contribute to endothelial dysfunction, hypertension, and proteinuria in preeclampsia. *J Clin Invest*. 2003; 111:649-658.

33. Levine RJ, Maynard SE, Qian C et al, Circulating angiogenic factors and the risk of preeclampsia. *N Engl J Med*. 2004; 350: 672-683.

34. Levine RJ, Karumanchi SA, Circulating angiogenic factors in preeclampsia. *Clin Obstet Gynecol*. 2005; 48:372-386.

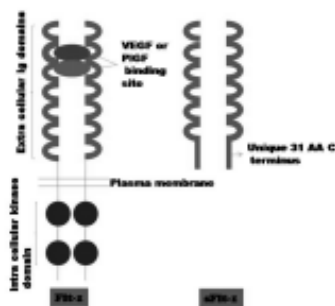


Figure-1, Flt-1 and sFlt-1 protein structures. Flt-1 has 7 extra cellular Ig domains that are binding to

Vascular Endothelial Growth Factor and Placental Growth Factor an intra cellular kinase domain. sFlt-1 has 6 extra cellular Ig domains and a unique 31 – aminoacid c-terminus region derived from alternative splicing and lacks the intra cellular kinase domain.

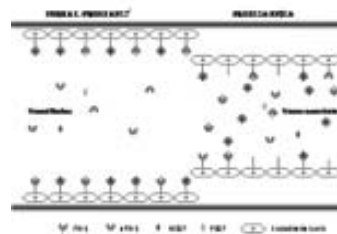


Figure-2, Soluble Flt-1 (sFlt-1) causes endothelial dysfunction by antagonizing vascular endothelial growth factor (VEGF) and placental growth factor (PlGF). This figure represents the binding of VEGF and PlGF to Flt-1 and sFlt-1 in normal and preeclamptic pregnancy respectively. In normal pregnancy, VEGF and PlGF binds to Flt-1 that are present on the endothelial cells of the blood vessels and causes vasodilation whereas in preeclampsia, the extracellular domain of Flt-1 is detached to form s-Flt-1, enhancing its concentration in circulation. This sFlt-1 then binds to free VEGF and PlGF in circulation thereby preventing their normal binding to the endothelial receptors.

Recent Advances

Chetan Merchant, Sushma Sagar, Maneesh Singhal

Department of Surgical Disciplines, JP Apex Trauma Center,
All India Institute of Medical Sciences, Delhi

Beginning its journey in trauma management in early 90's ultrasound (US) has evolved considerably over past two decades. The ultrasound machine has moved from the confines of radiological suites and radiologists, and entered the premises of emergency room and into the hands of emergency physicians and trauma surgeons. Ultrasound entered the domain of trauma management in the form of FAST (Focused Assessment with Sonography for Trauma)^{1,2,3,4}. FAST involved the concept of detecting peritoneal and pericardial fluid in patients of thoraco-abdominal trauma by trauma care providers with nearly 100% sensitivity. Though the concept was simple it brought about some revolutionary changes, one it made ultrasound available as a valuable diagnostic tool for assessment and management of trauma patients, as in case of blunt abdominal trauma where presence of free fluid in abdomen would suggest an intra-abdominal pathology and if patient is hemodynamically unstable would warrant an operative procedure. Second this diagnostic tool was to be used by emergency physicians and trauma surgeons without being completely dependent on radiologists. This is possible with US as it is simple, cheap, noninvasive, reproducible and yet provides valuable

information. This brought about a paradigm shift in the way ultrasound was used in trauma. Its role in management of trauma patients became more diversified due to better understanding of its principles and its limitations and at the same time due to development of better and portable machines and probes. US use in trauma now starts in prehospital setting in form of P-FAST^{5,6} where by using a simple, portable, compact US machine FAST is performed at the site of trauma. This helps to detect life-threatening injuries like hemoperitoneum⁷, hemothorax, and pneumothorax within the "golden hour" and allow appropriate triage of the patients.

