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Assessment of knowledge, perception, and readiness for telepharmacy-assisted pharmaceutical services among young pharmacists in rural Indonesia

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ABSTRACT

Background: The implementation of telepharmacy technology has expanded significantly, particularly during the COVID-19 pandemic, to ensure continuous pharmaceutical care services. This practice is vital in rural and underserved areas where access to healthcare is limited.
Objective: This study aims to assess the knowledge, perception, and readiness of young pharmacists in rural Indonesia towards telepharmacy-assisted pharmaceutical services.
Methods: A cross-sectional study was conducted from January to July 2023 in rural areas of Java, Sumatra, and Kalimantan, Indonesia. A convenience sampling method was employed with the aim of recruiting 520 registered pharmacists under 35 years of age (23–34 years old). Data were collected using an online questionnaire adapted for the local context and analyzed using SPSS version 26.0.
Results: The study achieved an 86.67 % response rate. Most participants were female (73.1 %) and aged between 26 and 30 years (53.8 %). Nearly all pharmacists (97.1 %) held a Pharm.D degree. The knowledge assessment showed high awareness of telepharmacy's importance and its role during the COVID-19 pandemic, with 96.15 % recognizing the need for a strong internet connection. Positive perception was noted, with 90.38 % agreeing that telepharmacy enhances medication access in rural areas. However, concerns about increased error rates and workload were highlighted. A substantial proportion of pharmacists expressed readiness for conducting drug counselling via video consultation (44.23 %) and showed a willingness to undergo relevant training (59.62 %).
Conclusion: Young pharmacists in rural Indonesia demonstrate a good level of knowledge and generally positive perceptions about telepharmacy, with notable readiness among pharmacists with less than five years of experience. While there is notable willingness to engage in telepharmacy practices and training, addressing concerns about workload and data security through targeted support and training will be crucial for the successful implementation of telepharmacy, potentially enhancing healthcare access in rural areas.

1. Introduction

Telepharmacy, which is defined as the delivery of pharmaceutical care services through telecommunications to patients at a distance,[1] has significantly evolved over recent years. Initially developed to address pharmacist shortages and enhance medication safety, this practice has been widely adopted – especially during the COVID-19 pandemic – to support continuous pharmaceutical services.[2] The scope of the practice varies but primarily includes remote dispensing, patient counselling, medication therapy management, and clinical consultations. Globally, according to a narrative review by the International Pharmaceutical Federation,[3] the practice has demonstrated substantial benefits, such as improved access to pharmaceutical services, reduced healthcare costs, and enhanced patient satisfactions. However, the implementation of the practice is not without challenges. Issues such as technological barriers, regulatory hurdles, patient privacy concerns, medication safety concerns, and the need for robust digital infrastructure continue to hinder its widespread adoption. Medication safety is a significant concern in telepharmacy due to the potential for medication errors, which can arise from miscommunication, lack of physical examination, and technological issues. Several studies have highlighted the importance of addressing these safety concerns to prevent medication errors and ensure

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patient safety. For example, this study found that telepharmacy can improve medication management quality but requires stringent protocols to mitigate risks associated with remote dispensing.[4] Another study emphasized the need for comprehensive training and guidelines to enhance medication safety in telepharmacy services.[5] Additionally, this study discussed the critical role of technology in ensuring accurate medication dispensing and the importance of continuous monitoring and evaluation to prevent adverse events.[6] All these studies underscore the necessity for robust systems and protocols to manage medication dispensing and counselling effectively in a telepharmacy setting, ensuring that patient safety is not compromised.

In developing countries, telepharmacy has emerged as a critical tool to improve healthcare access, particularly in remote and underserved areas. The status of this practice in these regions varies with some countries making significant progress while others lag due to infrastructural and financial constraints.[7] In some cases, the implementation of this practice in those countries faces unique challenges, such as limited internet connectivity, lack of technological infrastructure, and insufficient training for healthcare professionals.[8] Despite these obstacles, the practice plays a key role in enhancing healthcare access, particularly in rural areas where healthcare resources are scarce. For example, it has been instrumental in providing continuous care during the COVID-19 pandemic, ensuring medication adherence and patient monitoring even when physical consultations were not possible.[9] By bridging the gap between pharmacists and patients, this practice can significantly improve healthcare outcomes in developing countries, although sustained efforts are needed to address the existing challenges.[10]

In rural Indonesia, the healthcare infrastructure faces several challenges, including inadequate healthcare facilities, shortage of healthcare professionals, and logistical difficulties. These challenges are particularly pronounced in pharmaceutical care services, where the availability of pharmacists and essential medications is often limited.[11] The pharmacists often face numerous challenges, such as the lack of continuous professional development opportunities, limited access to advanced pharmaceutical technologies, and the need to manage a high volume of patients with minimal support.[12,13] Despite these challenges, there are opportunities to improve pharmaceutical services through innovative approaches such as telepharmacy, which can provide remote support, training, and supervision to pharmacists in rural areas, thereby enhancing their capacity to deliver quality care.[14]

1.1. Importance of telepharmacy-assisted pharmaceutical care in rural settings

Telepharmacy has the potential to significantly enhance access to pharmaceutical care by overcoming geographical barriers and resource limitations. By enabling remote consultations, medication management, and patient education, the practice can bridge the gap in healthcare access for rural populations.[15] Successful initiatives of the practice in other rural settings have demonstrated its effectiveness in improving medication adherence, reducing travel time and costs for patients, and providing timely access to pharmaceutical care.[16] For instance, the practice implemented in rural parts of Africa have shown promising results in improving health outcomes and patient satisfaction, despite the challenges related to infrastructure and regulatory frameworks.[17] These examples highlight the potential of telepharmacy to transform healthcare delivery in rural areas by providing continuous and accessible pharmaceutical services.[18]

The implementation of telepharmacy technology has been shown to improve health outcomes by ensuring better medication management and adherence. Studies have demonstrated that the technology can lead to significant improvements in patient health outcomes, such as better glycemic control in diabetic patients, improved management of chronic diseases, and reduced hospitalization rates.[19,20] The practice allows for regular follow-ups and monitoring, which are crucial for managing chronic conditions and preventing complications. Evidence from various studies indicates that telepharmacy services enhance medication adherence, reduce medication errors, and provide timely interventions, thereby contributing to better overall health outcomes.[21] For example, telepharmacy services in oncology care have been effective in managing complex medication regimens, reducing medication-related problems, and increasing patient satisfaction.[22] These findings underscore the importance of telepharmacy in improving health outcomes, particularly in rural and underserved areas where access to healthcare is limited.[23]

