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RESEARCH ARTICLE

Telepharmacy knowledge, attitude, and experience among pharmacy students in Indonesia: A cross-sectional study

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Abstract

Background: The advancement of technology in healthcare services has given rise to telepharmacy. The success of telepharmacy depends on the knowledge, attitude, and experience of pharmacy students. However, telepharmacy is relatively new in the Indonesian pharmacy education system. **Methods:** This cross-sectional study was conducted using an online questionnaire to evaluate pharmacy students' knowledge, attitude, and experience related to telepharmacy. **Results:** The questionnaire was completed by 442 pharmacy students. Among them, 97.96% demonstrated a high level of knowledge about telepharmacy, and 96.60% had a positive attitude toward it. However, 85.97% of students had limited experience with telepharmacy. While there was a significant correlation between knowledge and attitude, no such correlation was observed between attitude and experience. **Conclusion:** The findings revealed that pharmacy students had high knowledge and attitude, but limited experience with telepharmacy. Additionally, there is a significant correlation between knowledge of telepharmacy and a positive attitude towards its use. To better prepare future pharmacists to provide effective telepharmacy services, it is essential to integrate telepharmacy practice models into the curriculum.

Introduction

The evolution of technology in healthcare services has transformed how patient care is delivered (Iyanna *et al.*, 2022; Stoumpos *et al.*, 2023). In the field of pharmacy, this transformation is formed by the concept of telepharmacy (Poudel & Nissen, 2016). Telepharmacy involves delivering pharmaceutical care to patients in remote areas using telecommunications and information technologies, with pharmacists typically not physically present at the point of patient care (Alexander *et al.*, 2017). This approach significantly improves pharmacists' accessibility in underserved areas affected by economic or geographic challenges, leading to improved patient satisfaction, clinical outcomes, and quality of life (Baldoni *et al.*, 2019).

As healthcare and technology converge, it's crucial to assess how pharmacy students who will become future pharmacists perceive telepharmacy (Frenzel & Porter, 2023). The knowledge and perception of pharmacy students are determining factors in the success of telepharmacy (Patel, 2021). Prior reports have indicated that integrating telepharmacy into pharmacy education improves students' comprehension of drug therapy issues and patient care plans. There is also a need to develop strategies for technology-based education and training among students (Elnaem *et al.*, 2022). To understand telepharmacy practically, students require curriculum integration and hands-on experience. This exposure to telepharmacy is crucial as it allows students to adopt a patient's perspective,

offering valuable insights for their future telepharmacy practice (Park *et al*., 2022).

The Ministry of Health has issued regulations for implementing remote health services (Ministry of Health of The Republic of Indonesia, 2021). These regulations support the practice of telepharmacy in pharmacy services, including dispensing, patient education, and counselling (Sasanti *et al*., 2022). However, telepharmacy remains a relatively new technology and is not widely integrated into the pharmacy education system in Indonesia. Previous research on pharmacy students in Ethiopia has shown limited knowledge and perceptions of the telepharmacy system (Tegegne *et al*., 2023). In contrast, senior pharmacy students in Malaysia generally possess adequate knowledge, positive perceptions, and a readiness to implement telepharmacy services in their future pharmacy practice. However, they express concerns about potential increased workloads and a lack of incentives associated with the widespread adoption of telepharmacy practice models (Elnaem *et al*., 2022). Information on the knowledge and attitude toward telepharmacy is scarce and often conflicting.

Additionally, there is a lack of existing studies on the experience of telepharmacy among pharmacy students in Indonesia. Therefore, this study aimed to assess the knowledge, attitude, and experience related to telepharmacy.

Methods

Study design and population

This study used a cross-sectional design, distributing online questionnaires via Google Forms to students in the Department of Pharmacy at a public university in Central Java province in July 2022. Data were collected by surveying all active students in the Department of Pharmacy, including undergraduate pharmacy students and pharmacist professional students. The total number of respondents was 442 students.

