

Availability of Dispensing and Storage Facilities at Public and Community Pharmacies at Bahir Dar and Gondar Towns

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Background: The availability of various facilities that aid in providing expected services is necessary for the practice of pharmacy, which aims to make the best use of medications and other healthcare products and services. Therefore, the aim of this study was to assess the availability of dispensing and storage facilities at public and community pharmacies in Bahir Dar and Gondar towns.

Methods: In Gondar and Bahir Dar towns' public and private pharmacies, a facility-based cross-sectional study was conducted from July 2023 to September 2023. All pharmacy areas that were open during data collection were included in the study. The frequency and percentage were calculated using descriptive statistics.

Results: From 239 pharmacies, 208 (87.0%) of them were open during data collection, and they are included in the study. The water supply and dispensing counter were available in the dispensing area in 79.3% and 60.1% of instances, respectively. They also had adequate room for storage (92.8%), dispensing (92.8%), and receiving (95.7%) of medicines. Additionally, about 98.1% of the facilities had shaded, ventilated, and dry areas. A therapeutic order was the most often used method (59.6%) for medication organization. Merely 1.9% of participants did not employ a strategy to arrange their medications. A refrigerator (88.0%), a refrigerator thermometer (91.3%), a spoon or spatula (81.3%), a separate storage facility (74.5%), a cold room (68.8%), a lockable cabinet (90.9%), a tablet counter (69.2%), and a fire extinguisher (safety device) (88%) were among the various storage equipment the majority of the pharmacies in the survey had. Nonetheless, air conditioning was absent from the majority (53.4%) of pharmacy facilities.

Conclusion: Few pharmacies need to make improvements to their facilities in order to encourage convenient drug storage and dispensing practices, even though the majority of the pharmacies surveyed had all the necessary equipment and infrastructure. In addition to initiating the pharmacies to provide good practices of dispensing and storage, facility-focused initiation and regulation should be obtained to ensure full availability of the facilities.

Keywords: availability, Bahir Dar, dispensing, facilities, Gondar, pharmacies, storage

Introduction

A good dispensing environment, which comprises personnel, physical surroundings, and equipment with sterile, hygienic conditions, is a crucial component of daily pharmacy practice as the majority of medical items are intended for internal use.¹ Structures to control pharmacy practice and ensure that pharmacists are prepared to work as healthcare professionals became necessary as pharmacy practice developed into good pharmacy practice (GPP).² A successful healthcare system is built on sound pharmacy practices, and associated standards emphasize the value of pharmacy services and the role of the pharmacist in enhancing patient health.³ Dispensing is performed by a wide range of individuals with a wide range of backgrounds and training, which plays a crucial role in the realization of rational drug therapy based on the principle of good dispensing practices (GDP).⁴ It refers to giving the appropriate medication and medical supplies to the appropriate patient in the necessary dosage and quantity in a package that preserves acceptable potency and quality for a predetermined amount of time, along with clear drug information for implementing rational drug therapy.^{5,6} GDP now includes minimizing potential side effects and encouraging medication adherence.⁷

The distribution and storage of drugs is a significant aspect of healthcare, and it requires management support in the form of planning, funding, information management, and sufficient human resources.⁸ The storage space needs to be well-guarded, physically sturdy, and big enough for secure handling and storage.⁹ For precise and secure operation, storage rooms require adequate lighting; secured, clean, dry, and temperature-controlled storage facilities and buildings must also be built or modified to ensure the best storage conditions.^{1,10} All pharmaceuticals must be stored in compliance with product authorization requirements and manufacturer instructions to protect them from contaminants, sunshine, dampness, atmospheric moisture, and bad temperatures, which should receive special care to ensure good storage practices (GSP).^{10–13} The processing and storage of medical products that need particular storage conditions or controlled access should happen right away, so it is important to put in place proper safeguards to avoid contamination and/or mix-ups during storage.¹⁴ There are still inefficiencies in the cold chain product's storage and transportation due to inadequate facilities and storage settings, despite the health system's clear evidence of cold chain monitoring to prevent waste and preserve product potency.¹⁵ Pharmacies should have all the necessary supplies, tools, and other resources to enable timely and accurate medication distribution as well as suitable storage to maintain medications of appropriate quality.¹⁶ Proper handling and storage of medicines are essential, as inappropriate storage and insufficient protection from storage temperatures may necessitate retreatment for patients and cost extra expense.¹⁷

