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A Survey on Medicine Shortage in Community Pharmacies in Yogyakarta Province, Indonesia

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ABSTRACT

Access to quality healthcare has been considered an apolitical objective on a global scale. Despite this, there are occasionally shortages of medicines because they are not always readily available. A drug supply problem that necessitates a change that affects patient care and requires the use of an alternative agent is known as a medicine shortage. A shortage can occur at any point during a medicine's lifecycle and in any part of the pharmaceutical distribution chain (pharmacy, pharmaceutical company, or wholesaler). This research aims to evaluate the availability of medications in pharmacies in Special Region of Yogyakarta. A cross-sectional survey was conducted in 120 pharmacies in Yogyakarta province, during March to May 2022. WHO essential medicine indicators were used to observe the list of medicine shortage, and its characteristics, including the reasons for medicine shortages in pharmacies, classification of unavailable drugs, and the consequences of medicine shortages. Data was presented descriptively. There were 650 drug items (a total of 1560 items) in one month that were unavailable at 91 pharmacies (75.83%) at least once every six months. The active ingredients that are in short supply are atorvastatin (44.17%), diazepam (21%), azythromycin (13.33%), and haloperidol (13.21%). The medications that were in high demand were also the ones that were in short supply. The reasons for the medicine shortages were rarely communicated to the pharmacies. Customers were able to fill their prescriptions since there were usually enough alternatives. But every third time, there were problems at the pharmacy because there weren't enough medicines. Due to the potential for unhappy customers and increased workload for the pharmacy staff, these shortages may be significant for both the customer and the pharmacy.

Key words: Medicine shortage; Pharmacies; Special Region of Yogyakarta.

INTRODUCTION

Medicines are an important component of medical care because they improve patients' health and quality of life. With the advancement of manufacturing, distribution, and transportation technologies in the modern era, one would expect medication shortages to be a minor issue, with supply being quickly resolved without adverse effects on patient health and quality of life. In recent years, medication shortages have been described as a growing global issue (Phuong *et al*., 2019). A medicine shortage is defined as "a drug supply issue requiring a change that impacts patient care and necessitates the use of an alternative agent" (Heiskanen *et al*., 2015). Medication shortages or drug shortages occur when the actual or estimated demand for a given drug is insufficient to meet the demand at the end-user level. Drug shortages affect every stakeholder in the health-care system, and managing and mitigating shortages requires collaborative efforts. Drug shortages are likely to impact workload and clinical decision-making, with clinical and financial consequences to be expected.

All parties involved in the pharmaceutical supply chain, from Marketing Authorization Holders (MAHs) through wholesalers to hospitals, neighborhood pharmacies, and patients, are impacted by the problem, which poses a serious risk to the success of treatment (Heiskanen *et al*., 2015; Turbucz *et al*., 2022).

Furthermore, medication shortages may cause significant harm to health care professionals by increasing the workload of physicians and pharmacists. A few studies have found that medicine shortages occur frequently. According to a study of hospitals in the United States, nearly all of them experienced medicine shortages at least once in the previous six months. 44% of these hospitals reported 21 or more shortages in the previous six months. Medicine shortages were even more common in a Canadian study conducted in pharmacies, with nearly 94% of respondents reporting shortages in the previous week and 81% reporting shortages during their last shift. During the last week, the shortages complicated the dispensing of an average of ten prescriptions. About 89% of respondents agreed that the number of medicine shortages had increased significantly in the previous year (American Hospital Association, 2011; Pharmacists Association, 2010). Delayed treatment or switching to alternative therapies can lead to disease progression, an increased risk of side effects or medication errors, and decreased compliance. Although shortages affect all disease domains, many of the drugs involved in US drug shortages are considered high alert medications. Their scarcity has an impact not only on patient safety, but also on hospital performance when treatment or surgery must be postponed, cancelled, or transferred to other hospitals where the necessary treatments are still available (Atif *et al*., 2019, 2021; Phuong *et al*., 2019). Where generic equivalent options are available, the financial impact of drug shortages surpasses $78 million, with infectious diseases, surgery, cancer, and cardiovascular diseases having the biggest cost consequences. According to estimates, purchasing overall comparable or alternative medicinal replacements costs US hospitals roughly $215 million a year (American Hospital Association, 2011; Pharmacists Association, 2010).

