



ORIGINAL ARTICLE

E-pharmacy use among Medical Interns: Insights into Knowledge and Attitude

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Accepted: 8-August-2025 / Published Online: 9-September-2025

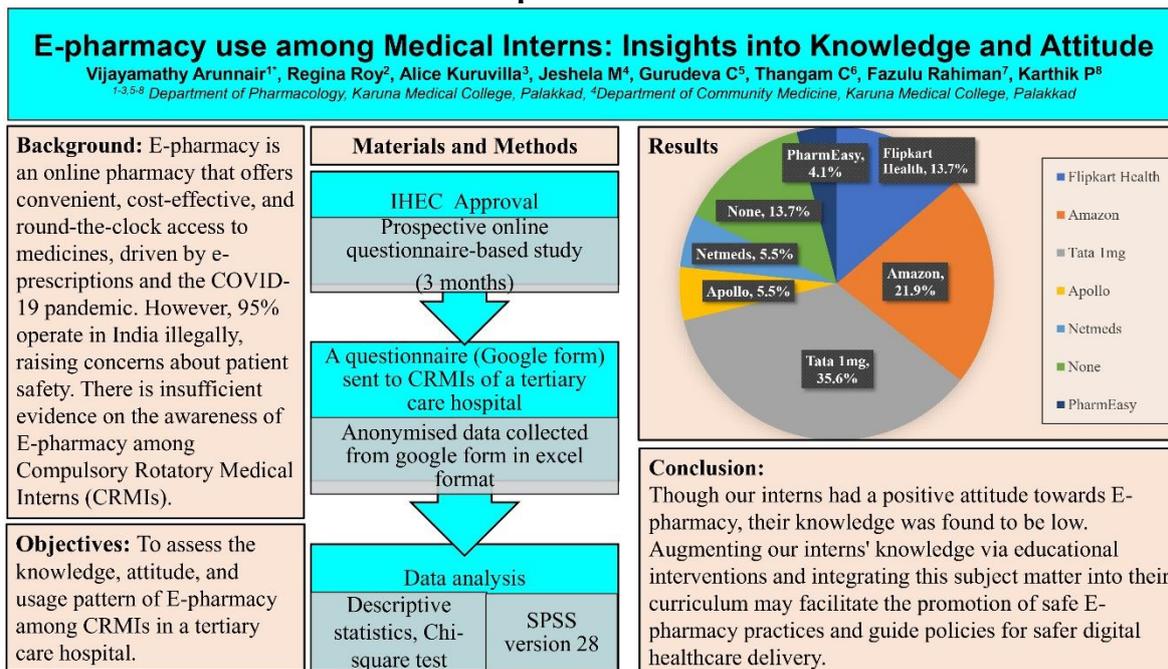
Abstract

Background: E-pharmacy is an online pharmacy that offers convenient, cost-effective, and round-the-clock access to medicines, driven by e-prescriptions and the COVID-19 pandemic. However, 95% operate in India illegally, raising concerns about patient safety. There is insufficient evidence on the awareness of E-pharmacy among Compulsory Rotatory Medical Interns (CRMIs). **Objectives:** To assess the knowledge, attitude, and usage pattern of E-pharmacy among CRMIs in a tertiary care hospital. **Materials and Methods:** A prospective online questionnaire (Google Form)-based study was conducted using convenient sampling among 73 CRMIs at a tertiary care hospital in Palakkad for 3 months. Descriptive statistics and chi-square test were used, and the results were reported in the form of numbers and percentages. Statistical Package for the Social Sciences, version 28 for Windows, was used to analyze the data. **Results:** The majority of participants (71%) had poor knowledge and a positive attitude (44%), and a significant association ($P < 0.012$) was found between knowledge and attitude. Despite 78.1% being aware of E-pharmacy, half (53.4%) had never purchased from an online pharmacy, potentially attributable to concerns regarding substandard medication quality (26%) and lack of personal interaction (21.9%). Beauty care products (31.5%) and nonprescription medications (28.8%) were the most often purchased items online. **Conclusion:** Though our interns had a positive attitude towards E-pharmacy, their knowledge was found to be low. Augmenting our interns' knowledge via educational interventions and integrating this subject matter into their curriculum may facilitate the promotion of safe E-pharmacy practices and guide policies for safer digital healthcare delivery.

