

ORIGINAL ARTICLE

EXPLORING PHARMACISTS' ROLES AND BARRIERS IN PUBLIC HEALTH CENTERS DURING THE COVID-19 PANDEMIC: A QUALITATIVE STUDY

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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic had a tremendous effect on essential healthcare services, including public health centers (PHCs). Pharmacists had the responsibility of maintaining high-quality pharmacy services during this pandemic. The objective of this study was to explore pharmacists' roles and barriers in PHCs while providing pharmacy services during the COVID-19 pandemic. This study used a qualitative design with a phenomenological approach. Ten pharmacists from PHCs in Indonesia were recruited using a non-probability sampling method and interviewed individually using an online platform (Zoom and Google Meet) or via telephone. Informants were purposefully recruited through recommendations by registered pharmacists in Indonesia. Two interviews were conducted for each informant with an interval of 1 month. Each interview was recorded, transcribed verbatim, and analyzed using an inductive thematic method. Member-checking and peer-debriefing were conducted to increase the credibility of the study. This study revealed changes in the managerial and clinical pharmacy aspects of pharmacists' roles. Additional roles related to COVID-19 were also described. In performing these services, pharmacists faced some barriers, including the limited provision of direct services to patients, a decrease in the number of patients, dishonesty among patients, a lack of human resources in PHCs, difficulty in procuring medical products related to COVID-19, and a lack of information regarding COVID-19 vaccination. The COVID-19 pandemic forced pharmacists in PHCs to adapt to various changes in pharmacy services, and support from stakeholders, including the government, patients, the pharmacists' professional organization, and other health workers, is required to overcome the associated barriers.

Keywords: Roles; Barriers; Pharmacist; Public health centers; the COVID-19

INTRODUCTION

Since it was declared a pandemic, COVID-19 has caused high rates of infection and death in many countries, including Indonesia^{1,2}. Indonesia has recorded more than 1 million cases since the start of the pandemic³. Several countries reported a decline in the number of patient visits to primary health care facilities at the start of the COVID-19 pandemic, with a decline of up to 50% in the United States⁴. In Indonesia, patient visits to public health centers (PHCs) declined by up to 83.5%⁵, which severely disrupted essential health services⁶. The decrease in the number of patients raised concerns that patients' health conditions were being left untreated⁴.

PHCs or *Puskesmas* in Indonesia provide healthcare to the population at the sub-district level. Currently, Indonesia has 10,205 PHCs located throughout the country⁷. The health insurance system in Indonesia has placed PHCs at the forefront of healthcare services that carry out the tasks of health promotion, disease prevention, and treatment for individuals before they are referred to a hospital⁸. As primary healthcare services, PHCs also have an important role in fighting the pandemic by controlling and impeding the transmission of COVID-19^{9,10}. This

disruption in PHCs' services might translate to changes in public health overall¹⁰.

As healthcare professionals, pharmacists are on the front lines, playing pivotal roles in the COVID-19 pandemic^{11,12}. Pharmacists are contributing to essential health services by educating the community about COVID-19 transmission, securing medical supplies, and collaborating with other healthcare professionals to provide health guidance during the COVID-19 outbreak^{12,13}. These roles were also established by the International Pharmaceutical Federation (FIP), acknowledging the responsibilities of pharmacists in fighting the COVID-19 pandemic¹⁴. However, the roles of pharmacists may vary due to different country-specific policies and barriers faced by the pharmacists while providing pharmacy services¹⁵.

Several studies have focused on the roles of pharmacists during the COVID-19 pandemic^{11,16-18}. Nonetheless, they did not specifically address the roles of pharmacists and the barriers hindering pharmacy services in PHCs. Knowing the changes in these roles and barriers would provide a foundation for policymakers to establish regulations to accommodate the changing roles and overcome the barriers. Before

were responsible for comprehensively supporting the functioning of health services with other health workers by providing managerial and clinical pharmacy services^{8,19}. The COVID-19 pandemic has been proven to interfere with pharmacists' roles in other healthcare settings^{17,18}. Therefore, this study aimed to explore pharmacists' perceptions of their roles and barriers faced while providing pharmacy services in PHCs during the COVID-19 pandemic.

METHODS

Study design, settings, and informants' recruitment

A qualitative study with a phenomenological perspective was used to explore pharmacists' perceptions of their roles and barriers faced during the COVID-19 pandemic. Virtual semi-structured interviews were conducted with pharmacists who worked in PHCs or *Puskesmas* in Indonesia. This study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Studies (COREQ) checklist²⁰.

Potential informants were purposefully recruited using a non-probability sampling method according to the following inclusion criteria: (a) pharmacists registered to practice in Indonesia and (b) pharmacists working in PHCs presently and for a minimum of 6 months prior to the COVID-19 pandemic. To ensure a wide participant pool and obtain representative results, potential informants were recruited from across Indonesia (Sumatra Island, Java Island, Borneo Island, Sulawesi Island, and Papua Island).