However, it is important to note that patients are at danger because of the drug shortages. To ensure the highest level of patient care, the challenges in managing medicine shortages must be located and overcome. This study's objective was to evaluate the availability of medications in pharmacies in Special Region of Yogyakarta. Further objectives included determining the frequency of medication shortages as well as their causes and the issues they pose for pharmacy customers, particularly in the Special Region of Yogyakarta.

MATERIALS AND METHODS

This study used a cross-sectional survey with a previously used standard questionnaire (Heiskanen *et al*., 2015; Atif *et al*., 2019). The research team made changes to the study questionnaire through group discussions. Two experts in Faculty of Pharmacy, Gadjah Mada University, in the field of pharmacy practice research examined the items and it's relevancy to determine the content validity, resulting content validity index 0.97. Final version of questionnaire was used for pilot study, using non-sample respondents, about 20 pharmacists completed the survey as a pilot study. To make small improvements, thorough input on format, clarity, and finishing time was gathered. The self-administered validated questionnaire enquired about the characteristics of the pharmacies where respondents work, types of medicine shortage in terms of duration, type of medicine, the most common active ingredients in short supply. Additionally, the reasons behind the medicine shortage and the consequences of the medicine shortages and possible solutions were questioned. List items of drug shortage was based on World Health Organization's indicator of essential medicines, consisted of 40 essential medicines. All questions were filled by community pharmacists who responsible in working hours.

From March to May 2022, data were collected using a convenience sample method. Yogyakarta has about 600 community pharmacists, based on data from the Indonesian Pharmacists Association. As a result, the necessary sample size was calculated to be 120 individuals at a 95% confidence interval and a 5% margin of error. We distributed our online survey to over 200 pharmacists who worked in community pharmacies to assure sample adequacy due to the low response rate of internet surveys. Participants were first approached using their Facebook or WhatsApp accounts. After obtaining the confirmation, we sent an email to every pharmacist with a cover letter outlining the study, a link to the online survey, and the participant's informed consent. We sent up to five reminder messages

(one reminder after 1 week) to participants, prompting them to complete the survey. This study procedure was approved by Ethical Committee in Medical and Health Research, Gadjah Mada University no KE/FK/0126/EC/2022.

The Statistical Package for Social Sciences (SPSS V.20) was used to conduct the analysis after the data had been initially coded and entered MS Excel. Descriptive statistics were used for categorical items, utilizing frequencies and percentages. It was reasonable to report information about medicine shortages as a percentage. An alpha of 0.05 was used to evaluate statistical significance. The results were displayed as percentages (frequencies). The open-ended questions' responses were tallied and thematically analyzed.

RESULTS AND DISCUSSION

A total of 91 pharmacies (75.83%) experienced a medicine shortage at least once every six months, with 650 drug items (a total of 1560 items) in one month (Table I). During the study period, medicine shortages occurred three or more times per week in 22 pharmacies (18.33%), once or twice per week in 65 pharmacies (54.17%), and less than once per week in 86 pharmacies. The type of medicine experiencing a medicine shortage is branded drugs, with 140 items out of a total of 1560 items unavailable, followed by prescription medicine with 97 items and OTC medicine with 48 items (Table I). The active ingredients that have a short supply are Atorvastatin (44.17%), Diazepam (21%), Azythromycin (13.33%), and Haloperidol (13.21%).

The findings of a survey on the causes of the medication shortage in 120 pharmacies in Special Region of Yogyakarta (Table II). Excessive demand or inadequate supply was cited by 65% of respondents as the cause of the drug shortage in pharmacies; 46.67% cited poor management of the drug supply; and 26.67% cited discontinuations. Then 20.83% of respondents said there were insufficient raw materials, 12.50% said there were manufacturing or licensing issues, 10.00% acknowledged drug abuse or misuse, and 14.17% said they were unknown.

The classification of unavailable drugs in 120 pharmacies in Special Region of Yogyakarta, with a total of 1560 drug items (Figure 1). The graph shows that cardiovascular system drugs were the most frequently unavailable (356 items), followed by central nervous system drugs (310 items), and endocrine system drugs (120 items). Furthermore, ear, nose, and oropharynx drugs (119 items) and gastro-intestinal system drugs (112 items) were among the drugs with a medication shortage.