In sites that had limited space, dispensing appeared chaotic as staff bumped into each other while going about tasks and could not queue items on counter tops for processing, which led to the mistaken use of medicines.¹⁸ The quality, accessibility, and distribution of medical services and medications are all negatively impacted by structural deficiencies in the healthcare systems of developing nations.¹⁹ Inadequate workplace facilities are just one of the numerous factors that lead to the irrational use of medicine.^{6,20} Irrational dispensing has the potential to have a major negative impact on patient care, both medically and financially, such as the possibility of antibiotic resistance, adverse drug reactions, and the masking of underlying infection processes.⁵ To enable pharmacies to fulfil their roles in the delivery of healthcare, adequate availability, convenient access, and a sufficient workforce capacity must be guaranteed.²¹

Although studies on GDP, GPP, and GSP are numerous,^{2–4,10,11,13} studies on facilities that significantly affect the practices listed are scarce. Sufficient dispensing and storage facilities are necessary to give the patient plausible services. Therefore, the aim of this study is to assess the availability of dispensing and storage facilities at public and community pharmacies in Bahir Dar and Gondar towns.

Methods

Study Design, Area and Period

A facility-based cross-sectional study was performed from July 2023 to September 2023 among public and private pharmacies in Gondar and Bahir Dar towns. Gondar town is located 185 KM from Bahir-Dar and 750 KM northwest of Addis Abeba in the central Gondar administrative zone of the Amhara regional state. Bahir Dar, the region's capital, is roughly 185 KM from Gondar and 565 KM from the country's capital, Addis Ababa. Due to their higher population density and improved accessibility to medical facilities, information, and practices, the two towns were chosen.

Inclusion and Exclusion Criteria

Every pharmacy that was open on the day that the data was collected was included, as were any practitioners who consented to participate in the research. The study excluded those who did not volunteer to participate and pharmacies that were closed at the time of data collection.

Sampling Strategy

There were 28 hospital pharmacies, 47 community pharmacies, and 32 drug stores in Gondar town, and there were about 35 hospital pharmacies, 56 community pharmacies, and 41 drug stores in Bahir Dar town. In the two towns, all pharmacies that were open during data collection were included in the study. A total of 208 pharmacies, with one delegated participant, were included in the study area (Figure 1).