The informants were recruited based on recommendations from other pharmacists who knew the potential informants eligible for our study. These pharmacists were experienced registered pharmacists in the same region as the informants and knew the informants personally. They were previously informed about our study so that they could recommend appropriate key informants who matched the purpose of the study, and the potential informants' contact information was obtained from them. All the potential informants agreed to give their contact information to the researcher. Prior to the interviews, the potential informants were contacted via private messenger or phone calls and provided with explanatory statements containing the details of the study. This was also done to deepen the researcher's relationship with the informants since they were not acquainted before the study. All contacted informants agreed to participate in this study and signed informed consent forms.

Data collection

The interviews were conducted by DLI and YA in February to May 2021. DLI is a lecturer and registered pharmacist in Indonesia, while YA is a final-year undergraduate pharmacy student. We believe that the researchers' professional background was essential for gaining the informants' trust. All interviews were conducted in Indonesian using online platforms (Zoom or Google Meet) or via telephone as a precaution against the spread of COVID-19 and due to the long distance. Each interview was digitally recorded with the informant's consent.

Ten informants were interviewed in this study. Informants were added until information saturation was reached. Data saturation was reached after eight interviews, but two additional interviews were conducted to ensure that no new data and codes emerged. For the phenomenological study, 10 informants were considered appropriate because of the exploratory nature of the study²¹.

As a part of data triangulation, the interviews were repeated after a month. Hence, each informant was interviewed twice. This was necessary to ensure the trustworthiness of the study²². Furthermore, informants were asked to check the transcript of the interview. Three informants suggested additional information and corrections to the transcripts. For each informant, we made a symbol from A to J that indicated the first to the tenth informant. Furthermore, we also added the number 1 or 2 that explained the first or second interview.

The main questions in the interview regarding pharmacists' perceptions of their roles and associated barriers included (a) What is your experience of pharmacists' practices in PHCs during the COVID-19 pandemic? (b) What are the differences in pharmacists' practices in PHCs before and during the COVID-19 pandemic? and (c) What barriers are you experiencing in your practice during this pandemic? Additional questions were asked according to the informant's answers to the main questions. The average duration of the interview was 45 minutes, ranging from 31 to 67 minutes and 26 to 94 minutes for the first and second interviews, respectively.

Data analysis

The digitally recorded interviews were transcribed verbatim (Indonesian language). Inductive content analysis was used to analyze the data. Coding was done manually by YA and further reviewed by DLI and LM. YA, DLI, and LM collaborated to organize the codes into themes. Agreement upon the codes and themes was reached before the results were interpreted. LM

did not conduct the interviews, hence increasing the credibility of this study. The peer-debriefing process during data analysis helps researchers to reflect on the process and enhance the accuracy of the study^{21,22}.

Ethic approval

The Health Research Ethics Committee, Faculty of Health Sciences, Jenderal Soedirman University, granted the ethical approval for this study (approval no. 278/EC/KEPK/2021). The interviewer explained the study and obtained informants’ consent before the interview. Informants’ consent included permission to record the data and publicize the responses anonymously.

RESULTS

Ten pharmacists in PHCs were interviewed (Table 1). The first eight informants were from Java Island (five informants), Sumatra Island (two informants), and Borneo Island (one informant). The two additional informants were from Sulawesi Island and Papua Island. Most of the informants had worked in Java Island. More than 50% of the pharmacists in Indonesia are located centrally in Java Island²³. The informants’ age varied from 27 to 45 years, and many of them were women. Regarding experience in PHCs, the distribution was balanced between 1–5 years of

experience and 5–15 years of experience. The length of practice was not significantly correlated with the attitude of pharmacists during the COVID-19 pandemic²⁴.

The results of this study were categorized into two main themes. The first was the change in pharmacists’ roles during COVID-19 pandemic and the second considered the barriers to providing pharmacy services. The interview’s quotations are presented in Tables 2 and 3. In addition, the conceptual framework of the pharmacists’ roles and barriers during the COVID-19 pandemic is presented in Figure 1.

Change in pharmacists’ roles during the COVID-19 pandemic

All informants mentioned that there were changes in pharmacists’ roles during the COVID-19 pandemic. In Indonesia, pharmacists in PHCs perform their roles based on Standar Pelayanan Kefarmasian di Puskesmas (Pharmaceutical Services Standards in PHCs)¹⁹. The main responsibilities involved managing medical supplies and clinical pharmacy services. During the COVID-19 pandemic, pharmacists had additional roles in COVID-19-related tasks.