Study questionnaire

Data for this study was collected through a questionnaire on telepharmacy, compiled from various sources, including Poudel & Nissen (2016), Alexander et al. (2017), Albarrak et al. (2021), FIP (2021), the Ministry of Health of The Republic of Indonesia (2021), and Elnaem et al. (2022). The questionnaire began with questions related to respondent characteristics, including age, gender, and programme of study in the Department of Pharmacy.

The questionnaire comprised a total of 54 questions, categorised into 15 knowledge questions, 13 attitude questions, and 26 experience questions. Respondents could choose between "true" and "false" for knowledge questions. Meanwhile, attitude questions offered answer choices of "*strongly agree*," "*agree*," "*disagree*," and "*strongly disagree*". Experience questions were answered with "*ever*" or "*never*".

To assess validity, a content validity test involved six validators: four academics in the pharmacy department who are also pharmacists, an academician in the public health sector, and a pharmacy professional student. The item-content validity index (I-CVI) was 0.99 for the knowledge questionnaire, 0.97 for the attitude questionnaire, and 0.85 for the experience questionnaire, meeting the minimum I-CVI requirement of 0.83 for six validators (Yusoff, 2019). For reliability, Cronbach-alpha values were calculated for each questionnaire: 0.831 for the knowledge questionnaire, 0.897 for the attitude questionnaire, and 0.932 for the experience questionnaire. The questionnaire is considered reliable, with Cronbach-alpha values falling between 0.7 and 0.95 (Tavakol & Dennick, 2011).

Data analysis

The data were analysed descriptively to assess the respondents' characteristics, knowledge levels, attitudes, and experiences related to telepharmacy. Knowledge questions were scored 1 point for "*true*" and 0 points for "*false*". Attitude responses of "*strongly agree*," "*agree*," "*disagree*", and "*strongly disagree*" were scored as 4, 3, 2, and 1 points, respectively. For experience, '*ever*' and '*never*' were scored as 1 and 0 points. The total knowledge, attitude, and experience scores were 15, 52, and 26, respectively. To calculate the scores for each knowledge, attitude, and experience question, the total score for each question was divided by the maximum possible total score and then multiplied by 100%.

For categorising knowledge, attitudes, and experience, the criteria set by Elhadi et al. (2021) were as follows: scores ≤ 49% were considered low, 50%-70% were average, and ≥ 71% were regarded as high. To examine the correlation between knowledge level and attitude, as well as attitude and experience, Spearman's rank correlation analysis was used due to the non-normal distribution of the data ($p < 0.05$). The analysis results were considered significant if $p < 0.05$.

Ethical approval

The study received official approval from the Faculty of Health Sciences ethics committee at Jenderal Soedirman University (Reference Number: 2706/EC/KEPK/IV/2022). Participant agreement for study involvement was obtained through a Google Form. Those who provided consent were eligible to complete the research questionnaire. Before answering the questionnaire, participants were given an introduction outlining the study's objectives and methods, along with a consent section ensuring anonymity and voluntary participation in the survey.

Table I: Characteristic of respondents

Characteristic of respondents	Frequency (%)
Gender	
Male	67 (15.16%)
Female	375 (84.84%)
Age (years old)	
18-20	189 (42.8%)
21-23	217 (49.1%)
>23	36 (8.1%)
Pharmacy students programme	
Undergraduate pharmacy	337 (76.24%)
Pharmacy professional	105 (23.76%)

Results

A total of 442 pharmacy students participated in this study, comprising 337 undergraduate pharmacy students and 105 pharmacy professional students. The education system in Indonesia primarily comprises a four-year undergraduate degree followed by a one-year pharmacy professional programme. The curriculum and learning outcomes align with the academic standards set by the Association of Indonesian Pharmacy Higher Education. Undergraduate programmes typically emphasise general pharmacy skills and knowledge, covering pharmaceutical sciences and clinical pharmacy. The pharmacy professional programme, a pre-registration programme before becoming a qualified pharmacist, provides additional practice training and skills (Cokro *et al*., 2021). The majority of respondents were female (84.8%), and their ages ranged from 21 to 23 years old (49.1%) as shown in Table I.