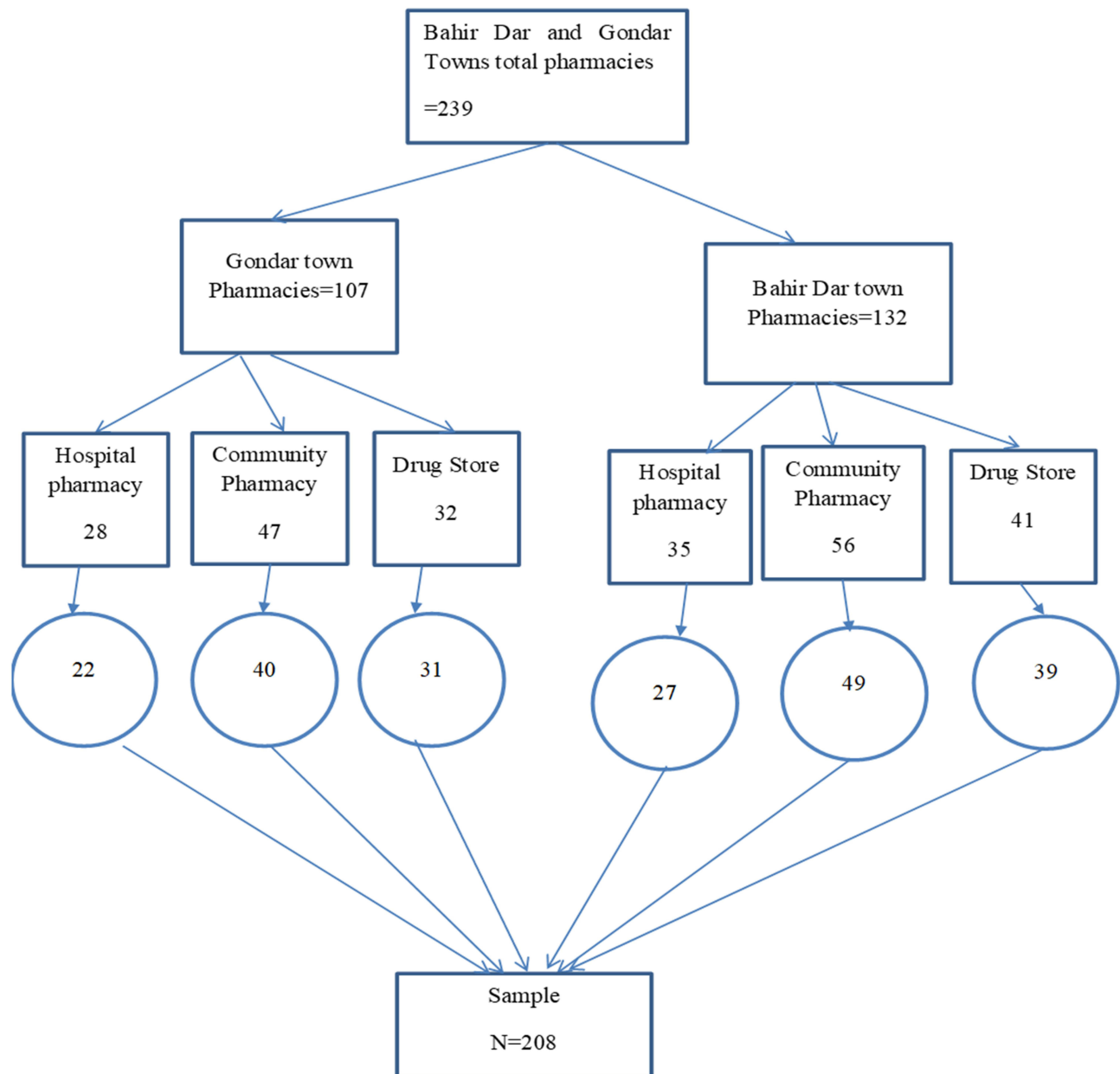


Figure 1 Sampling procedure.

Data Collection Procedure

Self-administered questionnaires were used that were adapted from published articles to collect all the necessary data.^{1,4,14,17} The first part contained the socio-demographic details of the study participants. In the second section, questions about the systems used for arranging medicines were covered. The third section included questions evaluating the availability of facilities for arranging medicines in the surveyed pharmacies. The final section covered questions evaluating the availability of storage facilities for the arrangement of medicines in the surveyed pharmacies.

Data Quality Control

The data collection tools were pretested on a sample of public and private pharmacies outside the study area that were selected at random. Of the total units, about 10% (21) were being pretested. Following the pretest, certain modifications were made in line with the study objectives. The principal investigator provides two hours of training about the study

objectives for data collectors. All investigators participated in the daily data collection and verified the validity of the questionnaires at the end of each day. The data collectors were trained to help respondents who needed explanations, and the incomplete questionnaires were cleared. The pretest data were excluded from the main study.

Data Management and Analysis

SPSS version 25 was used to analyze the data. The study's findings were reported as frequency and percentages using graphs and tables.

Operational Definitions

Cold chain: A supply chain that includes the handling, transportation, and storage of a temperature-controlled drug substance or finished drug product.²²

Good storage practices: The portion of quality assurance that guarantees the preservation of medical product quality through appropriate control during storage.^{12,14}

Dispensing: Refers to the process of producing and administering prescribed medicines to a specific individual with accurate preparation and labelling.⁴

Good dispensing practice: It guarantees that the right medications of the desired quality are given to the right patient at the right time in the right dosage form and quantity, with the right dose, strength, frequency, and written and verbal instructions. It also provides appropriate packaging that preserves the medication's effectiveness and quality.²³

Good pharmacy practice: The practice of pharmacy has the goal of assisting patients and the general public in making the best use of medications and other healthcare products and services by maintaining the patient's best interests as their top priority.¹²

Results

Sociodemographic Characteristics of the Respondents

About 208 (87.0%) of the 239 pharmacies that were open at the time of data collection were used in this study. Most participants (54.3%) age distribution was between 20 and 29 years. Of the respondents, 56.3% were male. The majority of respondents (48.6%) educational status was degree. About 68.3% of the respondents had less than ten years of experience. While 20.2% of the respondents were owners, the majority of respondents (72.6%) were employees of the study sites. The majority of the facilities owned by the respondents (50%) had been in operation for fewer than five years, with community pharmacies accounting for 42.8% of these. About 48.6% of the respondents worked more than 40 hours a week on average. The majority of respondents (52.4%) did not receive regular training (Table 1).

Availability of Different Facilities in Dispensing Areas in the Surveyed Pharmacies

In the dispensing area, there was 79.3% and 60.1% availability of the water supply and dispensing counter, respectively. The majority (93.8%) of pharmacy facilities had an office table and a pair of chairs. Additionally, they had enough space for receiving (95.7%), storage (92.8%), and dispensing (92.8%). Most of the facilities (98.1%) also offered dry, ventilated, and shaded areas (Table 2).

Availability of Facilities for Arrangement of Medicines in Dispensing Areas in the Surveyed Pharmacies

There were enough shelves in the majority of pharmacies (89.4%) to store medications. They also had enough space for medications to provide rational pharmacy services (80.8%) and shelves with labels (84.9%) (Table 3).