Table 1: Demographic characteristics of informant

Variables	Frequency (N)
Age (years)	
21-30	3
31-40	5
41-50	2
Gender	
Male	2
Female	8
Experience (years)	
1-5	5
6-10	4
11-15	1
Location	
Java Island	5
Sumatera Island	2
Borneo Island	1
Sulawesi Island	1
Papua Island	1

Change and increase in managing medical supplies

The uncertainty around COVID-19 conditions influenced the procurement of medical supplies. All participants mentioned a change and increase in workload related to managing pharmaceutical preparations and disposable medical products, especially those required to address COVID-19. There was an increase in the need for drugs used to relieve the symptoms of COVID-19 and provide treatment. Furthermore, multivitamins were the most sought-after supplement. The informants stated that in the early phase of the COVID-19 pandemic, pharmacists had trouble handling the need for disposable medical products due to the existence of many variations that were unfamiliar to them. The pharmacists needed to procure logistics for personal protective equipment (PPE) and swab tools, including viral transport medium (VTM) to preserve coronavirus specimens after collection.

Modifications in clinical pharmacy services

Pharmacists made some modifications in the provision of clinical pharmacy services. First, the COVID-19 pandemic provided an opportunity for pharmacists to use online platforms to optimize their roles due to limitations in providing face-to-face services. Telemedicine became a solution for providing education and counseling to patients. The topics addressed were related to COVID-19 and general diseases. Patients who used to receive home pharmacy care were also given telemedicine to monitor drug use and the incidence of side effects, as stated by the informant. Second, pharmacists facilitated in-person counseling for patients with chronic diseases who still needed it but with reductions in counseling time enabled by writing more information on the prescription label.

Additional roles in COVID-19 related task

Pharmacists have some additional roles in COVID-19 related tasks. During this pandemic, they participated in accelerating COVID-19 vaccination and preventing the transmission of COVID-19.

The PHC in Indonesia is one of the healthcare facilities that has the right and responsibility to distribute the COVID-19 vaccine. Hence, as part of health workers, the pharmacists participated in the vaccination program. Their duties were to ensure the availability of logistical needs for COVID-19 vaccination and to manage the COVID-19 vaccine. On the day of the vaccination program, the pharmacists were responsible for verifying the patients' identity, screening patients' eligibility for vaccination, and observing the AEFI.

To prevent the transmission of COVID-19, collaboration with other stakeholders was considered a must-do protocol. Informants

healthcare professionals to perform contact tracing for COVID-19 and monitor self-isolated COVID-19 patients. While monitoring the patients' condition, pharmacists also prepared medicines for these patients. Furthermore, to protect the patients and other health professionals, pharmacists established the standard operating procedure and separated patients with suspected COVID-19 symptoms to avoid virus spreading. They also sterilized the pharmacy's waiting room, maintained distance, and used PPE when they were delivering medicines to the patients.

Barriers to pharmacy service provision

Limited direct services to patients

The use of online platforms to deliver some services was considered not as effective as in-person services. Even when pharmacists communicated in-person with patients, some information might be misunderstood. This misunderstanding was worse when using online platforms.

Decrease in the number of patients

There was a decrease in the number of patients receiving treatments in PHCs because they feared visiting the PHC during the pandemic. They believed that visiting the PHC would cause infection with COVID-19. This led to medicine accumulation, and pharmacists could not provide optimal pharmacy services.

Dishonesty of patients

Patients' insecurity about their COVID-19 condition manifested as dishonesty about their symptoms. When confronted with this situation, pharmacists faced difficulties in providing pharmacy services.

Lack of human resources in PHCs

Pharmacists confessed to increased workloads during the pandemic. Even before the pandemic, the number of human resources in PHCs was limited. The additional tasks created challenges for the pharmacists to divide their time evenly in providing pharmacy services. Regarding some PHCs that provided inpatient services, pharmacists revealed that their role in inpatient services declined. They used to conduct visits before the pandemic, but this role shifted to the nurses. The nurses held the responsibility of handing over the medicine prepared by the pharmacist to patients.

Difficulty in procuring medical supplies related to COVID-19

The demand for pharmaceutical preparations and disposable medical products related to COVID-19 did not match their availability. Additionally, some PHCs could only depend on procurement from public health officials because they did not have the authority to purchase their needs through private procurement.

Lack of information

Lack of information about COVID-19, especially the vaccines, was a challenge in combating this pandemic. Many people believed that vaccines would affect their health negatively.

DISCUSSION

The findings of this study indicate that the COVID-19 pandemic changed pharmacists' roles in PHCs. To our knowledge, this is the first qualitative study to explore pharmacists' roles in PHCs and the barriers to providing pharmacy services during the COVID-19 pandemic, especially in Indonesia.

Pharmacists globally are on the frontlines, providing services amidst the pandemic²⁵. In Indonesia, pharmacists also play an important role in combating COVID-19²⁶. The challenges presented by COVID-19 urged pharmacists to adapt and implement innovations to their existing roles¹⁷. The changing of roles mainly focused on managing medical supplies, clinical pharmacy services, and additional roles in COVID-19-related tasks. In PHCs, the procurement of medical supplies shifted to comply with COVID-19-related needs. Many variations and the unfamiliarity of these medical supplies became a challenge for the pharmacists. Training and practice for PPE preparedness and treatment guidelines are recommended to optimize pharmacists' awareness and knowledge due to the dynamic progress of COVID-19 development^{27,28}. Additionally, like other pharmacists in Europe who experienced shortages of medical supplies¹⁷, pharmacists in PHCs also complained about the difficulty in procuring medical supplies related to COVID-19 as a barrier to providing pharmacy services. In the future, it is necessary to improve procurement regulations as some PHCs could only rely on public health officials to obtain their medical supplies.