In the emergency room US can accurately detect hemorrhagic or hypovolemic shock by identifying empty cardiac chambers and collapsed IVC thus aiding the resuscitative efforts⁸ and also detecting outcomes of CPR in a case of cardiac arrest⁹. E-FAST with US in emergency room is a combination of conventional FAST with a pneumoscan¹⁰. Pneumoscan is a rapid assessment of pleural cavities and lungs with US detecting hemothorax¹¹, pneumothorax¹⁰, and pulmonary parenchymal damage by determining absence of sliding-sign and presence of 'B'-lines or "comet-tail" artifacts¹². This helps

in rapidly initiating the appropriate management in form of needle thoracostomy or intercostal drainage without having to wait for an X-ray or a CT scan. US has more sensitivity in detecting rib or sternal fractures than an x-ray. US can also accurately confirm the placement of endotracheal tube in to the trachea by direct visualization and by confirmation of sliding-sign bilaterally after intubation¹³. The detection of fractures with US is well known but recently this has been included in a systematic approach and has been integrated in the primary and secondary survey^{14,15}. The interpretation of optic nerve sheath diameter as a marker of increased intracranial pressure by using US is currently investigational and would help in ICP monitoring of closed head injury victims in ER and in ICU^{16,17}. US is also being used in emergency room (ER) for central venous catheterisation¹⁸, arterial and venous cannulations. It is also used for administering peripheral nerve blocks for fracture manipulation and reduction^{19,20}. It is also used for US guided aspiration of peritoneal fluid thus aiding diagnosis in abdominal trauma. The multiple uses of US in trauma care and its benefits has helped US become an integral part of ABCDE assessment and management of a trauma patient. The use of US in trauma is not

just limited to emergency room but has extended to management of trauma patients in ICU and during the follow-up of patients managed non-operatively. US-enhanced trauma assessment and management is the newer trend in trauma care and to achieve this goal it is essential that the trauma care providers are educated and trained in using US. Thus by providing precise and problem oriented information in short time and that too bedside, US can have a major impact on decision making. It reduces the delay in initiation of definitive management in acute trauma.

References

1. Tiling T, Bouillon B, Schmid A, et al. Ultrasound in Blunt Abdominothoracic Trauma. Marcel Dekter Inc, 1990: 415-433
2. Tso P, Rodriquez A, Cooper C, et al. Sonography in Blunt Abdominal Trauma: A Preliminary Progress Report. J Trauma 1992; 33: 39-43
3. Rozycki S, Ochsner G, Jaffin H, et al. Prospective evaluation of surgeons' use of ultrasound in the evaluation of trauma patients. J Trauma 1993; 34: 516-526
4. Ma J, Mateer R, Ogata M, et al. Prospective Analysis of Rapid Trauma Ultrasound Examination performed by Emergency Physicians. J Trauma 1995; 38: 879-885
5. Brooks J, Price V, Simms M. FAST on Operational Military Deployment. Emergency Med J 2005; 22: 263-265
6. Kirkpatrick W, Sirois M, Laupland B, et al. Prospective Evaluation of Hand-held Focused Abdominal Sonography for Trauma (FAST) in Blunt Abdominal Trauma. Can J Surg 2005; 48: 453-460
7. Walcher F, Weinlich M, Conrad G. Prehospital Ultrasound Imaging Improves Management of Abdominal Trauma. Br J Surg 2006; 93: 238-242
8. Yanagawa, Youichi, Sakamoto, et al. Hypovolemic Shock Evaluated by Sonographic Measurement of the Inferior Vena Cava During Resuscitation in Trauma Patients. J Trauma 2007; 63: 1245-1248
9. Salen P, Melniker L, Choojian C, et al. Does the presence or absence of Sonographically Identified Cardiac Activity Predict Resuscitation Outcomes of Cardiac Arrest Patients? Am J Emerg Med 2005; 23 : 459-462
10. Kirkpatrick W, Sirois M, Laupland B, et al. Hand-held Thoracic Sonography for Detecting Post-traumatic Pneumothoraces: The Extended Focused Assessment with Sonography for Trauma (E-FAST).. J Trauma 2004; 57: 288-295
11. Sisley C, Rozycki S, Ballard B, et al. Rapid Detection of Traumatic Effusion using Surgeon-performed Ultrasonography. J Trauma 1998; 44: 291-296
12. Ball G, Ranson K, Rodriquez-Galvez M, et al. Sonographic Depiction of Post-traumatic Alveolar-interstitial Disease: The Hand-held Diagnosis of a Pulmonary Contusion J Trauma 2009; 66(3): 962
13. Chun R, Kirkpatrick W, Sirois M, et al. Where is the tube? Evaluation of hand-held Ultrasound in Confirming Endotracheal Tube Placement Prehosp Disaster Med 2004; 19(4); 366-369
14. Al-Kadi S, Gillman M, Ball G, et al. Resuscitative long-bone Sonography for the Clinician: Usefulness & Pitfalls of Focused Clinical Ultrasound to Detect long bone fractures during Trauma Resuscitation. Eur J Trauma Emerg Surg 2009; 35: 357-363
15. Dulchavsky A, Henry E, Moed R, et al. Advanced Ultrasonic Diagnosis of Extremity Trauma: The FASTER examination. J Trauma 2002; 53(1): 28-32
16. Soldatos T, Karakitsos D, Chatzimichail K, et al. Optic Nerve Sonography in the Diagnostic Evaluation of Adult Brain Injury. Crit Care 2008; 12: 67
17. Kimberly H, Shah S, Manil K, et al. Correlation of Optic Nerve Sheath Diameter with Direct Measurement of Intracranial Pressure. Acad Emerg Med 2008; 15: 201-204

