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A Systematic Review of Determinants Influencing Drug Availability in Community Health Centers in Indonesia

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ABSTRACT

Background: Drug availability in community health centers is a critical component in delivering quality health services to the community.drugSeveral factors influence drug availability, including the procurement process, stock management, and geographic distribution of health facilities.

Objectives: This study aims to to review the factors that influence drug availability in Indonesian community health centers.

Methods: This study conducted a systematic review of published articles in English that reported on factors influencing drug availability published during year 2016 to 2024. Relevant studies were located through an extensive search from four database (Scopus, PubMed, GARUDA, and Google Scholar). These keywords provide the necessary information. The quality of the included studies was assessed using Joanna Briggs Institute JBI critical appraisal tools, including extensions tailored to various systematic review research designs.

Results: Initially, 996 identified articles were screened by titles, abstracts, and full texts based on predefined inclusion and exclusion criteria, resulting in 25 eligible studies. This review identified twenty-fivestudies that focused on various regions in Indonesia, from large urban areas to remote areas. The main factors influencing drug availability include inadequacy planning and procurement processes, lack of knowledge, lack of pharmaceutical personnel, change in disease patterns and prescription patterns, the suboptimal use of the management information system and limited availability of drug at Health Office.

Conclusion: Suboptimal drug availability continues to occur frequently across various regions in Indonesia. Key improvement efforts should focus on increasing knowledge of drug management, the number of pharmacies, and providing a sufficient budget for the procurement of drug.. Future research should prioritize areas outside the main islands to develop targeted solutions to address local challenges.

Keywords: Community Health Centers; Drug Availability; Factor Influencing

INTRODUCTION

Community health centers are vital healthcare facilities that provide comprehensive primary care services, particularly to underserved community populations. These centers focus on promoting health equity and addressing social determinants of health, thereby improving overall community health outcomes.[1] According to the Regulation of the Minister of Health of the Republic of Indonesia, a Community Health Center is a health service facility or facility which has the aim of carrying out first-level public and individual health services, with

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an emphasis on promotive and preventive care.[2] However many community health centers remain heavily involved in curative services due to ongoing systemic challenges.[3]

The World Health Organization (WHO) defines essential drugs as those that meet the health care needs of the majority of the population and are available at all times in adequate quantities and at prices that are affordable to the community.4 WHO has set a target of 80% availability of affordable essential drug by 2025, especially for non-communicable diseases (NCDs).[4]

One of the objectives of the pharmacy program as outlined in the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/Menkes/422/2017 which came into effect on August 29, 2017 is to increase the availability of drug and vaccinesat community health centers [5] Community Health Centers play an important role in drug management with a focus on planning, procurement, distribution and reporting. The main goal is to ensure the consistent availability of medications for patients. Effective management in a drug warehouse is crucial aims to guarantee that drugs are available in sufficient quantities and of assured quality, supported by accurate and comprehensive drug planning. The procurement process involves selecting appropriate drug, qualified suppliers, and timing and receipt of drug, to avoid supply stagnation or shortages that could impact the quality and safety of drug.[6]

Drug availability in community health center facilities is influenced by several key factors, including efficient inventory management, appropriate procurement strategies, timely and targeted drug distribution, and rational use of drug. In addition, the competence of pharmaceutical human resources (HR) and optimal management information system support are very important to ensure effective drug management. By managing these factors holistically, health care facilities can improve drug accessibility and support the provision of quality health services.[7] High prices and inadequate health care infrastructure hinder access to essential drug, especially in developing areas.[8]

The main goal of proper drug distribution is to ensure that the drug received by each health facility are of good quality, in sufficient quantity, and appropriate to meet the patient's needs. With an effective distribution system, it is hoped that it can minimize drug waste (expired or damaged), increase drug availability, and ultimately improve the quality of health services.[9]

Drug availability at community health centers in Indonesia remains a challenge, particularly in remote areas, and there are limited studies that systematically evaluate the influencing factors. By reviewing the recent research findings and advances in this field, we can gain valuable insights into the most effective strategies for addressing drug shortages. Implementing innovative and appropriate interventions can help maximize drug availability at community health centers.This study is the first systematic review of drug availability in community health centers. To date, such a systematic review has not been previously reported. While no prior systematic review has specifically evaluated drug availability at community health centers in Indonesia, several international reviews have addressed broader issues of essential drug availability in low- and middle-income countries. A systematic review by Ewen et al[4] found that the availability of essential drugs for non-communicable diseases remained below the WHO target of 80% in most low- and middle-income countries, with significant variability across regions. Similarly, a global review conducted by Cameron et al[10] highlighted persistent gaps in both the availability and affordability of essential medicines, particularly in community-level care facilities. However, these studies did not focus specifically on Indonesia's community health centers, underscoring the need for a dedicated systematic review to understand local challenges and contextual factors.