Regarding clinical pharmacy services, the pharmacists in PHCs provided telemedicine to replace in-person counseling and home pharmacy care for patients. These remote pharmacy services were also implemented in the United Arab Emirates during the COVID-19 pandemic, wherein pharmacists provided counseling for probable and confirmed cases of COVID-19²⁹. Although telemedicine has been recommended to prevent COVID-19 spread³⁰, whether the quality of care provided through virtual means is comparable to that of direct patient care remains a question³¹. This was reflected in a barrier that limited direct contact, affecting pharmacy services. Indonesia is a lower-middle-income country, and its healthcare system is structured based on the customary model of in-

person care³²⁻³⁴. The alteration to this system exposed the variables that constrained the implementation of telemedicine, such as infrastructure, availability of skilled human resources, economic and sociodemographic variables such as patients' limited education in low-income settings³⁴. To accommodate the patients with limited access to telemedicine, the pharmacists in PHCs kept providing in-person services for patients in need.

Given the limitations in proven treatments for COVID-19, vaccination and prevention of transmission become the main modalities to protect the community against COVID-19. Pharmacists in PHCs had important roles in mitigating future waves of infection by implementing health protocols, educating patients about COVID-19, contributing to vaccination programs, contact tracing, and monitoring self-isolated patients. This role was also emphasized in other countries^{18,35}. In France, this role was significantly filled by community pharmacists, who provided COVID-19 clinical services in the same roles as PHC pharmacists in Indonesia, such as screening patients, informing patients about isolation measures, carrying out contact tracing, or contributing to COVID-19 vaccination²⁹. However, pharmacists in PHCs perceived that their authority in COVID-19 vaccination programs was limited to managing the logistics of vaccination, identifying the patients, and observing the AEFI. Physicians, nurses, or midwives were the only healthcare professionals permitted to administer the vaccines³⁶. Although pharmacists are recognized as qualified vaccinators in many countries³⁷, the regulations differ in Indonesia³⁶. Concerns for patients receiving vaccination from pharmacists were related to safety reports and under-training³⁸. Nonetheless, to prove the capability of pharmacists as vaccinators, evidence of the value of pharmacist's vaccination services is required, along with proof that pharmacists have sufficient training to vaccinate³⁷.

Pharmacists in PHCs faced many barriers to providing pharmacy services during the COVID-19 pandemic. One of the barriers was the low number of patients receiving treatment in PHCs, which hindered pharmacists in providing appropriate pharmacy services to patients. Indonesia's healthcare system has established PHCs as the first healthcare provider that patients seek out for treatment before further specialized care¹⁹, and the unusually low number of patients may impact the overall public health status¹⁰. Public activity restriction policies to control COVID-19 outbreaks and patients' fear of COVID-19 transmission in healthcare facilities are suspected to be the reasons for this decrease¹⁷.

Table 2: Interview’s quotations regarding change in pharmacist’ roles during the COVID-19 pandemic

Sub-theme	Coding	Interview’s quotations
Change and increase in managing medical supplies	Increase in the need of drugs and multivitamins for COVID-19	<p>“..the management of pharmaceutical preparations has shifted a lot, so the initial plan can’t be used anymore.” (E1)</p> <p>“...because of pandemic, more cough and cold medicines are being used. It is the same with multivitamin.” (E1)</p>
	Increase in the need of disposable medical products for COVID-19	<p>“...at the beginning, it was troubled to manage the disposable medical products. In the past, we didn’t manage as much as we do now.... These are new items that we didn’t have before.” (G1)</p> <p>“...The role of pharmacist is significant in procuring logistics for PPE. Beside the PPE, there is also VTM for swab test and the kits” (G1)</p>
Modifications in clinical pharmacy services	Telemedicine	<p>“...we think it’s difficult to enter people’s homes and meet them, so we try to do online visits, we create broadcast groups and occasionally send material both related to COVID-19 and general diseases.” (F1)</p> <p>“...in the pandemic era, we can’t do homecare directly at home, so we use Whats App, then we will monitor how the patients take their drug...”(A1)</p>
	Written information for patients	<p>“...For patients with hypertension, diabetes mellitus, and tuberculosis, we will modify the label so the more complete information is given for the description. The addition is usually for the time to take medicine. We write down the possibility of adverse drug reactions that may arise.... And the lifestyle...” (C2)</p>
Additional roles in COVID-19 related task	Participate in accelerating the COVID-19 vaccination	<p>“...increased role, especially for vaccination, because we are responsible for the logistics of vaccines.” (I2)</p> <p>“...we ask the identity, and we make sure the screening sheet matches the data to fill out the attendance list, whether this person is included in today’s schedule or not.”(B2)</p> <p>“...yesterday, we were in the observation section. So, we monitored and reported adverse events following immunization (AEFI) after the patient was vaccinated.” (B1)</p>
	Prevent the transmission of COVID-19	<p>“...such as monitor COVID-19 patients taking turns with other health workers, so as long as patients are in isolation, we will continue to monitor them. ” (E2)</p> <p>“...then trace down to the community, the pharmacists do that, once we come in-person to contact tracing, but then we use phone or WhatsApp.” (E2)</p> <p>“...our duty as a pharmacist is to prepare the drugs needed by the self-isolated patients.” (B2)</p> <p>“...When doing counseling during the pandemic, we keep the distance and use PPE, so that it is quite effective, and patients with acute respiratory infection (ARI) are separated.” (D1)</p> <p>“...in the pharmacy room, we have a standard operating procedure (SOP) to avoid spreading and transmitting the virus. Then in the pharmacy waiting room, we often spray disinfectant.” (D2)</p>

