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Availability and Utilization of the WHO-Recommended Lifesaving Medicines for Under-Five Children at University of Gondar Comprehensive Specialized Hospital, Amhara Region, Ethiopia

Alem Endeshaw Woldeyohanins, MSc[1], Asmamaw Emagn Kasahun, MSc[1], Chilot Abiyu Demeke, MSc[1], and Zemene Demelash Kifle, MSc[2]

Abstract

According to the World Health Organization report, 5.4 million under-five children died, which is similar to under-five mortality rate of 39 deaths per 1000 live births. This rate is higher in sub-Saharan Africa with 76 deaths per 1000 live births. More than 1 out of every 2 deaths is because of diseases that can be managed with drug of low-cost and high quality. Institutional-based cross-sectional survey was conducted from January to February 2021, at the University of Gondar Comprehensive Specialized Hospital. Statistical Package for the Social Sciences software version 24 was used for data analysis. The results were presented using Figures, tables, and texts according to the nature of the data. The overall average availability of priority medicines was 75% on the day of visit and the average stock-out duration in the last 6 months was 23.85 days. Availability and utilization of priority medicines for the management of antiretroviral infections, Vitamin A deficiency, malaria, and diarrheal cases were high, whereas availability and utilization of suggested medication for neonatal sepsis were very low. A significant proportion of priority diseases was managed by non-priority medications. Medicines supply sources of the country, ministry of health, policymakers as well as facility managers should work in collaboration toward ensuring sustainable and consistent availability of priority medicines through the country. Continues in-service training of healthcare professionals is also mandatory to update themselves with newly developed guidelines, standards, and recommendations.

Keywords

availabilities, utilization, lifesaving medicines, Gondar, Ethiopia

What do we already know about this topic?

The topic was conducted in different parts of the world, and there was significant variation in the availability and utilization of priority medicines.

[1]Department of Pharmaceutics and Social Pharmacy, School of Pharmacy, University of Gondar- College of Medicine and Health Sciences, Gondar, Ethiopia
[2]Department of Pharmacology, School of Pharmacy, University of Gondar-College of Medicine and Health Sciences, Gondar, Ethiopia.

Corresponding Author:
Alem Endeshaw Woldeyohanins, Department of Pharmaceutics and Social Pharmacy, School of Pharmacy, University of Gondar - College of Medicine and Health Sciences, Gondar 196, Ethiopia.
Email: aleend2008@gmail.com

How does your research contribute to the field?

This research can identify gaps in the availability and utilization of medication at health facilities and gives insight for the policymakers to give special attention to medicines of children under 5.

What are your research's implications toward theory, practice or Policy?

The implication of this research is, particularly toward practice and policy. This research found out poor availability and utilization of WHO Recommended priority medicines for children under 5. The policymakers should investigate the underlying cause of this practice and should tackled them accordingly.

Background

According to United Nations International Children's Emergency Fund report, there is a significant improvement in child survival observed in the past few years globally.[1] According to the World Health Organization report, 5.4 million under-five children died, which is similar to the under-five mortality rate of 39 deaths per 1000 live births. This rate is higher in sub-Saharan Africa with 76 deaths per 1000 live births.[2] More than 1 out of every 2 deaths is because of diseases that can be managed with low-cost drugs and high quality.[3] The main causes are preventable communicable diseases.[4] Approximately 52% of these children died of diarrhea, malaria, and pneumonia.[5] Under-five mortality rate is indirectly or directly correlated with malnutrition in 45% of the reported cases. Sub-Saharan Africa would still pay the highest price since it would concentrate more on half of the deaths.[6]

The main factors of under-five child mortality are biological, demographic, and socioeconomic.[7,8] Erogeneity of child deaths is usually due to socioeconomic factors such as milk teeth extraction, eyebrow incision after birth, female genital mutilation, and uvula cutting. However, demographic factors affect both exogenous and endogenous deaths such as exogenous deaths which can be prevented by antibiotic treatment, immunization, and public health measures, and problems at birth which are difficult to prevent and control. Biological factors principally refer to the total number of children born and the mother's fertility information which are concerned at the family level rather than children.[8,9]

The availability of lifesaving medicines is highly governed by the components of the pharmaceutical logistics system such as distribution, procurement, quantification, and selection; failure in one part of the pharmaceutical logistics system fails in the entire pharmaceutical management process. The poor quality of care, unaffordable, and inaccessible are the critical factors for child morbidity, child mortality, and high burden of maternal in low-income countries.[10] According to the United Nations commission report, utilization problems, and insufficient supplies of health commodities are the main issues facing developing countries.[11] A study conducted in Uganda revealed that the utilization and availability of priority lifesaving medicines for malaria and pneumonia are low. Though, the priority medicines for sepsis and diarrhea were available and highly prescribed by the healthcare professionals.[12] A similar study conducted in Ethiopia and Guatemala showed a lower availability of children's essential medicine.[13,14]

In spite of the availability of essential medicines for children under 5 at the global level, studies done in Chad, Uganda, and India revealed limited availability of medicines in public health facilities.[12]

Most of the studies conducted previously focused on the evaluation of essential medicine availability for a general pediatric population. However, studies focusing on the availability and utilization of the WHO-recommended lifesaving priority medicines for under 5 children are limited. Therefore, the current study assesses the availability and utilization of the WHO-recommended lifesaving priority medicines for under-five children in the University of Gondar Comprehensive Specialized Hospital, Amhara region, Ethiopia.