Overall, 63.33% of pharmacies acknowledged that there was a medicine shortage, the customer was dissatisfied, 47.50% felt that the workload of the pharmacy staff had increased, 35.83% claimed that the customer was left without a suitable medicine, 26.67% reported an increase in prescribing errors, and 18.33% felt that patient adherence had decreased. The impact of the medicine shortage is felt by 65% of pharmacies. To reduce the occurrence of medication shortages, 55.83% of pharmacies have a solution to borrow medicine from other pharmacies, and 37.50% provide customers with substitute drugs (Table I).

Drug shortages are a complicated and becoming worldwide issue. Although they have been extensively studied in the US and Europe, little empirical research has been done in Indonesia, a low-middle income country, even though there are many reports suggesting they happen often there. Based on the experiences of community pharmacists in Yogyakarta Province, this study investigates the phenomenon of drug shortages. The purpose of this study was to assess medicine shortages in pharmacies in Special Region of Yogyakarta. Further goals were to investigate how frequently medicine shortages occur, the causes of medicine shortages, and the problems that medicine shortages cause for customers in pharmacies, particularly in the Special Region of Yogyakarta. World Health Organization (WHO) defined "access to medicines" as a multifaceted problem considering rising drug prices and ongoing medicine shortages, among other things. Out-of-pocket payments are another source of concern, particularly in low and middle-income countries (LMICs), where medicine costs can account for up to 70% of total health-care spending and can be disastrous for patients and their families if they become ill (Acosta *et al*., 2019; Batista *et al*., 2019). Worldwide, healthcare professionals and healthcare systems spend millions of hours and hundreds of millions of dollars managing medicine shortages (Tucker *et al*., 2020). Medicine shortages affect a wide range of medicines from various pharmacological groups, including those used to treat communicable and noncommunicable diseases (Bocquet *et al*., 2017; Yang *et al*., 2016).

Table I. Medicine shortage characteristics (n=120)

Medicine shortage characteristics	**N**	**%**
Having medicine shortages at least once within the last 6 months	91	75.83
Total number of drugs that were unavailable within one month (1560 items in total)	650	41.67
Had medicine shortages during the study period:		
Daily or almost daily (three or more times per week) 17.1%	22	18.33
Weekly (one to two times per week)	65	54.17
Less frequently than weekly	86	71.67
Type of medicine		
Prescription medicine	97	80.83
OTC medicine	48	40.00
% of branded unavailable vs total item (1560)	140	8.97
The most common active ingredients in short supply:		
Atorvastatin	53	44.17
Diazepam	21	17.50
Azythromycin	16	13.33
Haloperidol	15	13.21

Table II. The reasons behind the medicine shortage (n=120)

The reasons:	**N**	**%**
Excess demand/inadequate supply	78	65.00
Poor medicine supply management	56	46.67
Discontinuations	32	26.67
Lack of raw materials	25	20.83
Manufacturing/licensing issue	15	12.50
Misuse/abuse medications	12	10.00
Unknown	17	14.17