1.2. Young pharmacists as key stakeholders

Young pharmacists play a critical role in healthcare innovation, particularly in the adoption and implementation of new technologies. Their familiarity with digital tools and willingness to embrace technological advancements make them key stakeholders in driving telepharmacy initiatives.[24,25] Involving such pharmacists in the adoption of telepharmacy is essential for its success, as they bring fresh perspectives and are often more adaptable to changes in healthcare practices. Through telepharmacy, young pharmacists can enhance their skills and knowledge in several practical ways: (a) Learning through experience: By engaging in telepharmacy, young pharmacists gain hands-on experience in managing remote consultations, medication therapy management, and patient counselling. This practical exposure helps them develop competencies that are crucial for effective pharmaceutical care in rural settings; (b) Mentorship and collaboration: Telepharmacy platforms can facilitate mentorship opportunities where young pharmacists can learn from more experienced colleagues. This collaborative approach allows for the sharing of best practices and knowledge, which can improve the quality of care provided; (c) Structured training programs: Many telepharmacy initiatives include structured training programs designed to enhance the pharmacists' knowledge and skills. These programs cover various aspects of telepharmacy, including the use of digital tools, patient communication, and adherence to safety protocols; and (d) Continuous Professional Development: Telepharmacy offers access to online courses, webinars, and other educational resources that support continuous professional development. This is particularly beneficial for pharmacists in rural areas who might otherwise have limited access to such opportunities. Despite their potential, these pharmacists in rural Indonesia face specific challenges, including limited access to continuous professional development, inadequate technological infrastructure, and a lack of support systems.[26,27] Addressing these challenges through targeted support and training is essential to enable young pharmacists to fully leverage telepharmacy services and enhance healthcare delivery in rural areas.

However, there are also significant opportunities for professional growth and development through telepharmacy. By participating in telepharmacy initiatives, young pharmacists can enhance their skills, gain valuable experience in managing remote pharmaceutical care, and contribute to improving healthcare outcomes in their communities.[28] The successful implementation of this practice can provide such pharmacists with opportunities to develop innovative care models, improve patient engagement, and enhance the overall quality of healthcare services in rural areas.[29]

1.3. Knowledge, perception, and readiness for telepharmacy

The constructs of knowledge, perception, and readiness are quite essential for assessing the preparedness of healthcare professionals, including pharmacists, to adopt new technologies such as telepharmacy. These constructs involve evaluating three key areas: (a) Knowledge: understanding of telepharmacy, its functions, and its potential benefits and limitations; (b) Perception: attitudes and beliefs about the advantages and challenges of implementing telepharmacy services; and (c) Readiness: willingness and ability to integrate telepharmacy into practice, including the necessary skills and resources.

Previous studies have highlighted the importance of these constructs in determining readiness for technology adoption. For instance, healthcare professionals with higher levels of knowledge and positive perceptions of telepharmacy are more likely to be ready to implement these services effectively.[12,30,31] Key findings from these studies indicate that targeted training programs, awareness campaigns, and supportive policies are essential for improving these constructs among healthcare professionals.

Assessing the knowledge, perception, and readiness of young pharmacists in rural Indonesia is significant for several reasons. First, it provides insights into their preparedness to adopt telepharmacy, which is crucial for its successful implementation in these areas. Second, understanding these constructs can help policymakers and healthcare administrators develop targeted interventions to address barriers and enhance readiness. Third, data obtained from these assessments can inform the design of training programs, awareness campaigns, and policy frameworks to support telepharmacy adoption in rural Indonesia.

Overall, evaluating these constructs is essential for ensuring that young pharmacists are adequately prepared and equipped to leverage telepharmacy for improving healthcare delivery in rural settings. This study aims to fill a significant gap in the existing literature on telepharmacy readiness among young pharmacists in developing countries. While previous research has focused on telepharmacy adoption in developed countries, there is a lack of studies on the readiness of healthcare professionals in developing regions, particularly in rural areas. By providing empirical data on these constructs among young pharmacists in rural Indonesia, this study contributes to a better understanding of the challenges and opportunities associated with telepharmacy adoption in these settings. The findings can inform the development of strategies to enhance telepharmacy readiness, ultimately facilitating the wider adoption and implementation of telepharmacy in similar contexts.

The primary aim of this study is to assess the knowledge, perception, and readiness of young pharmacists in rural Indonesia for telepharmacy-assisted pharmaceutical services. By evaluating these constructs, the study seeks to identify the factors that influence their readiness to adopt and implement telepharmacy, thereby providing valuable insights for developing targeted interventions to support telepharmacy adoption in rural settings.

2. Material and methods

2.1. Study design and participants

The study employed a cross-sectional design to evaluate the knowledge, perception, and readiness for telepharmacy-assisted pharmaceutical services among young pharmacists in rural Indonesia. The research was conducted over a period of six months, from January to July 2023, focusing on rural areas within three major islands: Java, Sumatra, and Kalimantan.

A convenience sample was used to select participants,[32,33] with specific eligibility criteria including being a registered pharmacist actively practicing in the designated rural areas, being under the age of 35 years (23–34 years old), and providing informed consent to participate in the study. The age cut-off of 35 years was chosen based on the definition provided by the Indonesian Young Pharmacists Group (IYPG), which classifies pharmacists under 35 years as "young" due to their relatively recent entry into the profession and their potential for adopting new technologies and innovations in pharmaceutical care. Based on data from the IYPG, there are approximately 5000 pharmacists under the age of 35 practicing in rural areas across Java, Sumatra, and Kalimantan. Using Raosoft, Inc.'s sample size calculator,[34] this study determined a minimum sample size of 471 participants, based on a 5 % margin of error, a 95 % confidence level, and a 50 % response distribution. This sample size represents approximately 9.42 % of the target demographic, ensuring a representative sample for the study.

The potential participants were recruited through direct channels, including public announcements disseminated using social media platforms such as Facebook, Instagram, and WhatsApp, in collaboration with the IYPG. To ensure that participants met the eligibility criteria, we used a self-reporting method where individuals confirmed their eligibility upon accessing the survey link. Specifically, the survey included initial screening questions to verify that participants were registered pharmacists actively practicing in the designated rural areas, under the age of 35 years, and had provided informed consent to participate in the study. Only those who confirmed meeting these criteria were allowed to proceed with the questionnaire. In this study, pharmacists from various practice settings, including community pharmacies, private clinics, and hospitals, were grouped together to provide a comprehensive overview of telepharmacy readiness in rural Indonesia. However, to address potential differences in perspectives based on practice environment, we conducted subgroup analyses. These analyses examined whether there were significant variations in knowledge, perception, and readiness for telepharmacy among pharmacists from different practice settings. The results of these subgroup analyses are detailed in the Results section and discussed in the Discussion section, providing insights into how practice setting influences pharmacists' perspectives on telepharmacy.