Systems Used for Arrangement of Medicines

A therapeutic order was the most often used method (59.6%) for medication organization. Among our respondents, pharmaceutical order (10.6%) and alphabetical order (13.5%) were the next most popular systems. Barely 1.9% of participants indicated that they did not employ a strategy to arrange their medications (Figure 2).

Table 1 Sociodemographic Characteristics of the Respondents (n=208)

Variables		Frequency (n)	Percentage (%)
Age in years	20–29	113	54.3
	30–39	67	32.2
	≥ 40	28	13.5
Gender	Female	117	56.3
	Male	91	43.8
Marital status	Married	89	42.8
	Single	110	52.9
	Divorced	6	2.9
	Widowed	3	1.4
Qualification	Diploma	80	38.5
	Degree	101	48.6
	Master	27	13.0
Experience	≤10 years	142	68.3
	Above 10 years	66	31.7
Ownership	Owner	42	20.2
	Partner	15	7.2
	Employee	151	72.6
Years of facilities since establishment	0–5 years	104	50.0
	6–10 years	40	19.2
	11–15 years	32	15.4
	> 15 years	32	15.4
Type of facility respondents work in	Drug store	70	33.7
	Community Pharmacy	89	42.8
	Hospital pharmacy	49	23.6
Weekly working hours	1–16	28	13.5
	17–31	29	13.9
	32–40	50	24.0
	>40	101	48.6
Regularity of medical education	Yes	99	47.6
	No	109	52.4

Availability of Various Equipment for Storage of Medicines in Surveyed Pharmacies

The majority of the pharmacies in the survey had a variety of equipment for storing medicines, including a refrigerator (88.0%), a refrigerator thermometer (91.3%), a spoon or spatula (81.3%), a separate storage facility (74.5%), a cold room for vaccines, sera, and biological products (68.8%), a lockable cabinet for narcotic and psychotropic medicines (90.9%),

Table 2 Percentage Availability of Different Infrastructure and Storage Facilities in Surveyed Pharmacies (n=208)

Variables	Yes N (%)	No N (%)
Availability of water supply in dispensing area	165 (79.3)	43 (20.7)
Availability of dispensing counter	125 (60.1)	83 (39.9)
Office table with two chairs	195 (93.8)	13 (6.3)
Sufficient reception area	199 (95.7)	9 (4.3)
Sufficient storage area	193 (92.8)	15 (7.2)
Dry, ventilated and shady store	204 (98.1)	4 (1.9)
Adequate surface area of pharmacy	193 (92.8)	15 (7.2)

Table 3 Availability of Facilities for Arrangements of Medicines in Surveyed Pharmacies (n=208)

Variables	Yes N (%)	No N (%)
Sufficient shelves for storage of medicines	186 (89.4)	22 (10.6)
Labeled shelves	174 (84.9)	31 (15.1)
Adequate space for movement of goods	168 (80.8)	40(19.2)

a tablet counter (69.2%), and a fire extinguisher (safety devices) (88%). However, the majority (53.4%) of pharmacy facilities lacked air conditioning (Table 4).

Discussion

Inappropriate dispensing practices, such as inaccurate measuring or counting with dispensing devices and inadequate supply container identification, can negatively affect the health care delivery system by increasing the risk of contamination, irrational medicine use, and poor preparation decisions.²⁴ The availability of physical space in which to carry out work influenced dispensing journeys in terms of safety.¹⁸ Temperature-controlled pharmaceutical products may be handled, transported, and stored in complex supply chains at temperatures above or below those recommended by the manufacturer due to a lack of facilities used for cold chain management.²² Proper storage conditions, including temperature control, light protection, humidity control, hygienic practices, and ventilation, are essential to maintaining product stability; facilities should include cool locations, refrigerators, room temperature storage, and cold rooms, with secure storage being crucial for poisons and combustible substances.²⁵

Most of our study facilities had a majority of storage and dispensing facilities, which were in line with a study done in Bhutan that showed the compliance level of community pharmacies with the regulatory requirements for proper storing and dispensing of medicine was 90.4% for the regulatory provisions classified as critical, while it was 86.74% for the major category.²⁶ The findings from this finding suggest that pharmacies generally had a good availability of facilities for adhering to regulatory requirements for the proper storage and dispensing of medicines. Continued monitoring, training, and support for pharmacies can help maintain and improve compliance levels to ensure full facility availability, ultimately benefiting patient care and public health.