Keywords: E-pharmacy, Knowledge, Attitude, CRMIs, Online pharmacy

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Graphical Abstract



Introduction

E-pharmacy is an online pharmacy that offers convenient medicine delivery to clients, resulting in global demand. The increasing use of e-prescriptions in hospitals has also contributed to the growth of E-pharmacy [1]. The advantages of using an online pharmacy include time and cost savings, convenience for some patients and elderly individuals who are unable to leave their homes, availability around the clock, a greater choice due to the larger selection of medications available, and the ability to receive medications at a chosen time and pace [1,2]. One of the primary forces behind promoting the significance of E-pharmacy has been the COVID-19 pandemic [2].

Approximately 95% of E-pharmacies operate illegally, and there is a lack of legislation or regulations governing online pharmacies in India [1-3]. The World Health Organization (WHO) has raised concerns about the safety of purchasing from E-pharmacies since half of the drugs sold online come from fake websites [1,4].

Online pharmacies without regulations sell counterfeit drugs, posing a significant threat to consumer health [1,4,5]. To recommend safe and reliable online pharmacies to their patients, healthcare providers must be aware of these fraudulent activities and take precautions to avoid them [6].

Research indicates several misconceptions about online pharmacies compared to retail pharmacies [7]. According to an Andhra Pradesh survey, although most medical students were aware of Internet pharmacies, they still favoured offline pharmacies due to concerns about false websites [1]. There are a few KAP (Knowledge, Attitude and Practice) studies in Indian literature about online pharmacy among second MBBS students, physicians, retail pharmacists, and consumers [1,5,7,8]. To the best of our knowledge, there are no such studies involving Compulsory Rotatory Medical Interns (CRMIs), who are budding physicians of tomorrow. Such research may help improve the safety and dependability of E-pharmacy for patient

care in the modern digital environment. Hence, the current study was conducted to analyze the knowledge, attitude, and pattern of use of E-pharmacy among CRMIs in a tertiary care hospital.

Materials and Methods

After approval from the Karuna Medical College (KMC), Institutional Human Ethics Committee (Approval No. KMC/IHEC/22/2024), a prospective observational online questionnaire-based study using convenient sampling was conducted at KMC, Palakkad, for a duration of 3 months (March 2024 to May 2024) among the CRMIs in the academic year 2024 - 2025. We got 73 responses.

Inclusion criteria

All the CRMIs of Karuna Medical College, Palakkad, in the academic year 2024-2025, aged 18 years and above, of either gender

Exclusion criteria

Not willing to participate, and Incomplete responses

Study procedure

A prevalidated questionnaire based on previous studies was sent to all MBBS interns through WhatsApp, utilizing Google Forms as a data collection tool [1,5,8]. An online consent was incorporated at the beginning of the questionnaire (Google Form). The form comprised four sections: the first section contained demographic data, such as age, gender, and regional distribution, while sections two, three, and four each featured ten questions about knowledge, attitude, and usage patterns of E-pharmacy, respectively. Questions were open-ended, closed-ended, and multiple-choice (with the option to add

more). Participants' attitudes were assessed using a three-point Likert scale: Agree, Disagree, and Neutral. A score of 1 was assigned to the correct answer and 0 to the wrong answer. The overall knowledge and attitude scores (ranging from 0 to 10) for each participant were determined and classified into three categories of knowledge {high (8-10), moderate (6-7), and low (<6)} and three categories of attitude (positive, neutral, and negative) according to Bloom's cut-off point, and their percentages were calculated [9].

Statistical Analysis

Anonymized data obtained via Google Forms was entered in Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 28. Descriptive and inferential statistics were used, when appropriate, to analyse the results. The association between variables was studied using a chi-square test. Results were presented as numbers (%). Significance was assessed at a 5% level of significance ($p < 0.05$).