2.2. Research instrument

The research instrument employed in this study was an online questionnaire consisting of 35 question items and statements originally developed by Elnaem.[35] To ensure the questionnaire accurately measured knowledge, perception, and readiness, this study undertook a thorough validation process involving content validation by experts, pilot testing with a sample of eligible pharmacists, and providing clear operational definitions for potentially ambiguous terms. Each knowledge question was designed to have a clear factual basis, and responses were scored accordingly. This process helped ensure that the survey tool was appropriate for accurately measuring the intended constructs in the context of rural Indonesia. This process involved translating the questionnaire into Bahasa Indonesia to facilitate comprehension among participants using the forward-backward translation method by two bilingual professionals and two pharmacists. This method involves translating the questionnaire from English to Bahasa and then independently back-translating it into English to check for consistency and accuracy. Furthermore, certain items were modified to better reflect the local healthcare landscape.

The survey gathered comprehensive data from participants, including their demographic characteristics (e.g. gender, age, and educational level), workplace setting, length of time practicing pharmaceutical care, annual salary, experience with telepharmacy, and sources of information about telepharmacy.

2.3. Data collection

Data collection for this study was conducted using a modified questionnaire, which was administered through Google Forms. The survey link was disseminated to participants via personal WhatsApp number. Each submission received through Google Forms was thoroughly checked to ensure data completeness thereby maintaining the integrity and reliability of the dataset. The questionnaire was designed to gather comprehensive data, such as demographic characteristics of the participants (e.g. gender, age, and educational level), their workplace settings, the length of time they had been practicing pharmaceutical care, annual salaries, their familiarity and experience with telepharmacy, as well as their previous exposure to telepharmacy practices and their sources of information about the practices.

2.4. Data analysis

The collected data were systematically organized using an Excel

spreadsheet with findings expressed in numerical values and percentages to ensure clarity and precision in the presentation of results. For the knowledge assessment, according to a previous study,[36] each correct response was assigned a score of 1, while incorrect responses were assigned a score of 0. The average knowledge scores were then calculated to categorize the level of knowledge among participants. Specifically, a knowledge score of less than 50 % was classified as poor knowledge, scores ranging from 50 % to 75 % were classified as moderate knowledge, and scores above 75 % were classified as good knowledge.

The parameters of perception and readiness for telepharmacy-assisted services were initially assessed using a Likert scale with responses categorized as "strongly agree", "agree", "neutral", "disagree", and "strongly disagree". For the purpose of data analysis, we grouped "strongly agree" and "agree" as a positive response (scored as 1), and "disagree" and "strongly disagree" as a negative response (scored as 0). The "neutral" responses were not included in the binary categorization to maintain clarity in the interpretation of positive and negative perceptions. This binary categorization was used to simplify data analysis and maintain consistency with previous studies. However, detailed reporting of the Likert scale responses is provided to offer a more comprehensive view of the participant's attitudes and readiness.

Statistical analyses were conducted using IBM SPSS Statistics version 26.0. To determine the significance of the results, according to a previous study,[37] a Chi-Square test was performed with the level of significance set at a P value less than 0.05. For the univariate analysis, we conducted separate Chi-Square tests for categorical variables and independent t-tests for continuous variables to identify factors significantly associated with the study outcomes. Each demographic and practice-related variable was analyzed independently to assess its relationship with the knowledge, perception, and readiness scores for telepharmacy. Variables with a p-value less than 0.2 in the univariate analysis were subsequently included in a logistic regression analysis to further elucidate the relationships between these variables and the study outcomes. The logistic regression results, including the odds ratios (OR) and 95 % confidence intervals (CI) for significant predictors, are now presented in the Results section.

3. Results

3.1. Study participants

The survey was distributed to 600 young pharmacists meeting the eligibility criteria, of which 520 participants completed the survey, resulting in a response rate of 86.67 % (Fig. 1). Among the study participants, shown it Table 1, 140 (26.9 %) were male and 380 (73.1 %) were female. The age distribution of the participants showed that 90 (17.3 %) were between 20 and 25 years old, 280 (53.8 %) were between 26 and 30 years old, and 150 (28.8 %) were between 31 and 35 years old. In terms of educational background, the majority of participants held a Pharm.D degree (97.1 %; $n = 505$), while a small fraction had obtained a Master's degree (2.9 %; $n = 15$). The distribution of workplaces indicated that 220 (42.3 %) worked in private pharmacies, 250 (48.1 %) in hospitals, 30 (5.8 %) in private clinics, and 20 (3.8 %) in community health centers. The length of time participants had been practicing pharmaceutical care varied, with 70 (13.5 %) having less than one year of experience, 160 (30.8 %) having between one and three years, 230 (44.2 %) having four to six years, and 60 (11.5 %) having more than six years.

Regarding annual salary, 50 (9.6 %) of the participants earned less than USD 2000, 230 (44.2 %) earned between USD 2000 and 2499, 200 (38.5 %) earned between USD 2500 and 2999, and 40 (7.7 %) earned more than USD 3000. A significant majority, 400 (76.9 %), reported having prior experience with telepharmacy, with 140 (26.9 %) having less than one year of experience, 320 (61.5 %) having one to two years, and 60 (11.6 %) having more than two years of experience. The sources of information regarding telepharmacy varied, with 260 (50.0 %) citing social media as their primary source, 120 (23.1 %) obtaining information from colleagues, 80 (15.4 %) from websites, 40 (7.7 %) from scientific journals, and 20 (3.8 %) from other sources.

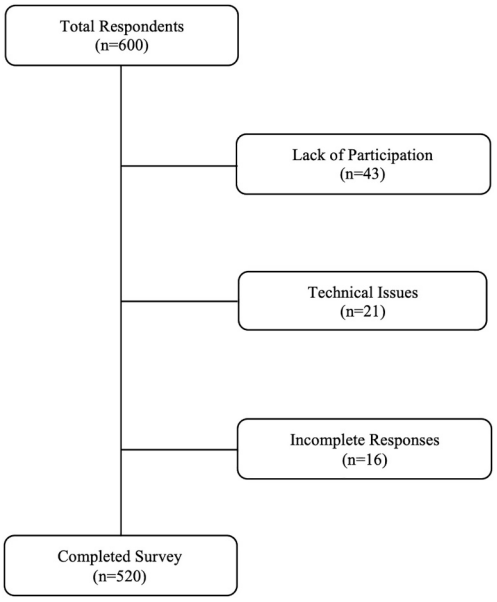

Fig. 1. Response Rate Diagram of Participants Involved in the Study.

Table 1
Sociodemographic characteristics of the selected participants ($n = 520$/100 %).