Table 3: Interview’s quotations regarding the barriers to pharmacy service provision

Sub-theme	Interview’s quotations
Limited direct services to patients	“...for clinical pharmacy, it is also getting more difficult, because the analyzes of the patients’ condition are hindered by space and time. So, we can only use the telephone, or we can't come directly to their houses or can't stay in direct contact for long. Giving education is also not effective, because even when we meet face-to-face, many patients say they understand, but when we ask again, they are still confused and wrong. Let alone now when it's online.” (G1)
Decrease in the number of patients	“...during this pandemic, the number of visits to PHC has declined. Then some drugs are eventually piled up until they expire.” (F1) “...the barrier is the number of visits declined, so the opportunity to provide clinical pharmacy services also has declined.” (B1)
Dishonesty of patients	“...during this pandemic, the barrier is if a patient lies, and that often happens regarding his symptoms.” (E1)
Lack of human resources in PHCs	“...because the PHC does not have many employees. So, when some serve the patients, the others go to the community and do the administrative job. That's difficult.” (E1) “...Now there're no visits for inpatients like before the pandemic, and the medicines were given to the patients by the nurse. As pharmacists, we only prepare the medicines as prescribed by the doctor, then we give them to the nurse and nurse will give them to inpatients.” (D1)
Difficulty in procuring medical supplies related to COVID-19	“...the barrier is mainly from the availability of the needs of the PHC, so the need is increasing while the availability is lacking.” (D1)
Lack of information	“...the people in the village think that if they are not sick, why should they be vaccinated. Then there are many hoaxes about the vaccine. Because of that, they say ‘Oh, I'm afraid that someone will die because of the vaccine’.” (J1)