METHODS

Study design

This systematic review includes 25 studies comprising quantitative, qualitative, and mixed-method research designs. A descriptive approach was used to describe drug availability. Data were collected through document analysis and descriptive statistics were applied to describe the characteristics of drug availability. The literature review focuses on studies conducted between 2016 and 2024.[6,7,11–33]

Search strategy

The preparation of this systematic review follows the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines. Several health-related databases, such as Google Scholar, GARUDA, PubMed, and Scopus, were thoroughly searched. To ensure the completeness of relevant data, additional searches were also conducted through WHO databases, government reports, discussion papers, gray literature, and references from extracted articles. The keywords used were selected based on the Medical Subject Headings (MeSH) from the US

National Library of Medicine: (“drug availability” AND “Community Health Center” AND “Factors Influencing” AND “Indonesia”).

Eligibility criteria

The studies examining drug availability at community health centers (Puskesmas) in Indonesia, and the factors influencing it. Articles included in this systematic review were published within the last 10 years with most using a systematic and evaluation approach. All studies reviewed were written in English. Study were excluded if (1) focused solely on theoretical or conceptual definitions of drug availability without presenting empirical data; (2) did not discuss factors influencing drug availability; (3) failed to meet minimum quality assessment scores based on the JBI checklist; (4) were review articles; or (5) did not provide access to full text.

Quality assessment was carried out using the Joanna Briggs Institute (JBI) evaluation tool for systematic review, which analyzes aspects such as research methodology, drug availability indicators, study design, data analysis, and interpretation and conclusions of research findings. The JBI tool was selected because it provides specific and standardized checklists for systematic review designs, making it suitable for reviews that include diverse methodologies. This approach ensures a comprehensive and consistent quality assessment across all included studies. The evaluation aims to ensure that each study’s methodology meets JBI quality standards, thereby making the findings reliable, relevant, and useful for clinical practice in Community Health Centers.

Data Extraction

An analysis of various studies conducted in the last 9 years (2016-2024) highlights the strong interest among researchers in researching the availability of drugs and the factors that influence them in community health centers (CHC). This is evident from the numerous scientific publications addresing this topic. Each city seems to offer its own narrative about how CHCs face challenges in ensuring acces to essential drug for their communities. These studies have been conductedaccros a wide range of regions in Indonesia, from major cities to rural district. Some of the research locations mentioned in the table include Central Java Province (Surakarta, Brebes, Tegal, Kendal, Sukoharjo, Magelang, Boyolali), East Java Province (Tulungagung, Jombang), West Java Province (Depok, Bekasi), Aceh Province (West Aceh), Bengkulu Province (Bengkulu), Southeast Sulawesi (Baubau), North Sulawesi (Mando, Tomohon), East Sulawesi (Enrekang), North Kalimantan Province (Gunung Mas), East Kalimantan (Banjarmasin), East Nusa Tenggara (Kupang), West Nusa Tenggara Province(Lombok), Maluku Province (Central Maluku), Papua Province (Keerom).[6,7,11–33]

All articles collected were geographically well-distributed accros Indonesia, covering cities and districts from both large and small islands. Two studies were conducted on Kalimantan Island [6,29], twelve studies were conducted on Java Island [11-13,15-16,19-21,25,31-33], two studies were conducted on Timor Island[14,23], one study was conducted on Lombok Island[26], one study was conducted on Maluku Island[22], four studies were conducted on Sulawesi Island[17,18,28,30], two studies were conducted on Sumatera Island[24,27] and one study was conducted on Papua Island[7]. The categorization was based on the United Nations Conference on Geographical Naming of Indonesia in 2017. Data extraction in this study includes study characteristics (author, year, location, study design), drug availability indicators (percentage or duration in months, descriptive narrative), and factors identified as influencing drug availability. These factors include procurement processes, planning accuracy, distribution systems, and human resource capacity.

Data Analysis

Once the source search was completed, Mendeley Desktop V1.19.8 software was used to organize the included studies. In the initial stage, studies whose titles and abstracts did not meet the inclusion criteria were excluded. The authors then retrieved and reviewed the full texts of the remaining articles.