Demographic information	n (%)
Gender	
a) Male	140 (26.9 %)
b) Female	380 (73.1 %)
Ages (years old)	
a) 20–25	90 (17.3 %)
b) 26–30	280 (53.8 %)
c) 31–35	150 (28.8 %)
Educational Levels	
a) Pharm.D	505 (97.1 %)
b) Master	15 (2.9 %)
Pharmacist's Office	
a) Private Pharmacy	220 (42.3 %)
b) Hospital	250 (48.1 %)
c) Private Clinic	30 (5.8 %)
d) Community Health Center	20 (3.8 %)
Length of Practicing Pharmaceutical Care (Years)	
a) < 1	70 (13.5 %)
b) 1–3	160 (30.8 %)
c) 4–6	230 (44.2 %)
d) > 6	60 (11.5 %)
Annual Salary (USD)	
a) < 2000	50 (9.6 %)
b) 2000–2499	230 (44.2 %)
c) 2500–2999	200 (38.5 %)
d) > 3000	40 (7.7 %)
Previously practicing telepharmacy	
a) Yes	400 (76.9 %)
b) No	120 (23.1 %)
Length of practicing telepharmacy (years)	
a) <1	140 (26.9 %)
b) 1–2	320 (61.5 %)
c) > 2	60 (11.6 %)
Source of information	
a) Social media	260 (50.0 %)
b) Colleagues	120 (23.1 %)
c) Website	80 (15.4 %)
d) Scientific Journals	40 (7.7 %)
e) Others	20 (3.8 %)

3.2. Young pharmacist's knowledge regarding telepharmacy

The knowledge assessment of young pharmacists in rural Indonesia regarding the telepharmacy-assisted pharmaceutical care services revealed varied levels of understanding and awareness across different aspects of the practices (Table 2). All the participants (100 %; $n = 520$) were aware that telepharmacy is available in Indonesia, reflecting a baseline level of awareness among the respondents. A significant majority (90.38 %; $n = 470$) acknowledged the importance of information communication technology knowledge for pharmacists to effectively conduct telepharmacy. Similarly, 96.15 % ($n = 500$) of respondents recognized the critical role telepharmacy played during the COVID-19 outbreak, underscoring its relevance in emergency health situations. Additionally, the necessity of a strong internet connection or high-performance technology for conducting telepharmacy was acknowledged by 96.15 % (n = 500) of participants.

Regarding the benefits and applications of telepharmacy, 73.08 % ($n = 380$) agreed that telepharmacy provides better counselling in terms of privacy and session length. Moreover, 86.54 % ($n = 450$) of respondents believed that telepharmacy solves the waiting time problem in most general hospitals. The involvement of telepharmacy in adverse drug reaction monitoring and reporting was recognized by 78.85 % ($n = 410$) of participants, while 21.15 % ($n = 110$) did not recognize this role. Additionally, 82.69 % ($n = 430$) agreed that telepharmacy is conducted by drug information services during office hours and by emergency departments after office hours. Notably, 94.23 % ($n = 490$) of pharmacists acknowledged that telepharmacy enhances medication access and information for patients in rural areas. Lastly, 84.62 % ($n = 440$) believed that telepharmacy services could extend hospital pharmacy services beyond office hours, benefiting facilities that do not offer round-the-clock services.

3.3. Yes: 1; No: 0

Based on the knowledge scores calculated from the responses, participants demonstrated a high level of knowledge regarding telepharmacy. The overall average knowledge scores indicated that the majority of pharmacists possessed good knowledge (scores above 75 %), reflecting a strong understanding of telepharmacy's availability, importance during the COVID-19 pandemic, technological requirements, and various benefits. Moderate knowledge (scores between 50 % and 75 %) was observed in several specific areas: privacy concerns related to telepharmacy, the appropriate length of counselling sessions provided via telepharmacy, and the role of telepharmacy in adverse drug reaction monitoring and reporting. These findings are detailed in Table 3 of the Results section, where the distribution of knowledge scores across different areas is presented. Additionally, Fig. 2 provides a graphical representation of the knowledge scores, highlighting areas with moderate and high knowledge levels.

Table 2
Indonesian young pharmacist telepharmacy knowledge ($N = 520$/100 %).

Question items	Yes	No
Telepharmacy is available in Indonesia.	520 (100.00 %)	0 (0.0 %)
Information communication technology (ICT) knowledge is important for pharmacists in how to conduct telepharmacy.	470 (90.38 %)	50 (9.62 %)
Telepharmacy played a big role during the COVID-19 outbreak around the world.	500 (96.15 %)	20 (3.85 %)
Telepharmacy does require a strong Internet connection or high-performance technology.	500 (96.15 %)	20 (3.85 %)
Telepharmacy provides better counselling in terms of privacy and length of the session.	380 (73.08 %)	140 (26.92 %)
Telepharmacy solves the waiting time problem in most general hospitals.	450 (86.54 %)	70 (13.46 %)
Telepharmacy is also involved in adverse drug reaction monitoring and reporting.	410 (78.85 %)	110 (21.15 %)
Telepharmacy is conducted by drug information services during office hours and by emergency departments after office hours.	430 (82.69 %)	90 (17.31 %)
Patients from rural areas can have more medication access and information via telepharmacy.	490 (94.23 %)	30 (5.77 %)
Telepharmacy services can extend hospital pharmacy services outside office hours that do not offer round-the-clock pharmacy services.	440 (84.62 %)	80 (15.38 %)

3.4. Young pharmacist's perception regarding telepharmacy

Perception of telepharmacy-assisted services among young pharmacists in rural Indonesia were evaluated based on a series of statements (Table 3). The analysis revealed varied perception among the pharmacists. For instance, a significant proportion of respondents agreed or strongly agreed that telepharmacy improves patient adherence to medication (80.77 %; $n = 420$), enhances patient access to medications in rural areas (90.38 %; $n = 470$), and helps patients save money and travel time (92.31 %; $n = 480$). Conversely, concerns were evident regarding the higher error rate for medication dispensing and filling compared to traditional pharmacy, with 57.69 % ($n = 300$) agreeing or strongly agreeing. Similarly, 65.39 % ($n = 360$) of participants expressed concerns about the increased workload and commitment associated

Table 3
Indonesian young pharmacist telepharmacy perception ($N = 520$/100 %).