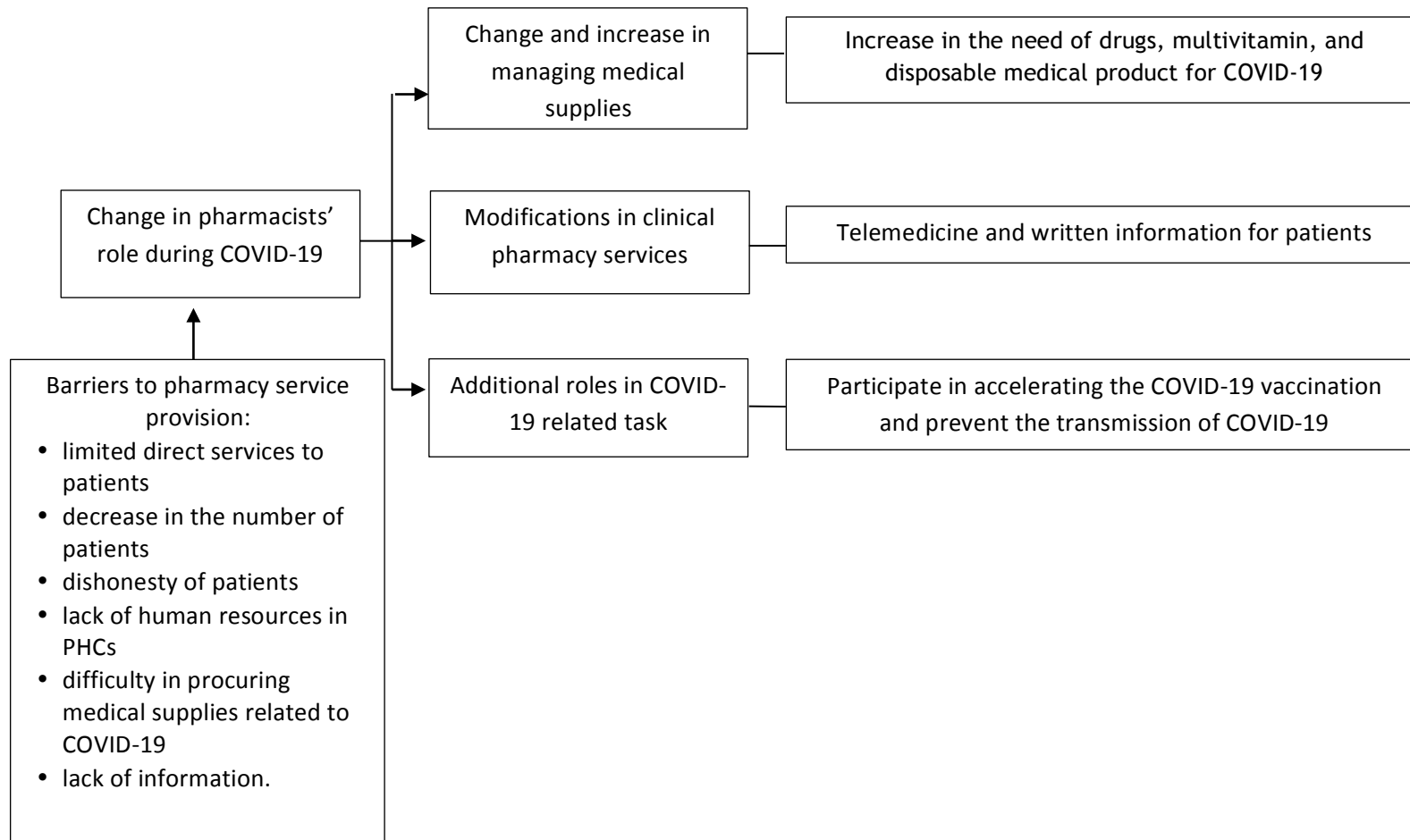


Figure 1: Conceptual framework of the pharmacists' role and barriers during the COVID-19 pandemic

Despite the low number of patients, pharmacists in this study perceived that PHCs lack human resources. They reported that this condition makes pharmacists mainly focus on securing scarce medical supplies and other roles related to COVID-19 such as contact tracing or monitoring self-isolated patients. As a result, tasks that are supposed to be carried out by pharmacists, including inpatient visits and administering medicine, have been reassigned to nurses. Similarly, previous studies in Jordan and Malaysia showed a decline in pharmacists' roles in clinical pharmacy services during COVID-19 pandemic^{11,16}. As compared with other roles in preserving the medication supply, pharmacists' role in clinical pharmacy is rarely highlighted¹⁶. Although such services may have a significant effect on improving patients' outcomes, without being able to prove the importance of said service, pharmacists lose the opportunity to gain support^{11,16}. Therefore, pharmacists must consistently contribute and collaborate with other health workers and show that their role in clinical pharmacy services is essential for patients¹⁶.

Other barriers faced by pharmacists in PHCs include the dishonesty of patients about their COVID-19's symptoms and a lack of information about vaccination. Problematically, the concealment of COVID-19 information can hinder the prevention of COVID-19 spread³⁹. People infected with COVID-19 described that they were facing uncertainty regarding their own mortality⁴⁰. The negative stigma and judgment from society regarding those who contracted the virus also resulted in greater rates of concealment³⁹. Comprehensive evaluation indicates that daily news about COVID-19 infection had an impact on patients' reactions to this new virus⁴⁰. The constantly changing evidence and advice, worsened by misinformation, could lead to false perceptions about COVID-19^{17,40}. One of the affected factors is the willingness to accept a COVID-19 vaccine service. Many patients presumed that the COVID-19 vaccine could affect their health negatively. Building trust, listening to concerns, allaying fears, combatting misinformation, and educating are the keys to counter this problem⁴¹. The competencies possessed by pharmacists indicate that they should be a part of the solution¹⁴.

Strength and Limitations

Due to the risk of COVID-19 transmission, the interviews were conducted via an online platform (Zoom or Google Meet) or telephone. These are less intimate because we could not meet face-to-face with the informants. Furthermore, a reliable internet connection and familiarity with the chosen platform should be ensured before the interview to minimize any barriers to communication. Despite the limitations, we deliberately chose informants

perspectives and represent Indonesia generally. Additionally, studies that address the role of pharmacists in PHCs and the barriers to providing pharmacy services during the COVID-19 pandemic are still limited. This study can be seen as a starting point for further research and a guideline for policymakers, especially regarding strategies to overcome the barriers presented herein.

CONCLUSION

The COVID-19 pandemic obliged pharmacists in PHCs to adapt to various changes in pharmacy services. Additional roles directly related to COVID-19 were also performed. In performing these services, pharmacists faced some barriers.

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Competing interests

The authors declare no potential conflict of interest.