For data extraction, a structured table form was created. Data related to the drug distribution process at community health centers were collected to assess the level of drug availability. Additional relevant information related to various dimensions was collected for each study, including (1) study overview, (2) research methods, (3) percentage of drug availability, and (4) factors affecting drug availability. All percentages of drug availability were adjusted according to calculations and formulas for calculating drug availability. After summarizing all data in a table form, the authors were able to eligible clinical studies (reporting factors related to drug availability in community health centers), as well as clinical trials that did not meet the inclusion criteria.

RESULTS AND DISCUSSION

Eligibility criteria result

All included studies underwent quality assessment using the Joanna Briggs Institute (JBI) critical appraisal checklists selected according to each study's design. A total of 25 studies met the majority of the quality criteria (at least 60%), indicating a low risk of bias. Overall, the methodological quality of the included studies was considered sufficient to support the synthesis of findings (see Table I).

Table I. Methodology and Quality Assessment of Selected Studies

No	Author	Year	Number of service units	Method	Quality assessment results using JBI (%)
1.	Saputera et al[6]	2023	1	Quantitative	75.0
2.	Carolien et al[7]	2017	6	Mix method	87.5
3.	Rukmana et al[11]	2023	1	Quantitative	87.5
4.	Indrayanti et al[12]	2020	34	Quantitative	75.0
5.	Richa et al[13]	2022	1	Quantitative	75.0
6.	Lutsina et al[14]	2021	11	Mix method	87.5
7.	Prasetyo et al[15]	2016	17	Mix method	75.0
8.	Hendri et al[16]	2018	22	Mix method	87.5
9.	Maspekeh et al[17]	2018	7	Mix method	87.5
10.	Ammirudin EE & Septarani WI[18]	2019	1	Qualitative	80.0
11.	Alfian et al[19]	2020	10	Quantitative	100.0
12.	Hilmawati et al[20]	2020	1	Qualitative	80.0
13.	Cholilah et al[21]	2021	8	Mix method	87.5
14.	Tualeka et al[22]	2021	9	Mix method	87.5
15.	Rintanantasari et al[23]	2021	22	Mix method	87.5
16.	Muslim Z & Laksono H[24]	2021	12	Qualitative	70.0
17.	Mustika et al[25]	2022	1	Quantitative	75.0
18.	Almahera et al[26]	2022	13	Mix method	87.5
19.	Safitri A & Wahyuni SS[27]	2022	1	Qualitative	80.0
20.	Kawulusan et al[28]	2023	1	Mix method	87.5
21.	Dharma WST & Cristiana C[29]	2023	1	Quantitative	75.0
22.	Kunnu et al[30]	2023	14	Quantitative	87.5
23.	Listiana et al[31]	2024	1	Quantitative	75.0
24.	Kurnilia et al[32]	2024	2	Mix method	75.0
25.	Hananto et al[33]	2024	2	Mix method	75.0

Search strategy result

The search process for this review is illustrated in the PRISMA diagram (Figure 1). A total of 996 studies were identified through the database searches: 883 articles from Google Scholar, 70 articles from GARUDA, 31 articles from PubMed, and 12 from Scopus. There were no disagreement during the search process. After the initial screening, 143 articles were excluded due to duplication and 786 articles were excludedby automation tools for not meeting the eligibility criteria. After duplicates were removed, the remaining titles and abstracts were screened for relevance to the systematic review, leaving 67 articles. Of these, 4 articles were excluded because they were review article and 21 articles were deemed not relevant to research focus. Ultimately, 34 articles were fully reviewed for eligibility, but 9 were excluded because the full text was not available, did not meet the inclusion criteria, or were qualitative studies. The final systematic review included 25 articles.

Characteristic Study

The articles were divided into two categories based on their focus: Two articles discussed drug management including drug availability in community health centers, while the remaining four articles focused directly on drug availability in community health centers. The included studies employed a variety of research methods, including quantitative, qualitative, and mixed method approaches.