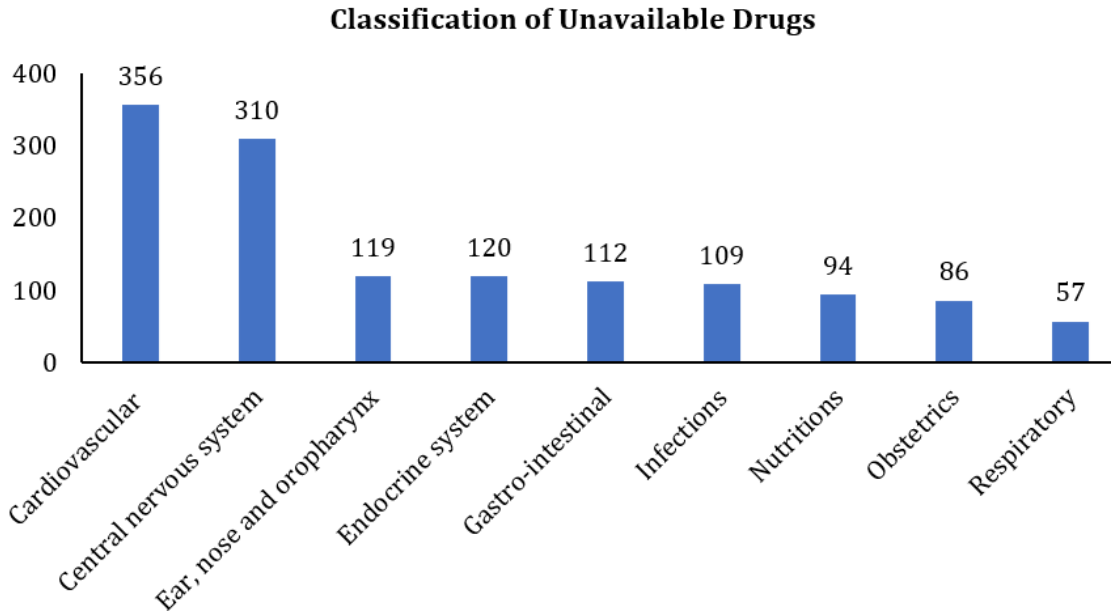

Figure 1. Classification of unavailable drugs (n=1560)

Table III. Consequences of medicine shortages (n=120)

The consequences of the medicine shortages:	**N**	**%**
The customer was unsatisfied	76	63.33
Increase the workload of the pharmacy staff	57	47.50
The customer was left with no suitable medicine	43	35.83
Increase prescribing inaccuracies	32	26.67
Reduce patient adherence	22	18.33
Medicine shortages caused problems for the pharmacies?		
Yes	78	65
Solution (n=78):		
The medicine had to be borrowed from another pharmacy	67	55.83
The customer was given a substitution of medicine	45	37.50

According to the study's findings, a total of 91 pharmacies (75.83%) reported a shortage of 650 drug items (a total of 1560 items) in a single month. Medicine shortages occurred three or more times per week in 22 pharmacies (18.33%), once or twice per week in 65 pharmacies (54.17%), and less frequently in 86 pharmacies during the study period. Branded drugs, which make up 140 of the 1560 available items, are the most in short supply, followed by prescription drugs (97 items) and over-the-counter drugs (48 items). Atorvastatin (44.17%), Diazepam (21%), Azythromycin (13.33%), and Haloperidol (13.21%) are the active ingredients that are in short supply. Based on the research by Atif *et al* (2019), azithromycin and diazepam are two medications that are in short supply in Pakistan over the previous 12 months (Atif *et al*., 2019). According to the American Society of Health-System Pharmacists (ASHP), 224 medicines were in short supply by the end of June 2018 (up from 146 at the end of 2017) (American Society of Health-System Pharmacists, 2021). The impact of drug supply and demand cannot be separated from the issue of drug availability.

This applies to other pharmaceutical supplies that are used in healthcare services in addition to medications. Several factors can affect a medical facility's drug availability. Due to issues with the demand for pharmaceutical supplies, the supply of pharmaceutical supplies, and regulations pertaining to the supply of pharmaceutical supplies, pharmaceutical supplies are in short supply. The availability of pharmaceutical supplies can also lead to issues with manufacturing, a lack of raw materials, logistics issues, and business issues. Drug shortages have an impact on humanistic, clinical, and economic aspects (AL-hawawsheh, 2019; Cahaya *et al*., 2022; Kanda & Iravo, 2015).