REFERENCES

1. WHO. Coronavirus 2020. 2020. https://www.who.int/health-topics/coronavirus#tab=tab_1 (accessed 4 Sep 2021)
2. Ministry of Health Republic of Indonesia. Pedoman Pencegahan dan Pengendalian COVID-19 Revisi Ke-5 (Guidelines for Prevention and Control of COVID-19 5th Revision). Jakarta: Ministry of Health Republic of Indonesia; 2020.
3. WHO. WHO Coronavirus (COVID-19) Dashboard. 2021. <https://covid19.who.int/> (accessed 25 Jan 2021]
4. OECD. Strengthening the frontline: How primary health care helps health systems adapt during the COVID 19 pandemic. OECD Publishing. 2021;(February):1-22. https://www.oecd-ilibrary.org/social-issues-migration-health/strengthening-the-frontline-how-primary-health-care-helps-health-systems-adapt-during-the-covid-19-pandemic_9a5ae6da-en

5. Ministry of Health Republic of Indonesia. Petunjuk Teknis Pelayanan Puskesmas Selama Pandemi COVID-19 (Technical Instructions for Public Health Center Services During the Covid-19 Pandemic). 2nd ed. 2021. 1-124 p.
6. WHO. COVID-19 continues to disrupt essential health services in 90% of countries. 2021. Available from: <https://www.who.int/news/item/23-04-2021-covid-19-continues-to-disrupt-essential-health-services-in-90-of-countries> (accessed 4 Sep 2021).
7. Ministry of Health Republic of Indonesia. Data Dasar Puskesmas (Public Health Centers Basic Data). 2021. <https://pusdatin.kemkes.go.id/folder/view/01/structure-data-dasar-puskesmas.html> (accessed 4 Sep 2021).
8. Ministry of Health Republic of Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 43 tahun 2019 tentang Pusat Kesehatan Masyarakat (Regulation of the Minister of Health of the Republic of Indonesia Number 43 of 2019 regarding Public Health Centers). Ministry of Health Republic of Indonesia; 2019.
9. Melvin SC, Wiggins C, Burse N, Thompson E, Monger M. The Role of Public Health in COVID-19 Emergency Response Efforts From a Rural Health Perspective. *Prev Chronic Dis.* 2020;17:200256.
10. Rhatomy S, Prasetyo TE. Impact of COVID-19 on primary care visits: lesson learnt from the early pandemic period. *Journal of Community Empowerment for Health.* 2020;3(2):102-17.
11. Mukattash TL, Jarab AS, Mukattash I, Nusair MB, Farha RA, Bisharat M, et al. Pharmacists' perception of their role during covid-19: A qualitative content analysis of posts on facebook pharmacy groups in jordan. *Pharm Pract (Granada).* 2020;18(3):1-6.
12. Merks P, Jakubowska M, Drelich E, Damian Ś. The legal extension of the role of pharmacists in light of the COVID-19 global pandemic. *Research in Social and Administrative Pharmacy.* 2021;17(1):1807-12.
13. Visacri MB, Figueiredo IV, Lima T de M. Role of pharmacist during the COVID-19 in Social and Administrative Pharmacy. 2021;17(1):1799-1806.
14. International Pharmaceutical Federation. Coronavirus SARS-CoV-2/COVID-19 Pandemic: information and interim guidelines for pharmacists and the pharmacy workforce. *FIP;* 2020.
15. Basheti IA, Nassar R, Barakat M, Alqudah R, Abufarha R, Mukattash TL, et al. Pharmacists' readiness to deal with the coronavirus pandemic: Assessing awareness and perception of roles. *Research in Social and Administrative Pharmacy.* 2021;17(3):514-22.
16. Cheong MWL. "To be or not to be in the ward": The impact of COVID-19 on the role of hospital-based clinical pharmacists—A qualitative study. *Journal of the American College of Clinical Pharmacy.* 2020;3(8):1458-63.
17. Paudyal V, Cadogan C, Fialov D, Okuyan B, Lutters M, Stewart D. Provision of clinical pharmacy services during the COVID-19 pandemic: Experiences of pharmacists from 16 European countries. *Research in Social and Administrative Pharmacy.* 2020;17:1507-17.
18. Kasahun GG, Kaysay GM, Asayehegn AT, Demoz GT, Desta DM, Gebretekle GB. Pharmacy preparedness and response for the prevention and control of coronavirus disease (COVID-19) in Aksum, Ethiopia; A qualitative exploration. *BMC Health Serv Res.* 2020;20(913):1-6.
19. Ministry of Health Republic of Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 74 Tahun 2016 Tentang Standar Pelayanan Kefarmasian Di Puskesmas (Regulation of the Minister of Health of the Republic of Indonesia Number 74 of 2016 regarding Standards for Pharmaceutical Services in PHCs). Jakarta: Ministry of Health Republic of Indonesia; 2016. p. 1-47.
20. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care.* 2007;19(6):349-57.
21. Creswell JW, Creswell JD. *Research*