Description of the Availability of Drugs

Drug availability drugs at community health centers serves as a key performance indicator in drug management. Effective drug management can ensure the continious availability of drugs when needed, in adequate quantities and with guaranteed quality to support quality services in community health centers.[14]

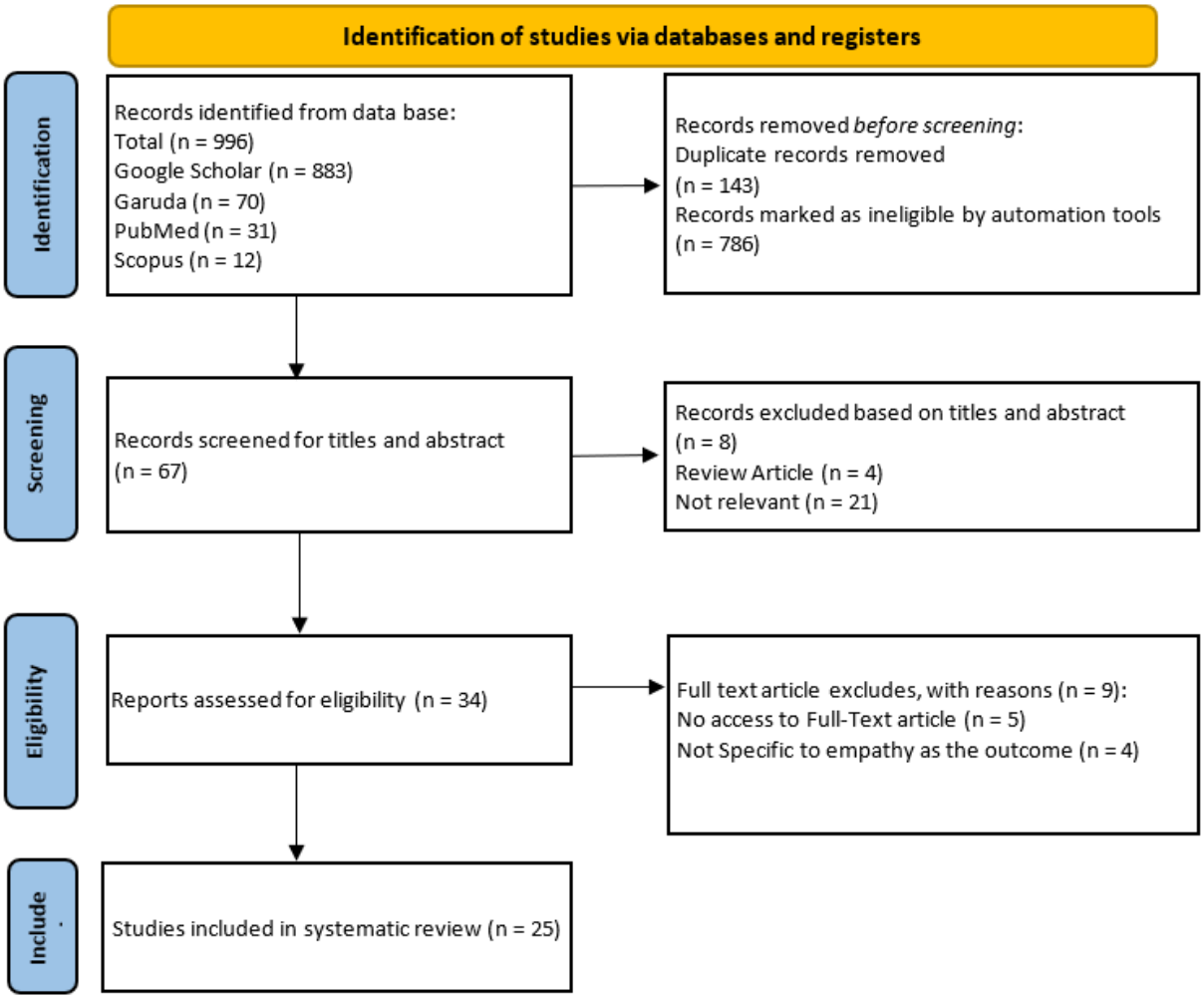

Figure I. PRISMA flow diagram for study selection

The level of drug availability is categorized into four groups: empty stock (< 1 month), insufficient stock (< 12 months), safe stock (12 – 18 months), and excess stock (> 18 months).[34] Data from various studies conducted between 2016 and 2024 reveal discrepancies between the level of drug availability and the ideal standard. These studies, carried out across different regions of Indonesia, reported drug availability in terms of months, percentage stock units (safe, insufficient, empty, and excess stock), and descriptive narratives.