Statement items	1	2	3	4
Telepharmacy improves patient's adherence to the medication.	20 (3.85 %)	80 (15.38 %)	220 (42.31 %)	200 (38.46 %)
Telepharmacy has a higher error rate for medication dispensing and filling compared to traditional pharmacy.	100 (19.23 %)	200 (38.46 %)	160 (30.77 %)	60 (11.54 %)
Telepharmacy enhances patient's access to medications in rural areas.	10 (1.92 %)	40 (7.69 %)	240 (46.15 %)	230 (44.23 %)
Telepharmacy provides a complete privacy setting during the consultation period.	60 (11.54 %)	160 (30.77 %)	200 (38.46 %)	100 (19.23 %)
Telepharmacy increases pharmacist's workload and commitment.	40 (7.69 %)	120 (23.08 %)	260 (50.00 %)	100 (19.23 %)
Telepharmacy helps patients save their money and travel time to reach the healthcare facilities.	0 (0.00 %)	40 (7.69 %)	200 (38.46 %)	280 (53.85 %)
I am willing to share my personal information on the online database when using telepharmacy services.	80 (15.38 %)	140 (26.92 %)	200 (38.46 %)	100 (19.23 %)
Telepharmacy minimizes the cost to establish a pharmaceutical business in comparison to the regular pharmacy.	20 (3.85 %)	100 (19.23 %)	240 (46.15 %)	160 (30.77 %)
Patient consultation via telepharmacy is effective.	30 (5.77 %)	90 (17.31 %)	220 (42.31 %)	180 (34.62 %)
Pharmacy schools should provide education programs on IT and telepharmacy to assist in the future utilization of telepharmacy.	10 (1.92 %)	30 (5.77 %)	240 (46.15 %)	240 (46.15 %)
Therapeutic drug monitoring via telepharmacy in rural areas is easily monitored.	20 (3.85 %)	80 (15.38 %)	260 (50.00 %)	160 (30.77 %)
Security is a greater concern in a remote site telepharmacy than in a traditional community pharmacy.	120 (23.08 %)	220 (42.31 %)	140 (26.9 % 2)	40 (7.69 %)
Telepharmacy helps to minimize the shortage of pharmacists.	10 (1.92 %)	50 (9.62 %)	250 (48.08 %)	210 (40.38 %)

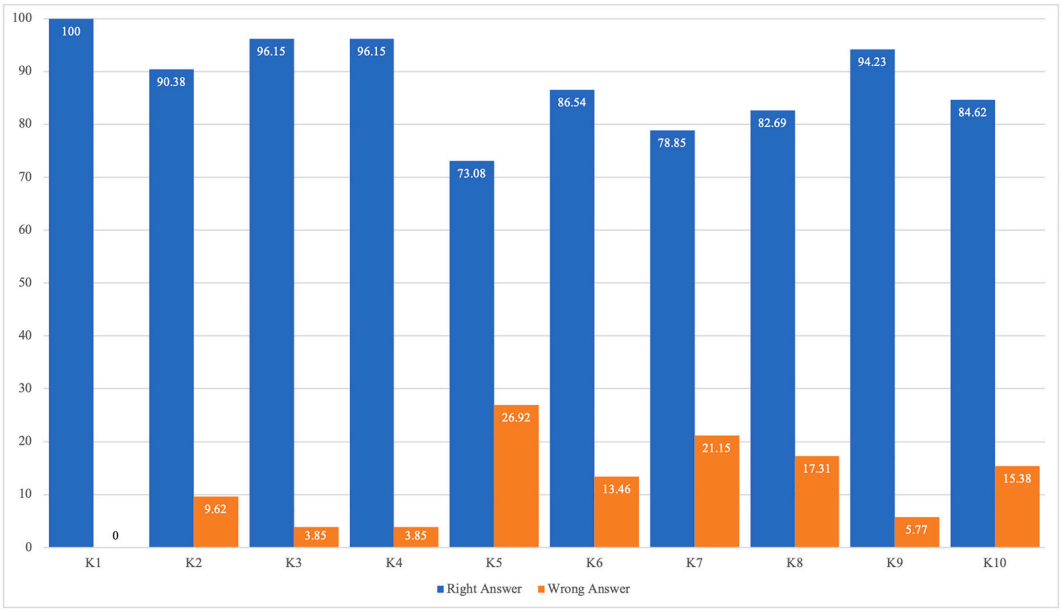

Fig. 2. Performance Analysis: Correct vs. Incorrect Responses Across Knowledge Domains.

with telepharmacy. The willingness to share personal information online for telepharmacy services was moderately positive, with 57.69 % (n = 300) of respondents agreeing or strongly agreeing. Additionally, the majority of pharmacists believed that pharmacy schools should incorporate education programs on IT and telepharmacy (92.3 %; $n = 480$) and that telepharmacy helps minimize pharmacist shortages (88.46 %; $n = 460$). These findings suggest a generally positive perception of telepharmacy although with notable concerns about potential drawbacks such as increased error rates and security issues.

3.5. *1: Strongly Disagree; 2: Disagree; 3: Agree; 4: Strongly Disagree*

The calculated average perception score across the statements indicated a predominantly positive perception among the young pharmacists in rural Indonesia. Statements highlighting the benefits of telepharmacy, such as improved patient adherence, enhanced access in rural areas, and cost savings for patients, received strong agreement. However, statements addressing the potential negative aspects, such as increased workload and security concerns, also garnered significant agreement, reflecting the balanced perspective of the respondents. The overall perception score, derived from the categorized responses, suggested that young pharmacists in rural Indonesia are largely supportive of telepharmacy-assisted services, recognizing both its advantages and challenges.

3.6. *Young pharmacist's readiness regarding telepharmacy*

Table 4 provides detailed insights into the readiness of young pharmacists for various aspects of telepharmacy. For instance, regarding their willingness to work on telepharmacy projects in rural areas without incentives, 180 participants (34.61 %) scored positively, indicating a significant level of readiness, while 340 participants (65.39 %) did not. When it came to working after office hours, 200 pharmacists (38.46 %) expressed readiness, and 320 pharmacists (61.54 %) were less willing. The readiness to conduct drug counselling via two-way video consultation was relatively high, with 230 pharmacists (44.23 %) scoring positively. Teaching patients to use their drug delivery devices through video consultation also saw a strong readiness score, with 250 pharmacists (48.08 %) in agreement. The highest readiness was observed in willingness to undergo training in ethics and legal issues related to telepharmacy, with 310 pharmacists (59.62 %) scoring

Table 4
Indonesian young pharmacist telepharmacy readiness ($N = 520/100$ %).

Statement items	1	2	3	4
I am ready to work on telepharmacy projects in rural areas, even without an incentive	100 (19.23 %)	80 (15.38 %)	140 (26.92 %)	200 (38.46 %)
I am ready to work after office hours if needed	70 (13.46 %)	130 (25.00 %)	160 (30.77 %)	160 (30.77 %)
I am ready to conduct drug counselling via two-way video consultation	40 (7.69 %)	100 (19.23 %)	190 (36.54 %)	190 (36.54 %)
I am ready to teach patients how to use their drug delivery devices through video consultation	50 (9.62 %)	70 (13.46 %)	200 (38.46 %)	200 (38.46 %)
I am ready to undergo training in ethics and legal issues related to telepharmacy	30 (5.77 %)	60 (11.54 %)	180 (34.62 %)	250 (48.08 %)
I am ready to face the implementation of telepharmacy in all healthcare settings	60 (11.54 %)	70 (13.46 %)	170 (32.69 %)	220 (42.31 %)
I am ready to conduct a home medication review (HMR) through telepharmacy	40 (7.69 %)	80 (15.38 %)	210 (40.38 %)	190 (36.54 %)
I am ready to reduce the risk of medication errors among patients through telepharmacy	20 (3.85 %)	60 (11.54 %)	220 (42.31 %)	220 (42.31 %)
I am ready to carry the increment of workload when conducting telepharmacy	80 (15.38 %)	120 (23.08 %)	160 (30.77 %)	160 (30.77 %)
I am ready to conduct medication reconciliation via telepharmacy services	50 (9.62 %)	70 (13.46 %)	190 (36.54 %)	210 (40.38 %)
I am ready to perform remote prescription-checking using an automated medication dispensing cabinet	30 (5.77 %)	80 (15.38 %)	210 (40.38 %)	200 (25.00 %)
I am ready to use applications and the Internet to receive refill orders and transfer prescriptions	10 (1.92 %)	70 (13.46 %)	220 (42.31 %)	220 (42.31 %)

positively.