18. P Temblett, D Hope. Ultrasound-guided Central line insertion. *Crit Care* 2004; 8(11): 72
19. Michael S, Daniel P, Ralphwang. Ultrasound-guided Supraclavicular block for the Treatment of Upper Extremity Fractures, Dislocations and Abscesses in the ED. *Am J Emerg Med* 2007; 25(4): 472-475
20. Plunkett A, Brown D, Rogers J, et al. Supraclavicular continuous Peripheral Nerve Block in a Wounded Soldier: When Ultrasound is the only option. *Br J Anaesth* 2006; 97: 715-717

Ultrasound in OBG

The A-mode scan had been used for early pregnancy assessment (detection of fetal heart beat), cephalometry and placental localization in Europe, Britain, United States, Japan, China, USSR, Poland and Australia in the early 1960s, the measurement of the biparietal diameter (BPD) having been invented by Ian Donald in 1961 and further expanded in his department by James Willocks, basing on improvements in the 'bright-up' markers and the electronic caliper system. The measurements were done 'blindly' without actually seeing the structures under study. Visualising the gestational sac by B-mode ultrasound was first described by the Donald and MacVicar team in 1963. In 1965,

they were able to demonstrate a 5-weeks gestational sac. The Gestational sac diameters in the assessment of fetal maturity was described by Lou M Hellman and M Kobayashi in 1969 and by Pentti Joupilla (Finland), Salvator Levi (Brussels) and E Reinold (Vienna) in 1971 in relation to early pregnancy complications. Kobayashi also described the ultrasonic appearance of extra-uterine pregnancy using bi-stable B-mode ultrasound in 1969. Kenneth Gottesfeld in Denver reported in 1970 a large series of patients where fetal death in utero was diagnosed solely on bistable ultrasound scan. The ability to recognise and confirm the presence of fetal cardiac action in early pregnancy was considered to be one of the most indispensable use of ultrasonography (and still is). Although detection of fetal heartbeat by the A-scan and audio doppler ultrasound (the first "Doptone" was invented in 1965, see section below on doppler) had been variously reported by early groups such as Wang (1964, M-mode from 10 weeks), Kratochwil (1967, vaginal A-scan from 7 weeks), Bang and Holm (1968, A- and M-mode from 10 weeks), it was not until 1972 that Hugh Robinson in Glasgow, basing on improved instrumentation reported a practically useful 100% detection of fetal cardiac action from 7 weeks onwards. The fetus was first located with B- scan ultrasound and the heartbeat

observed with a directed beam in A- and M-mode (also see below). This breakthrough has profound implication in the management of early pregnancy bleeding and threatened miscarriages.