Methods

Study Design and Setting

A cross-sectional survey was conducted from January to February 2021, at university of Gondar Comprehensive Specialized Hospital; Gondar town is located in North Gondar zone of Amhara regional state, which is located at 737 km far from the capital, Addis Ababa, and 180 km in the north direction of Bahir Dar (Capital of Amhara Region). North Gondar is one of the eleven zones in Amhara Regional State. Gondar town has a total population of 206,987, and out of these, 47.4% are males and 52.6% are females. Presently, Gondar town has one comprehensive specialized Hospital and 8 governmental Health Centers. University of Gondar Comprehensive Specialized Hospital is a teaching hospital, which serves more than 5 million people of the North Gondar zone and the people around the neighboring zones.

Source Population and Study Units

The source population of the study was University of Gondar Comprehensive Specialized Hospital, logistics documents, patient card, and medicines. The study units were WHO-recommended priority lifesaving medicines from University

Table 1. Sampled WHO-Recommended lifesaving medicines at University of Gondar Comprehensive Specialized Hospital, Ethiopia, by 2021.

S.N	Priority diseases of children under the age of five	WHO Recommended lifesaving medicines for children under the age of five
1	Diarrhea	Oral rehydration salt sacket Zinc phosphate 20 mg dispersible tablet
2	Pain	Paracetamol 100 mg dispersible tablet Morphine: Granules 10 mg, 20 mg
3	Pneumonia	Amoxicillin 250 mg dispersible tablet or 500 mg Ampicillin 250 or 500 mg powder for injection Gentamycin sulfate 40 mg/mL in 1 mL injection Ceftriaxone powder 1 gm/50 mL, or 2 gm/50mL powder for injection Artemether/lumefantrine 20 mg/120 mg tablet
4	Malaria	Artemether/lumefantrine 20 mg/120 mg tablet Artesunate 110 mg/*via* injection Artesunate 100 mg rectal capsule
5	Neonatal sepsis	Ceftriaxone: Powder for injection 250 mg and1 g Gentamicin: Injection 20 mg/mL Procaine benzylpenicillin: Powder for injection 1 g and 3 g
6	Vitamin A deficiency	Vitamin A: 100 000 IU or 200 000 IU strength capsules
7	Antiretroviral infection	AZT+ 3TC + NVP 3TC30mg + AZT60mg+NVP50 mg, dispersible tablet ABC+ 3TC 3TC60 mg+120 mgABC, scored and dispersible tablet AZT+3TC 3TC30 mg+AZT60 mg, dispersible tablet NVP oral syrup, 50 mg/5 mL (10 mg/mL) 3TC 30 mg LPV/r LPV100mg+Ritonavir25 mg) EVF 200 mg, scored tablet. Or 50 mg, tablet or capsule

of Gondar Comprehensive Specialized Hospital. The study observations include bin cards and patient cards.

Sample Size Determination and Sampling Procedures.

Regarding product selection, twenty WHO-recommended priorities lifesaving medicines for vitamin A deficiency, malaria, diarrhea, pain management, pneumonia, neonatal sepsis, and HIV/AIDS were considered. Selected medicines are shown in Table 1.

Document reviews were also performed to gather essential data. We reviewed bin cards to assess stock status rates in the past 6 months and patient cards, to determine the utilization of lifesaving medicines. The number of bin cards was based on the number of medicines. Accordingly, 1 bin card for each product was expected from each study facility. Therefore, a total of 20 bin cards were randomly reviewed from University of Gondar Comprehensive Specialized Hospital.

Card numbers from the register book have been used to obtain the required patient document. Patient cards of the last year were considered for sampling. The number of patient cards was calculated using the single population proportion formula

$$n = \frac{(Z_{\alpha 1/2})^2 * p(1-p)}{d^2} = 384$$

where n is the sample size from the formula, $Z_{\alpha 1/2}$ is the value of confidence, the level of 95% is 1.96, p is the proportion of patient cards (50%), and m is the margin of error (at 5% m = 0: 05).

Data Collection Procedures

Data regarding availability were collected using questionnaires and checklists adapted from the USAID deliver guideline,[15] and previously published articles.[12,16] the tools for assessing the utilization practices were developed by the investigators after reviewing related literature. The checklists had 2 parts; the first part contained questions regarding the availability of medicines on the day of the visit and in the last 6 months, the second part was designed to collect data on the utilization of lifesaving medicines.

Physical verification was conducted to determine availability on the day of the visit. Bin cards of the past 6 months were randomly picked and reviewed for each product to determine stock-outs. The sampled patient cards of 1 year were checked to determine the utilization practice.