Our study facilities had a water supply availability in dispensing areas of 79.3%, which was similar to a study conducted in south-west Ethiopia, which found that more than half (82.6%) of community drug retail shops had portable water in dispensing rooms.¹⁶ A study conducted in coastal Karnataka, India, found that the pharmacy had a drinking water point and a water tap with a hand washing station.²⁷ Improvements to ensure adequate water supply in pharmacy

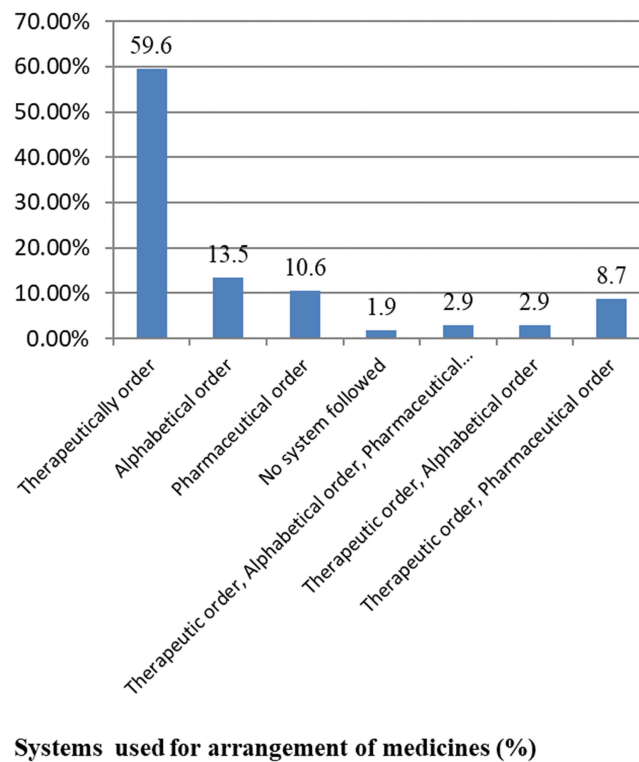


Figure 2 Systems used for arrangement of medicines.

dispensing areas are essential for maintaining high standards of hygiene, safety, and quality in medication dispensing practices, enabling adherence to best practices, regulatory requirements, and quality standards to ensure patient well-being and satisfaction.

The percentage of dispensing counters in the dispensing area was 60.1%, which was lower than the percentage of medication counter attendants reported in a study conducted in Ghana (71.4%).²⁸ Our study facilities provided sufficient reception area (95.7), storage area (92.8), and dispensing area (92.8%), in contrast to a study carried out in coastal

Table 4 Percentage Availability of Various Equipment for Storage of Medicines in Surveyed Pharmacies (n=208)

Variables	Yes n (%)	No n (%)
Air conditioner installed	97 (46.6)	111 (53.4)
Refrigerator	183 (88.0)	25 (12.0)
Refrigerator thermometer	190 (91.3)	18 (8.7)
Spoon/spatula	169 (81.3)	39 (18.8)
Separate storage facility	155 (74.5)	53 (25.5)
Cold room to vaccines, sera, and biological products	143 (68.8)	65 (31.3)
Lockable cabinet for narcotic and psychotropic medicines	189 (90.9)	19 (9.1)
Tablet counter	144 (69.2)	64 (30.8)
Fire extinguisher	184 (88.5)	24 (11.5)
Computer	114 (54.8)	94 (45.2)

Karnataka, India, which found that floor space and waiting areas were lacking (40%).²⁷ Nonetheless, the findings of this study were consistent with a study conducted in Puducherry, India, which also found that 90% of the pharmacies assessed had features like a sufficient surface area for pharmacies, a sufficient storage room, and a sufficient area for greeting customers.¹ Most of the pharmacy facilities in the study (93.8%) had an office table and two seats. This finding was consistent with a study on the availability of facilities carried out in Puducherry, India, which found that all pharmacies surveyed had access to features like a dispensing counter or table, an office table with two chairs, and a dry, shaded, and ventilated area (98.1%).¹ It is evident that the finding provides sufficient reception, storage, and dispensing areas, although there are discrepancies in the availability of dispensing counters. Addressing expressed discrepancies is essential to optimizing pharmacy services. To enable pharmacies to fulfil their responsibilities in the delivery of healthcare and to support the safe, efficient, and high-quality use of medications, convenient access to medications, and other health-related supplies and equipment in the primary care setting, adequate availability, convenient access, and sufficient workforce capacity must be guaranteed.²⁹