Results

The majority of participants, 50 (68.5%), were aged 18-25, while the remaining 23(31.5%) were aged 26-35. Most of them were females, 52(71.2%). More than half (54.8%) of the CRMIs belong to urban areas.

Knowledge

The majority (78.1%) were aware of E-pharmacy. Only half of the interns know about reliable online pharmacy websites (47.9%), requirements of prescription (61.6%), medication alerts (50.7%), types of drugs that can be sold (58.9%), and other value-added services (49.3%) like e-consultations, e-diagnostics, details on

medications and illnesses, health insurance services, and patient counselling. Nearly 47.9% were able to recognise safe E-pharmacies. Additionally, 80-95% of the participants had poor knowledge of E-

pharmacy laws, including advertisement of drugs (80.8%), E-pharmacy guidelines (94.6%), and reporting of unlawful sales (82.2%) (Table 1).

Table 1. Knowledge of the participants (N=73)

Knowledge-based Questions	Answers <i>n</i> (%)		
	Yes	No	Don't know
Do you know about E-pharmacy?	57(78.1)	16(21.9)	0(0)
Do you know about reliable online pharmacy websites?	35(47.9)	30(41.1)	8(11.0)
Advertisement of drugs through E-pharmacy is permitted.	26(35.6)	14(19.2)	33(45.2)
Do you require a prescription for the online purchase of medicines?	45(61.6)	14(19.2)	14(19.2)
Are there any approved E-pharmacy guidelines in India?	31(42.5)	4(5.5)	38(52.1)
E-pharmacies provide medication alerts to doctors and drug reminders to patients.	37(50.7)	3(4.1)	33(45.2)
Narcotics, psychotropic drugs, painkillers, and Schedule X drugs can be sold in online pharmacies.	5(6.8)	43(58.9)	25(34.2)
Are you aware of any other value-added services that E-pharmacies provide?	36(49.3)	19(26)	18(24.7)
Do you know whom to report for unlawful sales of medical products on the Internet in India?	13(17.8)	26(35.6)	34(46.6)
Safe online pharmacies:	Provide a physical address and telephone number in the country	1(1.4)	
	Have a licensed pharmacist on staff to answer your questions.	7(9.6)	
	Offer discounts and deals	1(1.4)	
	Are licensed with the state board of pharmacy	2(2.7)	
	Options 1,2 & 4 are correct	35(47.9)	
	All the above	27(37)	

Attitude

Almost 60-89% of Participants had a positive attitude towards various aspects including the benefit of online pharmacies during COVID-19(87.7%), inclusion in the undergraduate curriculum (86.3%), encouraging others to buy (61.6%), incorporating e-signatures (89%), helping in reducing healthcare expenditure

(71.2%), switching to E-pharmacy in the future (74%) and adherence to the country-specific laws (74%). However, individuals expressed negative opinions on the lack of preference for routine medication purchases (64.4%), medicine storage conditions (45.2%), and brand substitution (37%) (Table 2).

Table 2. Attitudes of Participants (N=73)

Attitude-based Questions	Answers n (%)		
	Agree	Disagree	Neutral
Do you feel online pharmacies were beneficial during the COVID-19 pandemic?	64(87.7)	7(9.6)	2(2.7)
Non-emergency day-to-day (routine) medicines can be procured offline rather than online.	47(64.4)	19(26.0)	7(9.6)
Should more information on online pharmacies be incorporated into the undergraduate curriculum?	63(86.3)	5(6.8)	5(6.8)
Would you like to encourage patients/ friends/ family members to buy medicine from an E-pharmacy?	45(61.6)	14(19.2)	14(19.2)
Do you feel it is necessary to incorporate the electronic signatures of physicians during purchase through E-pharmacy?	65(89.0)	4(5.5)	4(5.5)
Do you agree that E-pharmacy can reduce overall healthcare expenditure?	52(71.2)	10(13.7)	11(15.1)
Would you like to switch to E-pharmacy in the future?	54(74.0)	7(9.6)	12(16.4)
Do you think the storage conditions of the drugs sold by online pharmacies can be checked?	33(45.2)	19(26.0)	21(28.8)
Do you believe that the pharmacy laws allow a pharmacist to substitute a brand written by a doctor?	27(37.0)	31(42.5)	15(20.5)
Do you think the online pharmacy must be compliant with the laws in both the country of origin and the country of destination?	54(74.0)	5(6.8)	14(19.2)