3.7. 1: Strongly Disagree; 2: Disagree; 3: Agree; 4: Strongly Disagree

Further, 290 pharmacists (55.77 %) indicated readiness to face the implementation of telepharmacy in all healthcare settings, while 270 pharmacists (51.92 %) were ready to conduct home medication reviews (HMR) through telepharmacy. Reducing the risk of medication errors via telepharmacy saw a notable readiness score, with 240 pharmacists (46.16 %) in agreement. Meanwhile, the willingness to handle an increased workload associated with telepharmacy was evident in 280 participants (53.85 %). The readiness to conduct medication reconciliation through telepharmacy services was high, with 310 pharmacists (59.62 %) indicating readiness. Additionally, 260 pharmacists (50 %) were ready to perform remote prescription-checking using an automated medication dispensing cabinet, while the same number was prepared to use applications and the Internet for receiving refill orders and transferring prescriptions.

3.8. Relationship between demographic characteristics and knowledge framework

The results, as detailed in Table 5, showed no significant association between gender ($p = 0.696$), age ($p = 0.065$), educational level ($p = 0.540$), type of pharmacist's office ($p = 0.763$), length of practicing pharmaceutical care ($p = 0.524$), annual salary ($p = 0.859$), previous experience with telepharmacy ($p = 0.514$), length of practicing telepharmacy ($p = 0.696$), and source of information ($p = 0.949$) with the knowledge scores of young Indonesian pharmacists regarding telepharmacy.

3.9. Relationship between demographic characteristics and perception framework

According to the results presented in Table 5, no significant association was found between gender ($p = 0.824$), age ($p = 0.513$), educational level ($p = 0.219$), type of pharmacist's office ($p = 0.884$), length of practicing pharmaceutical care ($p = 0.594$), annual salary ($p = 0.536$), previous experience with telepharmacy ($p = 0.704$), length of practicing telepharmacy ($p = 0.843$), and source of information ($p = 0.956$) with the perception scores of young Indonesian pharmacists regarding telepharmacy.

3.10. Relationship between demographic characteristics and readiness framework

The results, as shown in Table 5, indicated that readiness scores were not significantly associated with gender ($p = 0.520$), age ($p = 0.151$),

Table 5
Relationship between demographic background and knowledge, perception, and readiness of indonesian young pharmacists regarding telepharmacy.

Demographic information	Knowledge (mean ± SD)	*p*-value (mean ± SD)	Perception (mean ± SD)	p-value (mean ± SD)	Readiness (mean ± SD)	p-value (mean ± SD)
Gender						
a) Male	0.74 ± 0.12	0.696	0.72 ± 0.11	0.824	0.74 ± 0.10	0.520
b) Female	0.75 ± 0.13		0.73 ± 0.12		0.75 ± 0.11	
Age						
a) 20–25	0.72 ± 0.11	0.065	0.71 ± 0.10	0.513	0.71 ± 0.12	0.151
b) 26–30	0.74 ± 0.12		0.72 ± 0.11		0.74 ± 0.11	
c) 31–35	0.76 ± 0.13		0.74 ± 0.12		0.79 ± 0.13	
Educational Levels						
a) Pharm.D	0.74 ± 0.12	0.540	0.72 ± 0.11	0.219	0.74 ± 0.11	0.796
b) Master	0.87 ± 0.14		0.85 ± 0.13		0.87 ± 0.12	
Pharmacist's Office						
a) Private Pharmacy	0.75 ± 0.11	0.763	0.71 ± 0.12	0.884	0.76 ± 0.11	0.631
b) Hospital	0.72 ± 0.12		0.76 ± 0.12		0.72 ± 0.12	
c) Private Clinic	0.79 ± 0.12		0.73 ± 0.12		0.79 ± 0.11	
d) Community Health Center	0.84 ± 0.13		0.82 ± 0.13		0.85 ± 0.12	
Length of practicing pharmaceutical care (years)						
a) < 1	0.77 ± 0.12	0.524	0.75 ± 0.11	0.594	0.79 ± 0.12	0.04*
b) 1–3	0.77 ± 0.12		0.75 ± 0.11		0.78 ± 0.11	
c) 4–6	0.73 ± 0.11		0.71 ± 0.11		0.72 ± 0.12	
d) > 6	0.70 ± 0.11		0.68 ± 0.12		0.71 ± 0.11	
Annual salary (USD)						
a) < 2000	0.76 ± 0.11	0.859	0.74 ± 0.12	0.0.536	0.76 ± 0.11	0.0.968
b) 2000–2499	0.74 ± 0.12		0.73 ± 0.11		0.76 ± 0.11	
c) 2500–2999	0.75 ± 0.11		0.72 ± 0.12		0.74 ± 0.11	
d) > 3000	0.72 ± 0.12		0.7 ± 0.11		0.72 ± 0.12	
Previously practicing telepharmacy						
a) Yes	0.76 ± 0.12	0.514	0.74 ± 0.12	0.704	0.71 ± 0.12	0.354
b) No	0.7 ± 0.11		0.68 ± 0.11		0.76 ± 0.11	
Length of practicing telepharmacy (years)						
a) < 1	0.75 ± 0.12	0.696	0.73 ± 0.12	0.843	0.75 ± 0.12	0.457
b) 1–2	0.75 ± 0.12		0.73 ± 0.11		0.76 ± 0.11	
c) > 2	0.7 ± 0.12		0.68 ± 0.12		0.7 ± 0.12	
Source of information						
a) Social media	0.73 ± 0.11	0.949	0.71 ± 0.12	0.956	0.74 ± 0.11	0.883
b) Colleagues	0.76 ± 0.12		0.74 ± 0.12		0.76 ± 0.12	
c) Website	0.74 ± 0.11		0.72 ± 0.11		0.75 ± 0.11	
d) Scientific Journals	0.75 ± 0.12		0.73 ± 0.11		0.8 ± 0.12	
e) Others	0.79 ± 0.12		0.77 ± 0.12		0.8 ± 0.12	