Therapeutic order was used in 59.6% of our study facilities, while alphabetical order was used in 13.5% of them. In most pharmacies (89.4%), there were enough shelves to accommodate medicines. Additionally, 84.9% of the shelves had labels, and 80.8% had enough room for items to move around. These outcomes were consistent with a study conducted in Puducherry, India, which found that alphabetical order (70%) and pharmaceutical therapeutic order (30%) were the two most widely used methods for organizing medicines. 80% of pharmacies had enough shelves to hold medicines, 90% of them had shelves with the correct labels, and 80% of them had adequate room for operating products.¹ According to a study conducted in Nepal, 95.3% of pharmacies kept their inventory in a systematic manner, and 56.9% of pharmacies had storage rooms with locks. These findings are consistent with our study's facility storage strategy. Similar to that study's findings, 98.1% of the study facilities had strategies in place for their medication arrangements. Unfortunately, research revealed that 7.1% of individuals dropped items, bottles, or medicines on the ground.³ These results emphasize the significance of proper organization, infrastructure, and space management in pharmacy facilities to ensure efficient operations and improve the quality of care provided. Continued attention to these aspects can contribute to optimizing pharmacy services and creating a conducive environment for both staff and patients.

Our analysis revealed that more facilities had distinct storage facilities (more than 50% availability of each facility) than did a study of three pharmacy settings in Nepal, which found that there were 36%, 39%, and 45% of separate storage areas available for the initial quarantine of all incoming pharmaceuticals.³⁰ However, our study's findings were lower than those of a study on community pharmacies in Lebanon's compliance with GPP and areas for quality improvement, which revealed 88.6% had separate storage for expired pharmaceuticals.³ While the current study showed a relatively high availability of distinct storage facilities, there may be opportunities for improvement based on the findings from other regions. By identifying areas for enhancement and learning from best practices in different settings, pharmacy facilities can strive to optimize their storage practices and infrastructure to better serve their patients and maintain regulatory compliance.

In our study, fewer pharmacy facilities (53.4%) had air conditioning installed than in a similar study in Nepal, where 87.2% of the facilities had air conditioning.³ This needs appropriate measures to increase its availability in addition to a refrigerator since temperature directly affects how stable pharmaceutical products are and can cause deterioration before the products' expiration date.³¹

While the majority of pharmacies in the survey (88.0%) had refrigerators, this was less than the results of studies done in Nepal, which indicated that every pharmacy had a refrigerator. Because temperature-sensitive drugs and vaccines may be compromised in terms of storage and integrity, the safety and effectiveness of pharmaceuticals and vaccinations for patients can be improved by addressing these problems and taking proactive steps to maintain appropriate refrigeration in the pharmacy area. Nonetheless, compared to a study conducted in Nepal, where only 17.7% of pharmacies monitored and recorded fridge temperatures, the majority of our study's pharmacies (91.3%) had refrigerator thermometers.³ However, according to our findings, better than a study in Tanzania, about 48.5% of the health institutions visited did not meet World Health Organization storage temperature requirements because all recorded mean kinetic temperature values were higher than 8°C. Only 31.6% of the health facilities in urban areas conformed to the storage temperature range (2°C–8°C), compared to 59.2% of the health facilities in rural regions.³² Due to their lack of potency and efficacy,

medications that are not kept at the proper temperature may cause an even greater unnecessary financial burden on the general public. Due to the serious health risks associated with medication waste, it is imperative to decrease drug waste and maximise the efficient use of limited resources.²¹

In our analysis, a large percentage of narcotic and psychotropic medication cabinets were locked (90.9%). This is greater than a study conducted in Nepal, which found that 71.1% of pharmacies said they stored regulated medications in locked cabinets or lockable drawers.³ Potentially inappropriate medication is linked to unfavorable outcomes, especially in elders, and may serve as an indicator of inadequate dispensing, which needs extensive investigation related to dispensing indicators and facilities.³³ Furthermore, given that environmental factors like temperature, air, light intensity, and humidity can impact drug stability and potentially trigger the drug degradation process, it is important to identify and investigate various facilities in pharmacy areas that safeguard pharmaceutical products against these factors.³⁴

Limitations of the Study

Despite its significant value in guiding future research in this field by scholars and all relevant parties, this study has some drawbacks. Due to insufficient publications pertaining to our research, we have found it challenging to compare and thoroughly discuss our work.

Conclusion

In the majority of the dispensing area, the water supply and dispensing counter were accessible. They also had enough space for receiving, distributing, and storing medications. There were also dry, air-conditioned, and shaded areas in the majority of the facilities. In the majority of facilities, the most popular approach for organizing medication was a therapeutic order. Most of the pharmacies in the survey had a variety of equipment for storing medicines, including a refrigerator, a refrigerator thermometer, a spoon or spatula, a separate storage facility, a cold room, a lockable cabinet, a tablet counter, and a fire extinguisher. Air conditioning, however, was lacking in most pharmacy buildings. While most of the pharmacies surveyed had most of the infrastructure and equipment required to support convenient drug dispensing practices, very few needed to make improvements to their facilities. GDP is based on having facilities and a working environment that are safe, clean, and well-organized, and these needs should be met in the dispensing area. To guarantee GSP, storage areas must be large enough and equipped with the right amenities to enable the organised storage of the various product and material categories. Furthermore, by using this study as baseline information, future research on this subject should be performed to identify gaps that affect GPP.