Pattern of use

Around 74% Participants use the internet frequently and shop online. The most commonly preferred online platform was Tata 1 mg (35.6%, n=26), followed by Amazon (21.9%, n=16) (Figure 1). Most (34.2%, n =25) of the interns stated that they didn't use an online pharmacy for any specific disease. However, E-pharmacy was commonly used for fever (19.2%), followed

by diabetes (11%), dermatological disease (6.8%), hypertension (5.5%), and cosmetic purposes (5.5%). While 4.1% and 2.7% used for diabetes along with hypertension, and bronchial asthma, respectively. One participant each used for allergic rhinitis, arthritis, headache, inflammatory bowel disease, hypothyroidism, gastritis, migraine, heart disease, and multiple comorbidities.

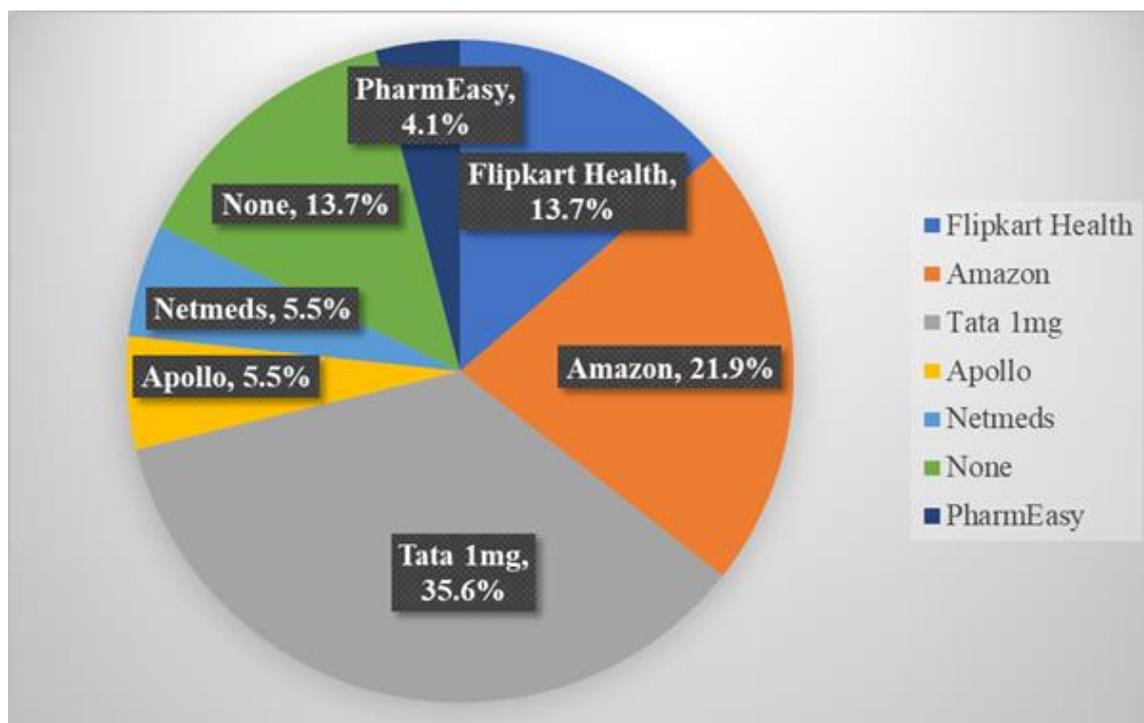


Figure 1. Online platforms for purchasing medicines (N=73)

Considering the frequency of online medicine purchases, the majority (53.4%) never procure, while 24.7% and 20.5% procure monthly and yearly, respectively. Only 1.4% of them bought daily. Participants (27.4%) have been purchasing medicines online for a month to a year, and

21.9% have been buying for over a year. Beauty care products (31.5%), followed by nonprescription drugs (28.8%), were the most common categories of products purchased online; nevertheless, personal care products 5.5% were the least preferred one (Figure 2).