The student's knowledge, attitude, and experience of telepharmacy

Overall, 97.96% of students demonstrated high knowledge of telepharmacy, while 96.60% showed a positive attitude toward it. However, regarding telepharmacy experience, 85.97% of students had a low level of experience, as shown in Table II. The analysis of knowledge levels revealed that the majority of students had good knowledge of "*Telepharmacy increases access to pharmacy services in areas with a limited number of pharmacists*," with an average score of 98.64%, as shown in Table III. Regarding attitudes toward telepharmacy, the highest average score (91.86%) was observed for students' opinions on the importance of pharmacists' knowledge of information and communication technology (telecommunications) for telepharmacy, as shown in Table IV. Furthermore, when it came to experience, the majority of students (average score 63.35%) reported having adequate electronic equipment, such as cell phones, for telepharmacy, as shown in Table V.

Table II: Categories of pharmacy students' level of knowledge, attitude, and experience related to telepharmacy

Categories	Knowledge n=422 (%)	Attitude n=422 (%)	Experience n=422 (%)
High	433 (97.96%)	427 (96.60%)	17 (3.85%)
Average	9 (2.04%)	14 (3.17%)	45 (10.18%)
Low	0 (0%)	1 (0.23%)	380 (85.97%)

Table III: Knowledge-based questions

Questions	Average scores (%)
Pharmacists and patients meet face to face on telepharmacy	83.03
Knowledge related to information and communication technology (telecommunications) is needed by pharmacists to conduct telepharmacy	99.32
Telepharmacy can be done using *video conference* (e.g *zoom* atau *Google Meet*)	96.15
Telepharmacy can be done using digital health applications (e.g halodoc, alodoc, etc)	97.74
Purchases of narcotic drugs can be served by electronic prescription	81.90
Purchases of psychotropic drugs can be served by electronic prescription	74.43
Telepharmacy allows pharmacists to confirm electronic prescriptions with doctors	96.83
Telepharmacy allows pharmacists to provide recommendations for overcoming drug-related problems in electronic prescriptions to doctors	96.61
Pharmacists can not gather patients' information by telepharmacy	85.52
Monitoring patients' medications can be done by telepharmacy	93.44
Drug counselling can be done by telepharmacy	98.42
Providing information on drugs and medical devices can be done by telepharmacy	97.51
Telepharmacy increases access to pharmacy services in areas with a limited number of pharmacists	98.64
Telepharmacy reduces the number of direct patients visit to pharmacy service facilities	87.78
Telepharmacy is a legally recognised pharmacy service	95.93

Table IV: Attitude-based questions

Questions	Average scores (%)
Telepharmacy allows me to get access to pharmacy services	88.40
I can use telepharmacy anytime and anywhere as long as I have a telecommunications or internet signal	90.33
I feel I can have good communication with pharmacists via telepharmacy	81.33
Telepharmacy allows to improve the quality of my communication with the pharmacists	82.47
I can save time on visits to pharmacy service facilities if I use telepharmacy	89.76
I can save on medical costs if I get pharmacy services via telepharmacy	80.77
The confidentiality of my information can be maintained through telepharmacy	78.96
Telepharmacy makes it possible to increase the quality of the pharmacy services that I receive	81.39
Telepharmacy may improve my medication adherence	77.15
In my opinion, pharmacists' knowledge of information and communication technology (telecommunications) is important for telepharmacy	91.86
In my opinion, it is important to provide knowledge related to telepharmacy to pharmacy students to help utilise telepharmacy in the future	91.06
I need adequate electronic equipment (e.g cellphone) for telepharmacy	88.24
I think that the existing laws and regulations are sufficient to regulate the technical implementation of telepharmacy	69.17