Abbreviations

GPP, Good Pharmacy Practice; GDP, Good Dispensing Practices; GSP, Good Storage Practices.

Data Sharing Statement

The data sets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

The study was approved and given ethical clearance by the College of Medicine and Health Science at the University of Gondar's School of Pharmacy Ethical Committee. Every research participant was asked to provide written, informed consent. The participants were made aware of their complete right to withdraw from the study at any point while it was ongoing. All raw data were treated with strict confidence after the study was finished and data collection was completed. Every technique was used in compliance with all applicable rules and regulations.

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Disclosure

The author declares that there are not competing interests in this work.

References

1. Meena DK, Jayanthi M, Ramasamy K, Thulasingham M, Mahalakshmi S. Medicine storage and dispensing facilities in public healthcare pharmacies of Puducherry, India. *Cureus*. 2022;14(1):1–7.
2. Bou-Saba AW, Kassak KM, Salameh PR. The current trends and challenges towards good community pharmacy practice and the way forward. *Explor Res Clin Soc Pharm*. 2022;6:1–8.
3. Bou-Saba A, Kassak KM, Salameh P. Adherence to good pharmacy practices by community pharmacies in Lebanon and opportunities for quality improvement: it is time to act. *Integr Pharm Res Pract*. 2023;12:25–35. doi:10.2147/IPRP.S377635
4. Yadesa TM, Zeberga G. Assessment of good dispensing practice among drug stores in Mizan Aman Town, South West Ethiopia. *Pharm Lett*. 2018;10:9–20.
5. Rabie D, Kheder SI. Assessment of prescribing and dispensing practices based on WHO core prescribing indicators in hospital and community pharmacies in Khartoum State-Sudan. *J Med Inform Decis Mak*. 2020;1(3):1.
6. Nadeshkumar A, Sathiadass G, Sri Ranganathan S. Rational dispensing of oral dosage forms of medicines to children at a teaching hospital in Sri Lanka. *BMC Health Serv Res*. 2020;20(1):1–6. doi:10.1186/s12913-020-05246-x
7. Kusynová Z, van den Ham HA, Leufkens HG, Mantel-Teeuwisse AK. Longitudinal study of good pharmacy practice roles covered at the annual world pharmacy congresses 2003–2019. *J Pharm Policy Pract*. 2022;15(1):1–14. doi:10.1186/s40545-022-00482-4
8. Ali I. Assessment of good storage practices and good distribution of pharmaceuticals in Punjab. *Pak J Health Sci*. 2017;1(1):9–12.
9. Kumar P, Kamaraj R. Compliance with regulatory requirements and their implementation regarding the storing and distribution of pharmaceuticals in India, Us and Eu. *Neuroquantology*. 2022;20(17):390–398.
10. Shafaat K, Hussain A, Kumar B, Hasan R, Prabhat P, Yadav V. An overview: storage of pharmaceutical products. *World J Pharm Pharm Sci*. 2013;2(5):2499–2515.
11. Pyatigorskaya NV, Beregovykh VV, Belyaev VV, Greibo SV, Pyatigorskiy AM. Rationale for the necessity of temperature mapping of storage areas for pharmaceutical products. *J Pharm Sci Res*. 2018;10(3):662–664.
12. World Health Organization. WHO expert committee on specifications for pharmaceutical preparations: fifty-sixth report; 2022.
13. Bhaskaran J, Venkatesh MP. Good storage and distribution practices for pharmaceuticals in European Union. *J Pharm Sci Res*. 2019;11(8):2992–2997.
14. World Health Organization. Good storage and distribution practices for medical products. *WHO Drug Inf*. 2019;33(2):194–225.
15. Nyirimanzi JD, Ngenzi J, Kagisha V, Bizimana T, Kayitare E. Assessment of medicines cold chain storage conformity with the requirements of the World Health Organization in health facilities of the Eastern Province of Rwanda. *J Pharm Policy Pract*. 2023;16(1):1–10. doi:10.1186/s40545-023-00534-3
16. Demissie F, Buno H, Paulos G. Assessment of pharmaceutical service quality provided in community drug retail outlets in selected towns, South West Ethiopia. *Integr Pharm Res Pract*. 2022;11:117–126. doi:10.2147/IPRP.S375155