Note: The numbers in the table represent the mean scores for knowledge, perception, and readiness for telepharmacy among young pharmacists in different demographic categories. The *p*-values indicate the significance of the differences observed, with a *p*-value of less than 0.05 considered statistically significant. The statistical tests used include Chi-Square tests for categorical variables and independent t-tests for continuous variables.

educational level ($p = 0.796$), type of pharmacist's office ($p = 0.631$), annual salary ($p = 0.968$), previous experience with telepharmacy ($p = 0.354$), length of practicing telepharmacy ($p = 0.457$), or source of information ($p = 0.883$). However, a significant association was found with the length of practicing pharmaceutical care ($p = 0.04$), suggesting that pharmacists with less experience (<1 year) exhibited higher readiness scores compared to those with more extensive experience. These findings highlight that while most demographic factors do not significantly impact pharmacists' readiness for telepharmacy, the length of professional experience may play a role in their preparedness for adopting telepharmacy practices.

4. Discussion

4.1. Overview of findings

This study surveyed 600 young pharmacists in rural Indonesia, with a response rate of 86.67 %, resulting in 520 completed surveys. The high response rate can be attributed to several factors: targeted recruitment through the IYPG, convenience sampling using popular social media platforms, effective engagement and communication about the study's significance, and the convenient online format of the survey. The majority of respondents were female (73.1 %), and most were between the ages of 26 and 30 (53.8 %). Educationally, nearly all participants held a Pharm.D degree (97.1 %), with a small fraction holding a Master's degree (2.9 %). Participants were primarily employed in private pharmacies (42.3 %) and hospitals (48.1 %). The length of their professional experience varied, with the largest group having 4–6 years of experience (44.2 %). A significant proportion of pharmacists reported prior experience with telepharmacy (76.9 %). These demographics provide a comprehensive backdrop against which the knowledge, perception, and readiness for telepharmacy were assessed, offering insights into the current state and future potential of telepharmacy services in rural Indonesia. The high response rate underscores the reliability and generalizability of the findings, reflecting a robust engagement with the surveyed population.[38,39]

4.2. Knowledge, perception, and readiness for telepharmacy among young pharmacists

The knowledge assessment revealed a high level of awareness and understanding of telepharmacy among the participants. Nearly all pharmacists recognized the importance of information communication technology for telepharmacy (90.38 %) and acknowledged its critical role during the COVID-19 pandemic (96.15 %). Additionally, the necessity of a strong internet connection was widely understood (96.15 %), indicating a solid foundational knowledge essential for the effective implementation of telepharmacy services. This high level of knowledge suggests that young pharmacists in rural Indonesia are well-prepared to integrate telepharmacy into their practices, potentially enhancing healthcare delivery in these areas.[40,41] The study findings suggest that demographic factors do not significantly influence the knowledge levels of young pharmacists on telepharmacy, highlighting the need for further research to identify other potential determinants.

Perception of telepharmacy were generally positive. A significant number of pharmacists agreed that telepharmacy improves patient adherence (80.77 %) and enhances access to medications in rural areas (90.38 %). Additionally, many believed that telepharmacy helps patients save money and travel time (92.31 %). However, concerns about increased error rates in medication dispensing (57.69 %) and increased workload (65.39 %) were notable. These concerns highlight the need for strategies to ensure accuracy in telepharmacy and manage the additional workload effectively. Moreover, while a moderate proportion of pharmacists were willing to share personal information online (57.69 %), this indicates a potential barrier to the full adoption of telepharmacy services that must be addressed through robust data security measures.[42,43] Like knowledge framework, these findings indicate that demographic factors do not significantly affect the perception of young pharmacists about telepharmacy, underscoring the need for additional research to uncover other possible influences on their perception. While this study focused on pharmacist's perceptions, it is also important to consider patient attitudes towards telepharmacy. Studies indicate that patients in Indonesia generally have a positive outlook on telepharmacy, appreciating the increased access to pharmaceutical services and convenience it offers. However, concerns about data privacy and the personal touch of face-to-face consultations remain significant.[44,45] Meanwhile, older pharmacists, typically in management and leadership positions, play a crucial role in the adoption of telepharmacy services. In Indonesia, these pharmacists tend to be more cautious about integrating new technologies, often citing concerns about the adequacy of training and the potential for increased workload.[46] Their buy-in is essential for successful implementation, and targeted training and support can help mitigate their concerns. In Indonesia, as in many other countries, older pharmacists often occupy management and leadership positions. Their perspectives are pivotal in decision-making processes regarding the adoption of telepharmacy services. Effective implementation strategies must therefore engage these key stakeholders to ensure comprehensive support for telepharmacy initiatives.

The readiness assessment showed a significant willingness among young pharmacists to engage in telepharmacy. High readiness scores were observed in areas such as conducting drug counselling via video consultation (44.23 %) and undergoing training in ethics and legal issues related to telepharmacy (59.62 %). Notably, there was a significant association between readiness scores and the length of practicing pharmaceutical care, with less experienced pharmacists (<1 year) exhibiting higher readiness scores. This suggests that newer pharmacists may be more adaptable to integrating telepharmacy into their practices. However, barriers such as reluctance to work without incentives (65.39 %) and after office hours (61.54 %) indicate areas where additional support and encouragement are needed to enhance engagement. Addressing these barriers could involve providing incentives for telepharmacy projects and promoting flexible work arrangements.[47,48] Overall, these findings suggest that a considerable proportion of young pharmacists in rural Indonesia are ready to embrace telepharmacy assisted services, though there remain areas requiring further support and encouragement to achieve widespread readiness.

In the logistic regression analysis, the following variables were found to be significantly associated with higher knowledge scores: length of professional experience (OR = 1.45, 95 % CI: 1.10–1.90, $P = 0.02$) and prior experience with telepharmacy (OR = 1.78, 95 % CI: 1.30–2.40, $P = 0.01$). For perception scores, significant predictors included workplace setting (private pharmacies vs. hospitals) (OR = 1.50, 95 % CI: 1.12–2.01, $P = 0.03$) and educational level (Pharm.D vs. Master's) (OR = 1.55, 95 % CI: 1.05–2.30, $P = 0.04$). Readiness scores were significantly associated with the length of practicing pharmaceutical care (less than 1 year vs. more than 1 year) (OR = 1.60, 95 % CI: 1.15–2.23, P = 0.02) and willingness to undergo training in ethics and legal issues related to telepharmacy (OR = 2.10, 95 % CI: 1.50–2.94, $P < 0.01$). These results provide a detailed understanding of the factors influencing knowledge, perception, and readiness for telepharmacy among young pharmacists in rural Indonesia.