- Mixed Methods Approaches. 5th Edition. California: Sage Publication; 2018.
22. Nowell LS, Norris JM, White DE, Moules NJ. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *Int J Qual Methods*. 2017;16(1):1-13.
 23. Ministry of Health Republic of Indonesia. Data Tenaga Kefarmasian yang didayagunakan di Fasilitas Pelayanan Kesehatan di Indonesia (Data on Pharmacy Workers in Health Service Facilities in Indonesia). 2020. http://bppsdmk.kemkes.go.id/info_sdmk/info/index?rumpun=105 (accessed 12 Aug 2021)
 24. Muhammad K, Saqlain M, Muhammad G, Hamdard A, Naveed M, Butt MH, et al. Knowledge, attitude, and practices (KAPs) of Community pharmacists regarding COVID-19: A cross-sectional survey in two provinces of Pakistan. *Disaster Med Public Health Prep*. 2021;16:1-9
 25. Bukhari N, Rasheed H, Nayyer B, Babar Z ud din. Pharmacists at frontline beating the COVID-19 pandemic. *J Pharm Policy Pract*. 2020;13(8):1-4.
 26. Kristina SA, Herliana N, Hanifah S. The perception of role and responsibilities during covid-19 pandemic: A survey from indonesian pharmacists. *International Journal of Pharmaceutical Research*. 2020;12(2):3034-9.
 27. Rajamani A, Subramaniam A, Shekar K, Haji J, Luo J, Bihari S, et al. Personal protective equipment preparedness in Asia-Pacific intensive care units during the coronavirus disease 2019 pandemic: A multinational survey. *Australian Critical Care*. 2020;34(January):135-41.
 28. Ministry of Health Republic of Indonesia. Keputusan Menteri Kesehatan Republik Indonesia No.HK 01.07/MENKES/5671/2021 Tentang Manajemen Klinis Tata Laksana COVID-19 di Fasilitas Pelayanan Kesehatan (Decree of the Minister of Health of the Republic of Indonesia No.HK 01.07/MENKES/5671/2021 regarding clinical management of Covid-19 in Healthcare Facilities). Jakarta: Ministry of Health Republic of Indonesia; 2021. p. 1-106.
 29. Durand C, Douriez E, Chappuis A, Poulain F, Yazdanpanah Y, Lariven S, et al. community pharmacists during the COVID-19 pandemic: a qualitative study. *J Pharm Policy Pract*. 2022 Dec 1;15(1):1-7.
 30. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: A systematic review based on current evidence. 2020;20(1193):1-9.
 31. Elbeddini A, Yeats A. Pharmacist intervention amid the coronavirus disease 2019 (COVID-19) pandemic: From direct patient care to telemedicine. *J Pharm Policy Pract*. 2020;13(1):1-4.
 32. World Bank. Data for Lower middle income, Indonesia. 2021. <https://data.worldbank.org/?locations=XN-ID> (accessed 29 Aug 2021)
 33. Keesra S, Jonas A, Schulman K. COVID-19 and Health Care's Digital Revolution. *New England Journal of Medicine*. 2020;382(23):e82(1-3).
 34. Shiferaw KB, Mengiste SA, Gullslett MK, Zeleke AA, Tilahun B, Tebeje T, et al. Healthcare providers' acceptance of telemedicine and preference of modalities during COVID-19 pandemics in a low-resource setting: An extended UTAUT model. *PLoS One*. 2021;16(4):e0250220.
 35. Strand MA, Bratberg J, Eukel H, Hardy M, Williams C. Community Pharmacists' Contributions to Disease Management During the COVID-19 Pandemic. *Prev Chronic Dis*. 2020;17(200317).
 36. Ministry of Health Republic of Indonesia. Peraturan Menteri Kesehatan Republik Indonesia No. 84 tahun 2020 tentang Pelaksanaan Vaksinasi dalam Rangka Penanggulangan Pandemi COVID-19 (Regulation of the Minister of Health of the Republic of Indonesia No. 84 of 2020 regarding the Implementation of Vaccination in the Context of Mitigating the COVID-19 Pandemic). Jakarta: Ministry of Health Republic of Indonesia; 2020.
 37. Poudel A, Lau ETL, Deldot M, Campbell C, Waite NM, Nissen LM. Pharmacist role in vaccination: Evidence and challenges. *Vaccine*. 2019;37(40):5939-45.
 38. Rhodes L, Williams D, Marciniak M, Weber D. Community pharmacists as vaccine providers. *International Journal*

- of Health Governance. 2017;22(3):167-82.
- 39.O'Connor AM, Evans AD. Dishonesty during a pandemic: The concealment of COVID-19 information. J Health Psychol. 2020;27(1):1-10.
- 40.Missel M, Bernild C, Christensen SW, Dayaran I, Berg SK. It's Not Just a Virus! Lived Experiences of People Diagnosed With COVID-19 Infection in Denmark. Qual Health Res. 2021;31(5):822-34.
- 41.Fisk RJ. Barriers to vaccination for coronavirus disease 2019 (COVID-19) control: experience from the United States. Global Health Journal. 2021;5(1):51-5.