17. Centers for Disease Control and Prevention. *Vaccine Storage and Handling Toolkit Updated with COVID-19 and Mpox Vaccines Storage and Handling Information Addendum*. CDC; 2023.
18. Harvey J, Avery AJ, Ashcroft D, Boyd M, Phipps DL, Barber N. Exploring safety systems for dispensing in community pharmacies: focusing on how staff relate to organizational components. *Res Social Adm Pharm*. 2015;11(2):216–227. doi:10.1016/j.sapharm.2014.06.005
19. Goswami N, Dahal P, Shrestha S, Kc B, Mallik SK. Community pharmacy personnel understanding of antibiotic dispensing in Eastern Nepal. *Risk Manag Healthc Policy*. 2020;13:1513–1522. doi:10.2147/RMHP.S264192
20. Ofori-Asenso R, Agyeman AA. Irrational use of medicines—a summary of key concepts. *Pharmacy*. 2016;4(4):1–13. doi:10.3390/pharmacy4040035
21. Wonte MM, Aweke Z, Getachew H, Ali SA, Tadesse M. Assessment of the usage, storage, and expiration date checking of drugs at Dilla University Teaching Hospital. *Clin Audit*. 2024;16:1–7. doi:10.2147/CA.S435155
22. Ziance R, Chandler C, Bishara RH. Integration of temperature-controlled requirements into pharmacy practice. *JAPhA*. 2009;49(3):e61–9. doi:10.1331/JAPhA.2009.08140
23. World Health Organization. WHO guidelines on good pharmacy practice: standards for quality of pharmacy services. *WHO Tech Rep Ser*. 2011;961:310–323.
24. Ejeta F, Feyisa D, Aferu T, Siraj J, Melkam D, Ali A. Rational dispensing of oral dosage forms of medicines to children and its associated factors in South West Ethiopia. *Pediatric Health Med Ther*. 2022;13:103–113. doi:10.2147/PHMT.S360383
25. Arshad A, Riasat M, Mahmood MK. Drug storage conditions in different hospitals in Lahore. *J Pharm Sci Technol*. 2011;3(1):543–547.
26. Chejor P, Jamphele K, Tsheten Z, et al. Compliance to current national medicines law for proper storage and dispensing of medicines at community pharmacies in Bhutan. *Med Access Point Care*. 2018;2:1–7. doi:10.1177/2399202618816900
27. Chand S, Shastry CS, Hiremath S, Joel JJ, Krishnabhat C. Hospital pharmacy management in a tertiary care charitable hospital: compliance study with quality standards. *Clin Epidemiol Glob Health*. 2022;17:1–4.
28. Amankwa CE, Bonful HA, Agyabeng K, Nortey PA. Dispensing practices for anti-malarials in the La Nkwantanang-Madina municipality, Greater Accra, Ghana: a cross-sectional study. *Malar J*. 2019;18:1–11. doi:10.1186/s12936-019-2897-5
29. Alrasheedy AA. Trends, capacity growth, and current state of community pharmacies in Saudi Arabia: findings and implications of a 16-year retrospective study. *Risk Manag Healthc Policy*. 2023;16:2833–2847. doi:10.2147/RMHP.S443325
30. Shrestha R, Ghale A. Study of good pharmacy practice in community pharmacy of three districts of Kathmandu valley, Nepal. *Int J Sci Rep*. 2018;4(10):240–245. doi:10.18203/issn.2454-2156.IntJSciRep20184191

31. Khuluza F, Chiumia FK, Nyirongo HM, Kateka C, Hosea RA, Mkwate W. Temperature variations in pharmaceutical storage facilities and knowledge, attitudes, and practices of personnel on proper storage conditions for medicines in southern Malawi. *Front Public Health*. 2023;11:01–10. doi:10.3389/fpubh.2023.1209903
32. Ringo S, Mugoyela V, Kaale E, Sempombe J. Assessment of medicines cold chain storage conformity with the world health organization requirements in health facilities in Tanzania. *Pharm Pharmacol*. 2017;8(10):325–338. doi:10.4236/pp.2017.810024
33. Blozik E, Rapold R, Reich O. Prescription of potentially inappropriate medication in older persons in Switzerland: does the dispensing channel make a difference? *Risk Manag Healthc Policy*. 2015;8:73–80. doi:10.2147/RMHP.S78179
34. Elghazaly A, Ben Salah G, Ibrahim N, et al. Public awareness regarding household drug storage, Qassim Region, Saudi Arabia: a Cross-Sectional Study. *Risk Manag Healthc Policy*. 2023;16:271–277.

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