As shown Table II. Characteristic of Included studies, data indicate that many community health centers have drug availability levels exceeding the recommended standards. The excess stock category of drug can be identified in Central Java Province, namely in Kendal (31,5 months)[13], Surakarta (33,13 & 33,95 months)[15], (19,95 months)[16], Tegal (36,08 months)[21], Sukoharjo (18,25 months)[32]; in East Java Province, namely Tulungagung (27,69 months)[23]; East Nusa Tenggara province (31,42 months)[23]; West Nusa Tenggara province (28,67 months)[26]. These findings suggest that drug consumption is relatively low compared to the stock held at the beginning of the year and the amount of drugs received throughout the year. Excessive stock can lead to increased waste and raises the risk of drugs expiring or being damaged during storage.[34]

In addition, several studies indicate that drug availability in community health centers is generally within safe stock range, though excess stock still occurs. Based on research conducted by Lutsina et al[14], the average level of drug availability in 11 community health centers in Kupang (East Nusa Tenggara) was still within the standard, namely 12-18 months (safe stock), but there was 1 community health center with an availability level of 26.94 months (not standard because the level of drug availability is excessive). Carolien et al[7]

found that the availability of drug at community health centers before and after National Health Insurance 2014 in Papua was safe, namely 13.9 months and 14.8 months, with an average level of drug adequacy of 72.9±6.1% and 70.9±6.1%, still below the WHO's recommended standard of 90%.

Table II. Characteristics of included studies

No	Author	Year	City	Overview	Standard	Factors Influencing Drug Availability
1	Saputera et al[6]	2023	Banjarmasin	In 2021, the average level of drug availability at the Pekauman Community Health Center was 8.71 months, which falls into the "insufficient" category. Regarding the classification of drug availability, the center reported 55.70% of drugs as out of stock, 34.25% as adequately available ("safe"), and 10.05% as excess stock.	12-18 months	An increased number of patients leads to higher drug availability. Information on drug indications affects drug availability. Proper drug distribution reduces the risk of expired stock. Proper drug management prevents drug shortages in health facilities. Effective drug procurement ensures optimal drug availability.
2	Carolien et al[7]	2017	Papua	The availability of drugs in community health centers before and after National Health Insurance (JKN) in 2014 was considered safe, with average durations of 13.9 months and 14.8 months. However, the average level of drug adequacy was 72.9% ± 6.1% before and 70.9% ± 6.1% after JKN, both of which fall short of the WHO standard for drug availability, which is 90%.	12-18 months	The request process remains suboptimal. Insufficient and uneven distribution of drugs. Lack of pharmacists. Inadequate support for drug distribution costs. Inaccurate data for drug planning. Geographical challenges affecting drug delivery. Delays in reporting drug needs. Inadequate training for drug managers.
3	Rukmana et al[11]	2023	Bekasi	The level of drug availability at the Margamulya Community Health Center was 17.44 months, which falls within the standard indicator range of 12-18 months. However, some drug supplies remained unused, leading to an excess stock and a low Inventory Turn Over Ratio (ITOR), indicating inefficiencies in inventory utilization.	12-18 months	Lack of Information Update in Pharmacy Services. Inaccurate drug planning due to Human error. Limited number of Pharmacy Staff. Fluctuating disease cases affect drug demand.
4	Indrayanti et al[12]	2020	Jombang	Several drugs experienced shortages and were out of stock with a stock-out rate of 16.83%.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	Increased patient visits. The availability of drug at the Health Office is still lacking.

Continuation of Table II. Characteristics of Included Studies

No	Author	Year	City	Overview	Standard	Factors Influencing Drug Availability
5	Richa et al[13]	2022	Kendal	The drug availability indicator was 31.5 months, which exceeds the standard range and indicates inefficient stock management. Additionally, 2% of drugs were expired, and the dead stock rate reached 32%. These figures suggest that management efficiency must be improved to ensure optimal inventory levels and compliance with drug availability standards.	12-18 months	Drug supply management directly impacts operational costs. Distribution systems must meet local health care needs. Storage conditions affect drug quality and availability.
6	Lutsina et al[14]	2021	Kupang	The average level of drug availability across 10 community health centers in 2019 fell within the safe stock category, which is 12-18 months. However, one Community Health Center reported an excessive drug availability level of 26.94 months, indicating overstocking.	12-18 months	The procurement process significantly influences the availability of drug in health facilities. Rational drug use impacts the availability and accessibility of drugs. Stock management affects drug. availability and distribution efficiency. Compliance with standards ensures optimal drug availability in healthcare settings.
7	Prasetyo et al[15]	2016	Surakarta	The average level of drug availability at treatment and non-treatment community health centers in 2015 was 33.13 and 33.95 months, respectively.	12-18 months	Lack of pharmacists. Inaccurate data for drug planning.
8	Hendri et al[16]	2018	Brebes	This study evaluated the management of PONED drugs in the Brebes District, including the level of drug availability in community health centers. The results showed that the level of drug availability was 19.95 months, indicating that drug stocks were excessive.	12-18 months	Inaccurate drug planning Lack of pharmaceutical pharmacists
9	Maspekeh et al[17]	2019	Tomohon	The average level of drug availability was 15.89 months with 5.97% classified as insufficient stock; 76.88% as safe stock; and 17.15% as excess stock.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	Lack of training in drug management Limited availability of drug at distributors Suboptimal use of the Management Information System.