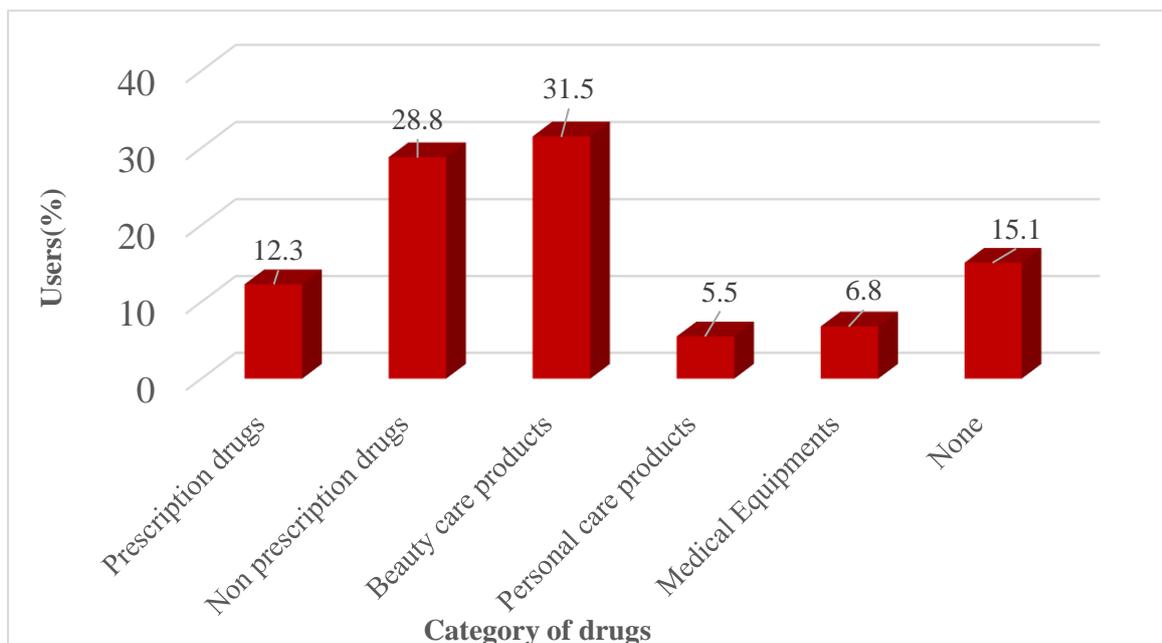


Figure 2. Category of drugs purchased in E-pharmacy (N=73)

Nearly 38.4% (n=28) opted to buy branded medication through an online pharmacy, followed by both branded and generic medications (35.6%, n =26). Only 2.7% preferred generic medicine. More than 87.7% of participants reported no issues, including side effects, poor quality, delays in delivery, or incorrect medication, when purchasing through an E-pharmacy.

The common reasons for choosing E-pharmacy were cheap costs/ special offers (27.4 %) and the lack of certain drugs in offline pharmacies (26%) (Figure 3). Compromised quality of medicine (26%) and lack of face-to-face interaction (21.9%) were the most common reasons for avoiding E-pharmacy (Figure 4).