Table V: Experience-based questions

Questions	Average scores (%)
I received drug counselling by the phone from the pharmacist	14.93
I received drug counselling via video conference (eg. Zoom or Google Meet) from the pharmacist	8.60
I received drug counselling via a messaging service application (e.g WhatsApp) from the pharmacist	31.67
I received drug counselling via a digital health service application (halodoc, alodoc, etc.) from the pharmacist	35.07
I received medication monitoring by the phone from the pharmacist	10.86
I received medication monitoring via video conference (eg. Zoom or Google Meet) from the pharmacist	3.39
I received medication monitoring via a messaging service application (e.g WhatsApp) from the pharmacist	18.55
I received medication monitoring via a digital health service application (halodoc, alodoc, etc.) from the pharmacist	13.57
I received information regarding medication by the phone from the pharmacist	21.04
I received information regarding medication via video conference (eg. Zoom or Google Meet) from the pharmacist	14.48
I received information regarding medication via a messaging service application (e.g WhatsApp) from the pharmacist	34.16
I received information regarding medication via a digital health service application (halodoc, alodoc, etc.) from the pharmacist	45.70
I asked the pharmacist for drug-related information by the phone	18.78
I asked the pharmacist for drug-related information via video conference (eg. Zoom or Google Meet)	7.69
I asked the pharmacist for drug-related information via a messaging service application (e.g WhatsApp)	34.16
I asked the pharmacist for drug-related information via a digital health service application (halodoc, alodoc, etc.)	28.51
I asked the pharmacist for general health information (other than medications) by the phone	15.61
I asked the pharmacist for general health information (other than medications) via video conference (eg. Zoom or Google Meet)	8.14
I asked the pharmacist for general health information (other than medications) via a messaging service application (e.g WhatsApp)	24.21
I asked the pharmacist for general health information (other than medications) via a digital health service application (halodoc, alodoc, etc.)	23.98
I bought medicine with an electronic prescription	16.97
I bought medicine without a prescription (over the counter-medication) via telepharmacy	23.08
I bought medical equipment (such as a thermometer, oxygen mask, etc.) via telepharmacy	18.78
I bought other medical materials (such as masks, handscoons, etc.) via telepharmacy	30.54
I provided adequate electronic equipment (e.g cellphone) for telepharmacy	63.35
I studied the laws and regulations related to telepharmacy	42.99

To measure the correlation between knowledge and attitude, as well as attitude and experience, Spearman's rank correlation analysis was conducted. There was a significant correlation between knowledge and attitude (p = 0.011). However, there was no significant correlation between attitude and experience (p = 0.092). These results are presented in Table VI.

Table VI: Correlation of level of knowledge, attitude, and experience of pharmacy students related to telepharmacy

Variables	*p-value*
Knowledge to Attitude	0.011[i]
Attitude to Experience	0.092

[i]statistically significant ($p < 0.05$)

Discussion

This study examined the knowledge, attitude, and experience of pharmacy students regarding telepharmacy. To the authors' knowledge, this is the first study specifically measuring the knowledge, attitude, and experience of pharmacy students in this area. Generally, pharmacy students demonstrated a high level of knowledge and a positive attitude toward telepharmacy. The COVID-19 pandemic likely contributed to increased knowledge due to exposure and the demand for technology in healthcare (Malhotra *et al*., 2020). However, this study's findings differ from those of Ethiopian pharmacy students, where 86.4% of students were unaware of telepharmacy systems, resulting in poor knowledge about telepharmacy (Tegegne *et al*., 2023). Additionally, a study on Malaysian senior pharmacy

students found that 61% viewed telepharmacy favourably, as it can improve their ability to provide patient care interventions (Elnaem *et al*., 2022). Similarly, pharmacy students in North Dakota showed a positive attitude toward telepharmacy and telehealth, believing these services positively impact patient care (Frenzel & Porter, 2023).

The finding also highlighted the pharmacy students' understanding of the importance of telepharmacy in improving access to pharmacy services in areas with a shortage of pharmacists. In regions lacking pharmacists, obtaining prescriptions and accessing critical services becomes more challenging. Telepharmacy mitigates the impact of pharmacist shortages, especially in rural areas where clinical pharmacy services are delayed and prescription errors associated with pharmacists increase (Ahmed *et al*., 2023).