Continuation of Table II. Characteristics of Included Studies

No	Author	Year	City	Overview	Standard	Factors Influencing Drug Availability
10	Ammirudin EE & Septarani[18]	2019	Baubau	The availability of drugs at the Meo-Meo Community Health Center does not adequately meet the community's needs.	-	Drug procurement planning is only based on consumption patterns in the previous year. Lack of pharmacists in health centers. Lack of knowledge of health center managers in carrying out proper planning. There are drug items that are needed but there is no stock at the Health Office.
11	Alfian et al[19]	2020	Malang	The average drug availability across 10 community health centers was 64,19%, with 20% classified as good, 70% as moderate and 10% in the poor category.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	There was an excess workload so the performance of officers was not optimal. Lack of training to improve the knowledge of pharmaceutical officers.
12	Hilmawati et al[20]	2020	Depok	Community health centers occasionally experienced stock shortages in 2019	-	Out-of-stock from the supplier Long waiting time for drug Lack of human resources
13	Cholilah et al[21]	2021	Tegal	The availability of drug at the community health center was 36.08 months with. The stock categories included 37.94% safe stock, 14.01% insufficient stock, 41.76% excess stock, and 4.49% non-prescribed drug items.	12-18 months	Too much workload Lack of knowledge of human resources themselves about a good drug management system The planning and request processes are still not good.
14	Tualeka et al[22]	2021	Central Maluku	The average percentage of 17 indicator drug at the community health center in Central Maluku District was 85.35% ± 9.30%, with 45% ± 11.5% classified as safe stock and 55% ± 11.5% categorized as excess stock.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	Lack of training on drug management. Unavailability of management information systems in health centers. Lack of pharmaceutical personnel.
15	Rintanantasari et al[23]	2021	Tulungagung & Kupang	Data in Tulungagung District (27.69 months) and Kupang City (31.42 months) in 2018 indicate that the level of drug availability remains highly excessive.	12-18 months	There is a change in disease patterns Inaccurate drug planning calculations Changes in disease patterns in community health centers

Continuation of Table II. Characteristics of Included Studies

No	Author	Year	City	Overview	Standard	Factors Influencing Drug Availability
16	Muslim, Z., & Laksono, H.[24]	2021	Bengkulu	The report on drug availability in community health centers shows a good category with a percentage of 97%. However, this report assessed the presence or absence of drugs, without considering the actual quantity available.	-	Late approval of drug purchase budgeting Long drug procurement process. Late distribution from factories, health offices to community health centers Procurement practices directly influence generic drug availability. Prescribing practices may shift from generics to patented drug
17	Mustika et al[25]	2022	Magelang	In December 2020, the level of drug availability at Muntilan II Health Center was still excessive on average, with excess stock items accounting for 87.21%.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	The existence of doctor mutations affects the prescription pattern in health centers The information system is not yet optimal
18	Almahera et al[26]	2022	Central Lombok	The average level of drug availability at 13 community health centers was 28,67 months.	12-18 months	Inappropriate planning and requesting stages. The large workload makes the performance of officers less than optimal
19	Safitri, A., & Wahyuni, S.S.[27]	2022	West Aceh	Lack of drug availability often occurs in health centers	-	Delay in delivery by supplier affect drug availability Increase in the number of visitors
20	Kawulusan et al[28]	2023	Manado	The availability of drug at the Kombos Community Health Center is mostly in the safe category (55,88%), but several drug items fall into the empty (28,43%), insufficient (3,93%), and excess (11,76%) categories.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	There are changes in drug prescribing patterns that can affect the excess stock of certain drug. There is a shortage of drug at the district pharmacy installation. Long waiting times for drugs
21	Dharma, W.S.T., & Cristiana, C.[29]	2023	Gunung Mas	The level of drug availability was 1.3 months, indicating that the drug availability at the health center is still insufficient.	12-18 months	There are changes in disease patterns. Obstacles in the planning and procurement process. Shortage of pharmaceutical personnel.
22	Kunnu et al[30]	2023	Enrekang	the availability percentage of 40 national indicator drug items at Enrekang's community health centers was categorized as safe at 56%, empty at 4.4%, insufficient at 10.5%, and excess at 29.1%.	Safety stock: 100% Empty Stock: 0% Less stock: 0% Excess stock: 0%	Inappropriate drug planning Inadequate drug availability in IFK Shifting disease patterns and treatment patterns