B-mode placentography was successfully reported in 1966 by the Denver group in the United States and the Donald group in 1967 (Usama Abdulla). Ultrasonic diagnosis of molar pregnancies was described as early as 1963 by the same group. Stuart Campbell's landmark publication in 1968 "An improved method of fetal cephalometry by ultrasound" described the use of both the A- and B-mode scan to measure the fetal biparietal diameter. This elegant and practical 'maneuver' had quickly become standard practice in an ultrasound examination of the fetus for the next 10 years. Operating the static scanner skillfully and effectively has also become a crafted art. In 1971, with improvements in the caliper system, Campbell and Newman published normograms for the biparietal diameter from the 13th weeks of gestation and has made cephalometry a standard tool for the assessment of fetal growth and maturity. Many early paper in cephalometry followed in the late 1960s such as those from Boog in France, Khentov in the USSR, Zacutti and Brugnoli in Italy, Kratochwil in Austria and Pystynen and Ylostalo in Finland.

The Journal of Postgraduate Medical Education, Training & Research

Available free full text at NBE website : www.natboard.edu.in

The Journal of Post-graduate Medical Education, Training & Research is published by National Board of Examinations. It is basically meant to share experiences on post graduate medical education, training & research and to provide a forum to DNB candidates as well as the NBE accredited hospitals/institutions to publish their research work.

All correspondence regarding submission of manuscripts, reprints, etc. must be addressed to - the Editor, The Journal of Post-graduate Medical Education, Training & Research, National Board of Examinations, Ansari Nagar, Ring Road, New Delhi-110 029.

Fax : 011-45593009; Phone : 011-46054605; Email : journal_nbe@yahoo.com

Editorial Board

Patron

Prof. K S Reddy, President, National Board of Examinations

Editor-in-chief

Prof. A K Sood, Executive Director, National Board of Examinations

Managing Editors

Dr. Bipin Batra, Additional Director, National Board of Examinations

Dr. Anurag Aggarwal, Joint Director, National Board of Examinations

Editors

Dr. Vishakha Kapoor, Deputy Director, National Board of Examinations

Dr. Vinay Gupta, Assistant Director, National Board of Examinations

Dr. N Iboyaima Mangang, Assistant Director, National Board of Examinations

Journal Committee

Prof. Arvind Sali, Dept. of Pediatrics, LHMC, New Delhi

Prof. R K Batra, Dept. of Anesthesia, AIIMS, New Delhi

Prof. O P Kalra, Principal, UCMS, New Delhi

Dr. Avinash Supey, Dept. of Surgical Gastroenterology, Seth G S Medical College, Mumbai

Prof. Arun Kakar, Dept. of Surgery, MAMC, New Delhi

Prof. Alka ganesh, CMC, Vellore

Pro. C.S. Pandav, Centre for Community medicine, AIIMS, New Delhi

Note : The editor or publisher assumes no responsibility for the statements and opinions of the contributors.

For restricted circulation only.

Manuscript submission check list

1. Covering letter
2. Undertaking by authors signed by all authors
3. Copyright transfer agreement form signed by all authors
4. One copy of manuscript with one set of illustrations (one hard copy and also on CD)
5. Title page
 - Title of manuscript
 - Full name(s) and affiliations of authors(s) and city(ies) from which work originated
 - Name, address, telephone, fax numbers and e-mail address of the corresponding author.
 - Running title
6. Abstract in structured format along with key words (on a separate sheet)
7. Article
8. Acknowledgment
9. References
10. Tables (on separate sheets)