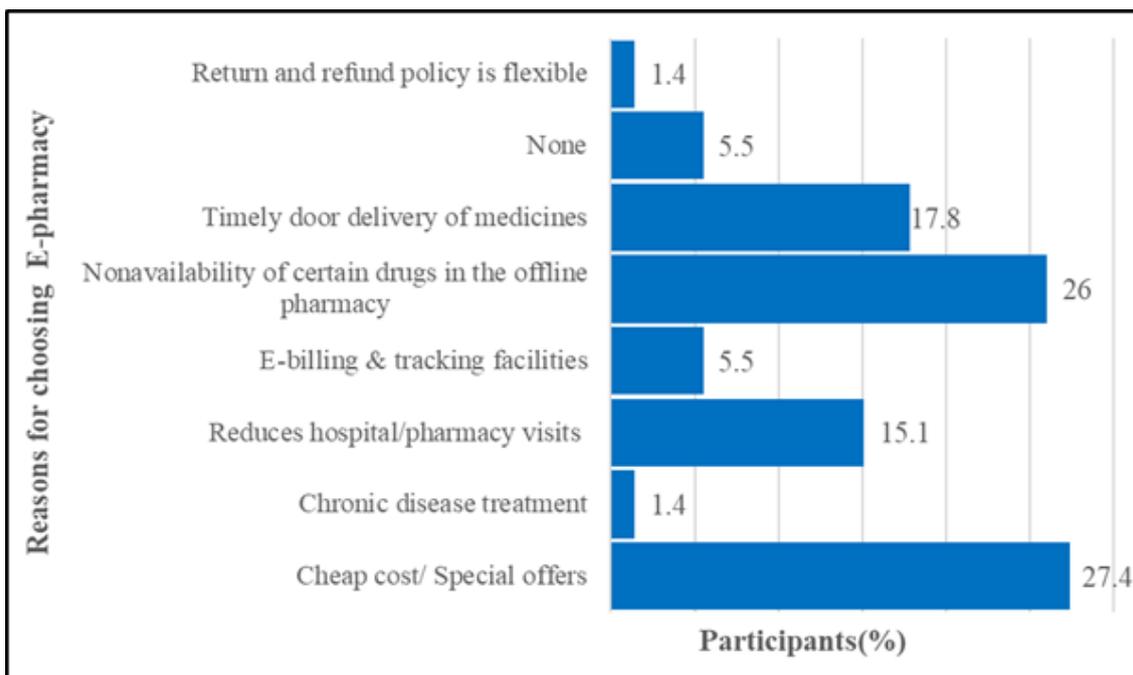


Figure 3. Reasons for choosing E-pharmacy (N=73)

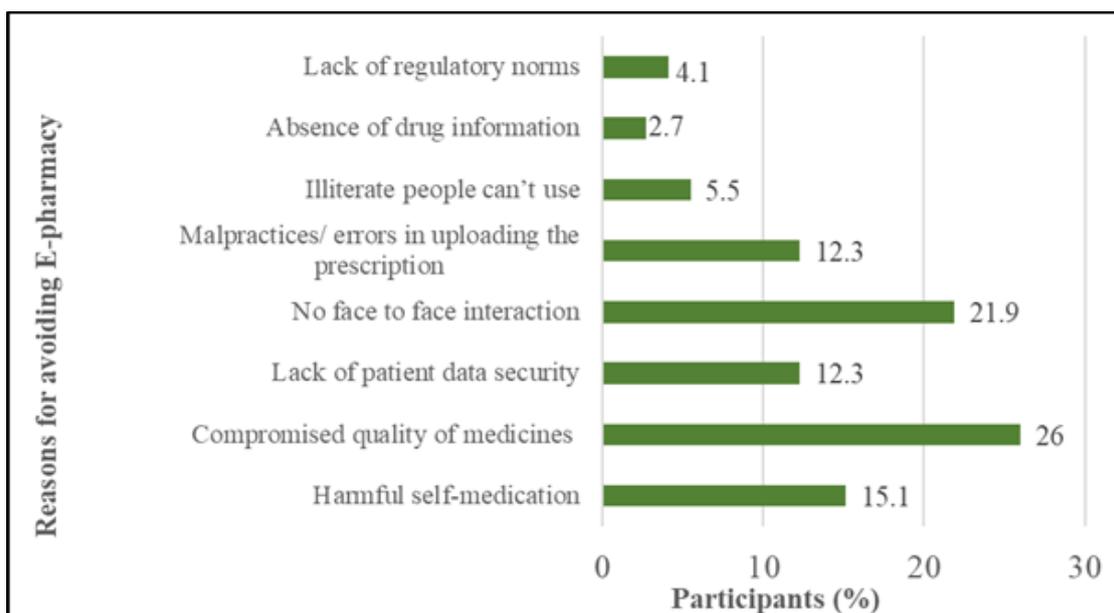


Figure 4. Reasons for avoiding E-pharmacy (N=73)

Knowledge and attitude scores

Students (71%) had low knowledge scores, while 23% and 6% had moderate and high knowledge scores, respectively. A positive attitude was noticed among 44% of students, 18% had a negative attitude; the remaining 38% had a neutral attitude. The Chi-square test found that the relationship between knowledge and attitude was statistically significant. (χ^2 value = 6.241, $P < 0.012$).