Most shortages in Indonesia comprised low-cost generic prescription medications. Prescription medications are thought to be particularly prone to manufacturing challenges or quality problems because of how complex the production process is, how stringent the quality standards are, and how little room there is for error. Generic prescription medicine shortages can occasionally be attributed to generics' unattractiveness to consumers. The reasons for the drug shortage in pharmacies were cited by 65% of respondents as being either excessive demand or insufficient supply, poor management of the drug supply by 46.67%, and discontinuations by 26.67%. Insufficient raw materials were cited as a problem by 20.83% of respondents, manufacturing, or licensing issues by 12.50%, drug abuse or misuse by 10% of respondents, and unknown by 14.17% of respondents. Medicine shortages affect a wide range of therapeutic areas and are not just a problem for essential medications as the World Health Organization defines them (Blankart & Felder, 2022; Think Tank | European Parliament, 2020; Vyas *et al*., 2019). Many factors influence the supply and demand for pharmaceutical supplies, including health insurance financing, regulation of pharmaceutical product registration and imports, pharmacists' level of knowledge as pharmaceutical service providers, changes in disease patterns, disasters, and wars (Cahaya *et al*., 2022). Drug care must be interrupted, changed, or substituted by doctors due to shortages. Patients may experience negative outcomes as a result, and the price of their care may increase. Most frequently, quality issues related to the production of medicine and the supply chain are at the heart of shortages (de Weerdt *et al*., 2015; Woodcock & Wosinska, 2013). In mature multisource markets where the brand name of a formerly patented drug and one or more

equivalent generic versions are available, shortages are common (Blankart & Felder, 2022).

The classification of unavailability of drugs in 120 pharmacies in Special Region of Yogyakarta (n=1560) revealed that cardiovascular system drugs (356 items) and drugs for the central nervous system (310 items) were the most frequently unavailability (120 items). Additionally, among the drugs with a medication shortage were those for the gastro-intestinal system (112 items) and the ear, nose, and oropharynx (119 items). This condition is different from Kenya, where the most frequently identified essential medicines that were out of stock were anesthetics, antibiotics, cancer treatments, and cardiovascular medications, though it is not a new phenomenon (Martha Wangu & Onyango Osuga, 2014).

The results of a survey of 120 pharmacies in the Special Region of Yogyakarta regarding the effects of a medication shortage showed that 63.33% of pharmacies acknowledged a medicine shortage, the customer was dissatisfied, 47.50% felt that the workload of the pharmacy staff had increased, 35.83% claimed that the customer was left without a suitable medicine, 26.67% reported an increase in prescribing errors, and 18.33% reported that there was a customer left without a medicine. 65% of pharmacies are affected by the medication shortage. Based on Raikabakaba *et al*.(2022), 50 people were interviewed, and out of those, 98% agreed that staff workload was increased by the lack of drugs, and all key informants agreed that patients' quality of care was compromised; and when asked about the impact of drug shortage on clinical practice, 90% key informants agreed of the time that it forces patient management to diverge from the recommended course of treatment and turn to less effective or inferior alternatives (Raikabakaba *et al*., 2022). To reduce the occurrence of medication shortages, 37.50% of pharmacies offer customers substitute medications, and 55.83% of pharmacies have a solution to borrow medication from other pharmacies. To prevent drug vacancies, coordination between various parties is required when carrying out drug management. Drug shortages are a widespread issue that affects nations with low, middle, and high incomes. Various approaches have been developed by numerous nations to address this issue (Kanda & Iravo, 2015; Shukar *et al*., 2021). Based on study findings, a comprehensive collaborative institutional, societal, and patient-centered approach is advised in order to successfully reduce medication shortages in Indonesia. From a research perspective, this study offers a strong evidence for future multidimensional surveys that can better estimate and further access the impact, underlying causes, and potential solutions of drug shortages to provide recommendations to policymakers.

Despite being the first study to examine the occurrence of medicine shortages and suggested policy solutions, this study has few limitations. Since there are currently very few pharmacies that formally record this data, we first evaluated the occurrence of shortages using self-reported data from community pharmacists rather than formal databases or reports. Second, because a convenience sample was used for the study and more community pharmacist from metropolitan areas participated, the findings may be limited. Finally, this study did not include hospital pharmacists or other healthcare specialists like doctors and nurses. Future quantitative research examining drug shortages in hospital pharmacies may be conducted.

CONCLUSIONS

According to this study, medicine shortages are a common occurrence in pharmacies in Special Region of Yogyakarta. Additionally, medications that were in short supply were ones that were widely used. Rarely were the pharmacies informed of the causes of the medicine shortages. Most of the time, pharmacies were unaffected by medicine shortages, and customers received their prescriptions thanks in large part to the availability of substitutes. The pharmacy did experience issues in every third instance, though, due to the lack of available medications. These shortages could be important for the customer or the pharmacy because they could result in unhappy customers and add to the workload of the pharmacy staff.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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