This study revealed that pharmacy students highly value pharmacists' knowledge of information and communication technology (telecommunications) for telepharmacy. Telecommunications and information technologies serve as the foundation for telepharmacy implementation (Ameri *et al*., 2020). To prepare students for telepharmacy, pharmacy programmes should incorporate technology-related subjects into their curricula (Frenzel & Porter, 2023). The integration of telepharmacy simulation into university programmes in the United States, specifically for prescription verification and patient counselling activities, has led to an increased perception among students regarding the use of telepharmacy for patient education. Additionally, students expressed a high level of confidence in their ability to verify prescription medications and counsel patients through telepharmacy, albeit with varying degrees of confidence (Porter *et al*., 2022).

Another study conducted at North Dakota University, focusing on communication via telepharmacy, indicated that students demonstrated the ability to counsel patients through this technology. However, their performance was noted to be better in face-to-face consultations, suggesting the need for additional exposure to telepharmacy in the learning programmes (Skoy *et al*., 2015). Students should learn how to adapt their skills to provide effective patient care, including prescription verification, patient consultation and education, interprofessional interactions, and the use of electronic health records. These services can be delivered using telecommunication technologies when face-to-face interactions are not possible (Frenzel & Porter, 2021). Telecommunication technology in telepharmacy has demonstrated effectiveness in enhancing the quality of pharmacy services (Baldoni *et al*., 2019). Telepharmacy applications have been shown to reduce medication errors and alleviate acute complaints in elderly patients within 30 days post-hospital discharge (Rebello *et al*., 2017). Furthermore, in tuberculosis management, the use of digital technology, including video-observed treatment, telephone calls, or SMS reminders, presents a promising approach to improve medication adherence and treatment outcomes. This involves providing personalised feedback to patients (Ridho *et al*., 2022).

There was a statistically significant correlation between knowledge and attitude regarding telepharmacy among pharmacy students, which is consistent with previous findings that prior knowledge of telepharmacy is significantly linked to a positive attitude toward its use (Omran *et al*., 2021). Continuing professional education is an effective way to enhance understanding and foster a positive attitude toward telepharmacy. To better prepare future pharmacists for providing telepharmacy services, pharmacy colleges should integrate telepharmacy practice models into their curricula. Furthermore, by attending lectures, seminars, and conferences, pharmacy students can enhance their understanding and readiness for utilising telepharmacy (Ahmed *et al*., 2023).

The findings of this study suggest a gap between knowledge and attitude toward telepharmacy compared to its experience among pharmacy students. Pharmacy students demonstrated unfavourable scores in telepharmacy experience. Despite having adequate electronic equipment (e.g. cell phones) for telepharmacy, they rarely received medication monitoring via video conference (e.g., Zoom or Google Meet) from pharmacists. The majority of pharmacists do not prefer video conferencing due to its technical demands and limited access to technology, making it challenging for them to utilise video conferencing in telepharmacy. As a result, only a small number of patients receive telepharmacy services via video conference (Cubo *et al*., 2021; Sasanti *et al*., 2022; Ilma *et al*., 2023)

No association was observed between attitude and the experience of telepharmacy in pharmacy students. When pharmacy students engage in telepharmacy, they actively participate as patients to receive pharmacy services. However, for community pharmacists in Indonesia, there was a correlation between attitude and experience in providing pharmacy services through telepharmacy (Ilma *et al*., 2023). Effective telepharmacy requires support from both pharmacists and patients (Sasanti *et al*., 2022). Interestingly, despite patients willingness to use telepharmacy, the majority of patients in Indonesia

(79.8%) have never used telepharmacy services (Tjiptoatmadja & Alfian, 2022).

Strength and Limitations

This study is the first to examine the knowledge, attitude, and experience of pharmacy students toward telepharmacy in the country, offering valuable insights for future telepharmacy implementation. However, the online survey and the relatively small number of participants may have led to findings that are not fully representative of the general population.

Conclusion

The majority of pharmacy students exhibited high knowledge and a positive attitude toward telepharmacy, but their experience of telepharmacy was unfavourable. Additionally, there is a significant correlation between knowledge of telepharmacy and a positive attitude towards its use. To better prepare future pharmacists for providing effective telepharmacy services, it is essential to integrate telepharmacy practice models into the curriculum.

Conflict of interest

None

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