Continuation of Table II. Characteristics of Included Studies

No	Author	Year	City	Overview	Standard	Factors Influencing Drug Availability
23	Listiana et al[31]	2024	Boyolali	The level of drug availability was 14,53 months.	12-18 months	Drug planning is based on the consumption method
24	Kurnilia et al[32]	2024	Sukoharjo	The level of drug availability was 18.25 months at Bulu Community Health Center and 12.18 months at Mojolaban Community Health Center.	12-18 months	Inappropriate drug planning Changes in disease patterns Provision of drugs from District Pharmacy Installation that do not match the request
25	Hananto et al[33]	2024	Sukoharjo	The drug availability at Community Health Center X was 17.32 months, with excess stock items accounting for 18.09%. At Community Health Center Y, drug availability was 13.55 months, with excess stock items at 11.11%.	12-18 months	Disease patterns from previous years to current ones are different. Human resource factors originate from pharmaceutical personnel and prescription writers.

Furthermore, a study by Maspekeh et al[17] showed that the drug availability in community health centers in North Sulawesi was 15.89 months, which falls into the safe category. Yet, when broken down by stock levels, 5.97% of drugs were insufficiently stocked, 76.88% were in the safe category, and 17.15% were in excess. These findings suggest that although the overall drug availability in community health centers may be considered safe, specific drugs may still be understocked or overstocked.

Drug availability below the standard has also been reported in several studies. A study conducted by Dharma et al[29] in Gunung Mas (North Kalimantan) showed that the availability of drugs was only 1.3 months, which is far below the safe stock standard. This is similar to what was researched by Saputera in Banjarmasin (South Kalimantan), with drug availability recorded at 8.71 months. Lack of stock can disrupt pharmaceutical services because it does not meet all patient needs. If this situation persists over a prolonged period, it may result in decreased patient visits and reduced revenue at community health center.[18]

Based on the data obtained from several studies, regional factors do not necessarily determine the quality of drug management in community health centers. Effective drug management certainly leads to good drug availability. Across all regions of Indonesia, almost every community health center faces issues related to drug availability, whether in the form of overstock or shortage.

Influencing Factor Regards Drug Availability

Various illustrations of factors that influence the availability of drugs in several Indonesian health centers are summarized in Table I based on research conducted between 2016 and 2024. Beyond identifying these influencing factors, it is crucial to define what effective drug management means in the context of a community health center. This understanding helps in identifying practical areas for improvement and intervention. Several studies highlight that good drug management play a vital role in ensuring sufficient drug availability in communityhealth centers. Good drug management ensures that drug is always available when needed, in sufficient quantities and of guaranteed quality, to support quality services at community health centers.[25] Effective drug management in community health centers refers to a series of practices including accurate drug needs planning, efficient procurement processes, proper storage management, timely and equitable drug distribution, and rational drug use. Such management not only ensures continuous drug availability but also reduces the risks of stock-outs or excessive stock, thereby minimizing wastage.

Based on the review conducted, it can be concluded that the dominant factor affecting drug management in community health centers is the inadequacy of the planning and demand process for drug needs.[11,13,15,16,21,23,26,30,32] It is known that the staff often plan the needs based on the consumption pattern from the previous year.[18,31] Excess or shortages of certain drug can occur due to inaccurate and irrational calculations of drug needs.[22] Effective planning must incorporate not only past consumption data but also current disease patterns and epidemiological trends specific to each community health center.[36]

In addition, inaccurate drug planning is often caused by the lack of knowledge of those responsible for drug management. Several studies conducted reveal that a lack of knowledge affects the suboptimal availability of drug.[6,18,21,22,33] This is based on the lack of training provided for drug managers at community health centers. The lack of training is a contributing factor to the inadequacy of community health center pharmacists in calculating drug needs.[21] This issue should be a priority for the government, which needs to enhance the competencies of drug managers through targeted training programs on drug management in community health centers across Indonesia.