4.3. Relationships between demographic characteristics and knowledge, perception, and readiness for telepharmacy

The sample of this study reflects the broader demographics of the pharmacy workforce in Indonesia. According to the Indonesian Pharmacists Association, the majority of pharmacists are female and under the age of 35, aligning with our sample where 73.1 % were female and the majority were between 26 and 30 years old.[12] This similarity suggests that these study findings are representative of the general pharmacist population in rural Indonesia.

The analysis of the relationships between demographic characteristics and the knowledge, perception, and readiness of young pharmacists regarding telepharmacy revealed several insights. Gender, age, educational level, type of pharmacist's office, length of practicing pharmaceutical care, annual salary, previous experience with telepharmacy, length of practicing telepharmacy, and source of information were all examined. The findings indicated no significant associations between most demographic variables and knowledge scores, suggesting that knowledge about telepharmacy is uniformly distributed across these demographics. This lack of significant associations highlights that telepharmacy knowledge is likely influenced by factors other than demographics, such as professional development opportunities and individual engagement with telepharmacy practices.[49,50]

Similarly, the study found no significant associations between demographic characteristics and pharmacist's perception of telepharmacy. This uniformity suggests that positive perception about telepharmacy's benefits, such as improved patient adherence and enhanced access to medications, are broadly shared across different demographic groups. However, concerns about increased error rates and workload also cut across these groups, indicating common challenges that need addressing regardless of demographic differences.[51,52]

In terms of readiness for telepharmacy, demographic characteristics were generally not significantly associated with readiness scores, except for the length of practicing pharmaceutical care. This finding suggests that less experienced pharmacists might be more adaptable and open to adopting telepharmacy practices. This adaptability may be due to their recent training and exposure to newer technologies in their education. The significant readiness among newer pharmacists underscores the importance of integrating telepharmacy training in early career stages and suggests that targeted interventions might be required to engage more experienced pharmacists who may be more set in the traditional practices.[53,54]

4.4. Implications for practice and education

The findings of this study have several implications for pharmacy practice, especially in rural settings where telepharmacy can greatly enhance healthcare delivery. Given the high levels of knowledge and generally positive perception among young pharmacists, there is substantial potential for integrating telepharmacy into routine practice. Telepharmacy can address the healthcare disparities in rural areas by improving access to pharmaceutical services and providing timely medication management and counselling.[55,56]

The need for comprehensive educational programs on information technology and telepharmacy in pharmacy schools is paramount. By incorporating these subjects into the curriculum, future pharmacists will be better prepared to utilize telepharmacy technologies effectively. This preparation will not only enhance their technical skills but also their confidence in delivering remote pharmaceutical care. Educational programs should also include ethical and legal aspects of telepharmacy to ensure that pharmacists are well-versed in the regulatory frameworks governing telepharmacy practices.[57,58]

Ongoing professional development and training are crucial for maintaining high levels of knowledge and readiness among practicing pharmacists. Continuous education opportunities, such as workshops and online courses, can keep pharmacists updated on the latest advancements in telepharmacy and best practices. These programs should be designed to address both the technological and clinical aspects of telepharmacy, ensuring that pharmacists are well-equipped to manage the increased workload and mitigate potential error rates associated with telepharmacy.[59,60]

Individual pharmacists in Indonesia typically do not have the autonomy to independently initiate telehealth services. Such decisions are generally made at the institutional level, requiring approval from higher management and adherence to regulatory guidelines. However, pharmacists can advocate for telepharmacy services and contribute to the planning and implementation processes.

The implementation of telepharmacy in Indonesia faces several legal and technological challenges. Legally, there are concerns regarding compliance with healthcare regulations, data privacy laws, and professional practice standards. Technologically, issues include the need for reliable internet connectivity, secure data transmission, and access to appropriate telepharmacy platforms. Addressing these challenges requires coordinated efforts between regulatory bodies, healthcare institutions, and technology providers.[61,62]

4.5. Strengths and limitations of the study

This study's strengths include a high response rate, which enhances the reliability and validity of the findings. The large sample size and the focus on rural pharmacists provide valuable insights into a critical segment of the healthcare workforce. Additionally, the comprehensive assessment of knowledge, perception, and readiness offers a holistic view of telepharmacy's current state and future potential in rural Indonesia. However, the study also has several limitations. The use of convenience sampling may introduce selection bias, as participants who chose to respond might have different characteristics from those who did not. This could affect the generalizability of the findings to all young pharmacists in rural Indonesia. Furthermore, self-reported data might be subject to response bias, with participants possibly providing socially desirable answers. These limitations suggest the need for caution when interpreting the results and underscore the importance of validating the findings through further research.

4.6. Recommendations for future research

Future research should explore other factors influencing knowledge, perception, and readiness for telepharmacy, including qualitative studies that provide deeper insights into the experiences and attitudes of pharmacists. Understanding the barriers and facilitators from a qualitative perspective can inform more targeted interventions to enhance telepharmacy adoption.

Longitudinal studies are recommended to assess the long-term impact of telepharmacy on healthcare outcomes in rural areas. Such studies could provide valuable data on how sustained use of telepharmacy affects patient health outcomes, medication adherence, and overall healthcare access over time. This information is critical for developing evidence-based policies and practices that support the integration of telepharmacy into routine care.[63,64] Additionally, research on the effectiveness of different training programs in enhancing pharmacist's readiness for telepharmacy is essential. Comparative studies evaluating various educational approaches can identify the most effective strategies for equipping pharmacists with the necessary skills and knowledge. This research can guide the development of standardized training programs that ensure consistency and high-quality telepharmacy services across different settings.[65,66]

5. Conclusion

The study revealed that young pharmacists in rural Indonesia possess high levels of knowledge and generally positive perception towards telepharmacy, indicating a strong foundation for its future integration. Significant readiness among less experienced pharmacists suggests adaptability to new technologies, although concerns about increased workload and data security must be addressed. These findings underscore the importance of continuous support, targeted training, and strategic development to overcome barriers and ensure the successful implementation and widespread adoption of telepharmacy services, thereby enhancing healthcare access in rural areas.

Ethical approval

Ethical approval for this study was obtained from the relevant institutional review board (IRB) at the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia (No. 184/EC-KEPK FKIK UMY/IX/2022). Informed consent was obtained through a two-step process: (a) Initial Information: potential participants were provided with detailed information about the study's purpose, procedures, risks, and benefits via an information sheet distributed through social media platforms (Facebook, Instagram, WhatsApp) in collaboration with the IYPG. This information sheet also included contact details of the researchers for any queries; and (b) Online Consent Form: Participants who expressed interest in the study were directed to an online consent form hosted on Google Forms. The consent form reiterated the study information and required participants to confirm their consent by selecting an "I Agree" checkbox before accessing the survey questions.

CRediT authorship contribution statement

Muhammad Thesa Ghozali: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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