Discussion

Though there is a global demand for using E-pharmacy in patient care, the safety and dependability are questionable. Since there is a paucity of studies in Indian literature on the awareness of E-pharmacy among CRMIs who are future doctors, our study is the first of its kind to be done among them. This questionnaire-based study was conducted among 73 medical interns to analyze their knowledge, attitude, and pattern of use of E-pharmacy. The majority of our participants had poor knowledge (71%) and a positive attitude (44%), and a significant association was found between the two.

Most (71.2%) of our study participants were females from urban regions (54.8%), and the majority (68.5%) were between the ages of 18 and 25. Though 78.1% of our interns were aware of online pharmacies, only 46.5% purchased medicines online, consistent with other work [8]. A study by Mrinalini et al., reported that most online customers were found to be graduates, urban residents, and aware of E-pharmacy, but still preferred offline pharmacy purchases [1]. Another study also found that the urban population has higher knowledge and utilization rates of E-pharmacy services, with younger age

groups (18-25) more likely to use them [10].

Fewer than half (47.9%) of them only knew about reliable online pharmacy websites. Likewise, in other studies, a lower percentage (37.7%-47.44%) were aware of the trustworthy sites [1,5]. Just 47.9% of our students could identify secure online pharmacies. While in another research, a similar proportion (35-66%) of pharmacy students were able to identify an illegal online pharmacy website; however, following an educational session, the percentage increased to 58-82% [11]. Other study respondents (57%) also stated illegal websites as a major concern [12]. Almost 49.3% of our trainees knew about value-added services, but in a Delhi-based study, 95% of them favoured e-consultations and medication advice [12]. The majority (80-95%) of our interns had poor knowledge of E-pharmacy laws, such as advertisements of drugs (80.8%), E-pharmacy guidelines (94.6%), and reporting of unlawful sales (82.2%). North Indian consumer surveys revealed that only 23%-25.8% of respondents were familiar with E-pharmacy legislation, with varying degrees of familiarity reported in other studies [10,12,13]. Although few articles have stated that the urban population has higher awareness of E-pharmacy, the poor knowledge of our interns could be attributed to their higher preference for offline pharmacies and a lack of practical knowledge about E-pharmacy in their undergraduate curriculum [5,10].

Similar to a previous study, our CRMIs expressed a favourable attitude on the benefit of E-pharmacies during COVID-19 (87.7%) [14]. Nevertheless, like others, our students also preferred an offline pharmacy during non-emergencies [5]. Corresponding to other projects, our

CRMIs also expressed a preference for incorporating E-pharmacy programs into the curricula [11,13,15,16]. Our respondents overwhelmingly supported the use of electronic signatures (89%), citing cost reduction (71.2%), future adoption of E-pharmacies (74%), adherence to country-specific legislation (74%), and encouraging others to use E-pharmacies (61.6%). These findings were consistent with previous studies [1,5,12-13,15-16]. Yet, our students wrongly felt that storage conditions (45.2%) were controlled and brand substitution (37%) was permissible in E-pharmacy. However, some articles have identified doubtful/poor quality of medicines, including counterfeit, substandard, illegal, outdated medicines, and improper storage conditions, as well as nonavailability of specific brands, as the major disadvantages of E-pharmacy [1,5,10,12,16-17]. Although a favourable attitude among medical students is critical for preserving supply chains and protecting consumers from illegal websites, a few factors still require attention.