Another factor contributing to the availability of drug is the shortage of pharmaceutical personnel in community health centers.[6,7,11,16,18,21,29,] This reflects an unequal distribution of pharmaceutical personnel at community health centers. According to pharmaceutical standards, pharmaceutical activities should be conducted by pharmacists, supported by pharmacy technicians[37] The recommended workload is one pharmacist per 50 patients per day.[37] The limitation of pharmacy personnel also impacts the excessive workload.[19,21,26] which hinders optimal pharmaceutical service delivery and negatively impacts drug availability at community health centers.

Changes in disease patterns can significantly affect to the availability of drug.[22,23,29,32,33] This can cause a decrease in the number of medication visits, resulting in reduced drug usage. Moreover, if there is a change in doctors, it will certainly affect the prescription patterns.[13,25,28] As a result, unprescribed drugs may accumulate in community health centers, leading to excess stock and increased risk of drug expiration.[21] Cholilah et al[21] revealed that the value of the expired drug is 3,85% due to the excess drug at the community health centers.

Drug availability at the Health Office plays a crucial role in supporting pharmaceutical services at community health centers. Drug availability at the community health center becomes suboptimal due to the

limited availability of drug at the Health Office.[7,17,18,20,28] This creates an imbalance between the demand and supply of drug at the community health center.[14,17,32] Drug availability at the Health Office is also affected by delays in delivery by suppliers[24,27] and delays in the approval of the drug procurement budgets. [24] Drug availability at the Health Office plays a crucial role in supporting pharmaceutical services at community health centers.[20,24,28]

Overall, this study confirm that the factors influence drug availability include procurement, distribution, stock planning, and the availability of competent human resources at community health centers. Inefficiencies in drug procurement and stock planning have a direct impact on patient care. When essential drugs are delayed or unavailable due to poor planning, patients may experience treatment interruptions or have to seek alternatives at unaffordable private facilities. In emergency situations such as asthma attacks, hypertensive crises, or infections requiring immediate antibiotics—delays in drug availability can lead to worsening clinical conditions, increased hospitalizations, and even preventable deaths. If such issues persist over time, they may lead to a decline in patient visits and reduced revenue for community health centers.[18] Therefore, strengthening drug procurement and stock management systems is not only a matter of administrative efficiency but is an essential part of patient safety and continuity of care. Enhancing these aspects will help ensure better access to needed drugs and maximize optimal pharmaceutical care.

Although many of the studies included in the final analysis had a certain limitations, valid conclusions can still be drawn regarding the factors influencing drug availability in community health centers. However, the generalizability of these findings remains limited, as most of the research was conducted in major regions of Indonesia, with relatively few studies focusing on remote or smaller islands. Consequently, further research that takes into account the unique geographic, logistical, and infrastructural challenges of Indonesia's more remote areas is urgently needed to provide a more comprehensive understanding of drug availability nationwide.

This study also has several limitations. First, the reliance on English-language literature may lead to language bias, potentially overlooking valuable insights from non-English publications. Second, the predominant focus on research conducted in major island regions limits the comprehensiveness of the analysis, particularly in capturing the realities of drug availability in community health centers located in remote or less-developed areas. The scarcity of research in these regions restricts the generalizability of the findings and hinders a more holistic understanding of the factors influencing drug management and availability across diverse healthcare settings in Indonesia.

CONCLUSION

Suboptimal drug availability remains a persistent issue across various regions in Indonesia. Several interrelated factors contribute to this problem, including inaccurate drug planning, limited knowledge among pharmacy staff regarding effective drug management, inadequate numbers of pharmaceutical personnel at community health centers, and high workloads. Additional contributing factors include the limited supply of medicines at the Health Office leading to an imbalance between demand and supply, changes in disease patterns and prescription patterns, increased number of visits due to the implementation of JKN, and the long procurement and delivery process by suppliers. To address these challenges, strategic improvement should include enhancing the competencies of pharmacy staff through structured training programs, increasing the number of qualified pharmaceutical personnel in community health centers, and ensuring adequate budget allocations for drug procurement. Further research is required to dig deeper into the availability of drugs outside the large islands in Indonesia, so that solutions can be found that suit the characteristics of each region. Developing evidence-based policies that reflect regional characteristics will be essential in ensuring equitable and consistent access to essential medicines across all community health centers in the country.

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CONFLICT OF INTEREST

The author of this study has declared that there are no conflicts of interest or personal relationships that could have influenced the work reported in this study.

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