The majority of our study respondents (74%) were frequent internet users and online shoppers, in line with other research, and frequent internet usage is one of the leading causes for online shopping [12]. Similar to a study by Bansal et al., the most common E-pharmacy website preferred in our study was Tata 1mg (35.6%), followed by Amazon (21.9%) [5]. But, in other studies, Pharmeasy and Netmeds were the most common websites preferred [1,18,19]. In our project, the most common conditions for which online pharmacy was opted were fever (19.2%), diabetes (11%), and dermatological issues (6.8%). A few of the CRMIs used it for chronic health conditions like hypertension, bronchial asthma, and multiple

comorbidities, demonstrating the growing interest in online health management.

More than half of our members (53.4%) have never made an online pharmacy purchase, although monthly (24.7%) and annual (20.5%) usage shows a slow shift in favor of E-pharmacy. Contrarily, past studies have depicted only 1- 6% usage of E-pharmacy [12,15]. But a questionnaire-based study conducted among physicians showed 22.35% usage [8]. This increase in purchasing trend seen in our study could be attributed to the time spent by younger generations on the internet and online shopping. In our research, beauty care products (31.5%), followed by nonprescription drugs (28.8%), were the most common category of product purchased online, but in other articles, prescription drugs and cosmetics, followed by dietary supplements, were most commonly purchased [1,5,20]. Considering the type of medicine, 38.4% CRMIs opted to buy branded, followed by both branded and (35.6%) generic, in contrast to other studies in which a greater percentage (59.3%-63.77%) of participants chose both branded and generic [1,5].

More than 87.7% of our participants had not encountered any problems like side effects, poor quality, delay in delivery, or wrong medicine while purchasing through E-pharmacy, in line with an earlier study in which majority (58.9%) didn't encounter any problem, still rest of them had issues like unavailability of medicine, delay in receiving the medication and wrong medication delivery [15]. Even Jain et al pointed out the chances of wrong medication and delayed delivery in E-pharmacy [21]. Our students chose E-pharmacy due to cheap costs/ special offers (27.4 %) and the unavailability of certain drugs (26%) in offline pharmacies. Various

studies have also supported this finding [1,5,7,12,16,22-24]. Poor medicine quality (26%) and lack of personal interaction (21.9%) discouraged E-pharmacy use among our interns, comparable to numerous other findings [1,5,7,12,13, 25]. As per research, health literacy significantly influences the adoption and usage of E-pharmacy, which could also be an explanation for our respondents' usage pattern [24].

Our CRMIs showed a positive attitude, but poor knowledge, and a significant association between both, which corresponded to a pilot study done among consumers [15]. Nevertheless, a survey of retail pharmacists revealed good knowledge and a positive attitude towards E-pharmacy [7,26]. Another consumer poll found a significant correlation between respondents' education level and their perception of the security of online pharmaceutical services [23]. To address interns' lack of knowledge, formal education on the risks posed by illegal online pharmacies to patient and medication safety is necessary.

Limitations

This study was limited to Interns in a tertiary care hospital with a small sample size, and it can't be generalized to all medical students. Furthermore, the results are entirely subjective and based solely on the responses of the participants. To overcome the shortcomings of the current study, a comparative, multicenter study with an educational intervention involving various target groups (different streams of students) is required. Also, further research is needed to extend the findings to the general public.

Conclusion

This questionnaire-based study has provided valuable insights into the current knowledge, attitude, and pattern of use of E-pharmacy among CRMIs. Though CRMIs had a positive attitude and a gradual inclination towards E-pharmacy usage, poor knowledge was observed. Additionally strong relationship was found between knowledge and attitude. Hence, educational intervention on the guidelines, risks, and benefits of E-pharmacy platforms, as well as their inclusion in the MBBS curriculum, is needed to enhance our CRMIs' knowledge, attitude, and pattern of usage. This may also facilitate the promotion of safe E-pharmacy practices and guide policies for safer digital healthcare delivery. The study's limitations may prompt future research on the impact of E-pharmacy inclusion in medical curriculum, including training and public information.

Acknowledgments

We would like to thank all the participants who participated voluntarily in the study.

Authors' Contributions

All the authors contributed to the concept, design, data collection, data analysis, and interpretation, drafting of the article, critical revision of the article, and final approval of the version to be published.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the research, authorship, and publication of this article

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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