Data were collected by 2 trained druggists under the supervision of principal investigators. Half-hour training was given to the data collectors regarding the data collection procedures and ethical issues

Table 2. Availability of World Health Organization–Recommended Priority Medicines for Children Under the Age of 5 on the Day of Visits and in the Last 6 Months in University of Gondar Comprehensive Specialized Hospital, Ethiopia, by 2021.

Priority drugs for children under the age of five	Availability at the day of visit		Stock out in the last six months		Frequency of stock out in last six months	Total days of stock out in the last six months
	Yes	No	Yes	No		
Oral rehydration salt sackets	Yes			No	0	0
Zinc phosphate 20 mg dispersible tablet		No	Yes		4	18
Paracetamol 100 mg dispersible tablet	Yes		Yes		4	22
Morphine: 10 mg, granules 20 mg	Yes			No	0	0
Ceftriaxone: Powder for injection 250 mg and 1 g		No	Yes		5	27
Gentamicin: Injection 20 mg/mL		No	Yes		No available in the last 6 months	180
Procaine benzyl penicillin: Powder for injection 1 and 3 g		No	Yes		6	43
Amoxicillin 250 mg dispersible tablet or 500mg	Yes			No	0	0
Ampicillin 250 or 500 mg powder for injection	Yes		Yes		1	7
Artemether/lumefantrine20mg/120mgtablet	Yes			No	0	0
Artesunate 110 mg/via injection	Yes			No	0	0
Artesunate 100 mg rectal capsule		No	Yes		No available in the last 6 months	180
Vitamin A: 100 000 IU or 200 000 IU strength capsules	Yes			No	0	0
AZT+ 3TC +NVP 3TC30+AZT60+NVP50 mg, dispersible tablet	Yes			No	0	0
ABC+ 3TC3TC60 +120 mgABC, scored and dispersible tablet	Yes			No	0	0
AZT+3TC3TC30+AZT60 mg, dispersible tablet	Yes			No	0	0
NVP oral syrup, 50mg/5mL (10mg/mL)	Yes			No	0	0
3TC30 mg	Yes			No	0	0
LPV/r (LPV100mg+Ritonavir25 mg)	Yes			No	0	0
EVF 200 mg, scored tablet. Or 50 mg, tablet or capsule	Yes			No	0	0

Utilization of WHO-suggested medicines for children under the age of 5

Data Enter and Analysis

Statistical Package for the Social Sciences (SPSS) software version 24 was used for data analysis. The utilization was calculated as the percentage of individual medicines prescribed for specific diseases stipulated in the patient cards. The results were presented using Figures, tables, and texts according to the nature of the data.

Quality Control

Experienced data collectors were recruited and trained in data collection methods. The questionnaires were pretested for purposes of validation, suitability, clarity, and logical flow of the questions used in this study. Medicines were checked with the help of the pharmacist by physically verifying the medicines on the shelves and bin cards. Data were checked for accuracy and completeness prior to leaving the facility. The principal investigator carefully supervised the data collection process.

Results

Availability of Lifesaving Medicines for Under—Five-Year-Old Children

The finding of the current study revealed that the overall average availability of lifesaving medicines was 75% on the day of visit and the average stock-out duration in the last 6 months was 23.85 days.

ORS was available at all the time throughout the last 6 months, but zinc phosphate was stock out 18 days in the last 6 months. ART medications were the most available class of medication among all priority medications, whereas gentamicin injection and artesunate rectal both were the most stocked class of priority medicines as shown in Table 2.

Utilization for both oral rehydration salt and zinc phosphate for the management of diarrhea was 91.66%. Only 54 (14.06%) and 32 (8.33%) pain was managed by paracetamol dispersible tablet and morphine, respectively, whereas most 296 (77.08%) of the case were managed by

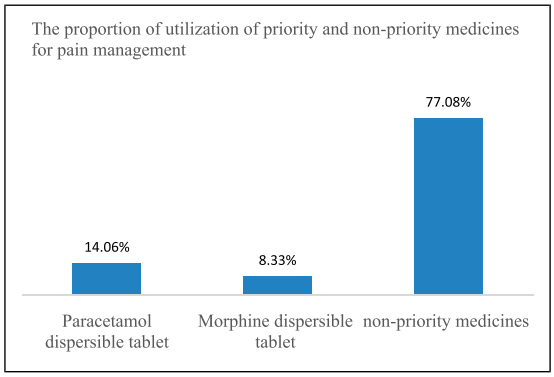

Figure 1. The proportion of utilization of priority and non-priority medicines for the management of pain for children under the age of 5 at University of Gondar Comprehensive Specialized Hospital Ethiopia.

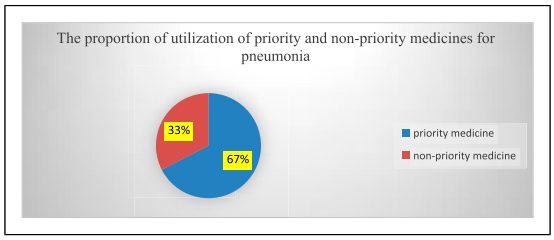

Figure 2. Proportion of utilization of priority and non-priority medicines for the management of pneumonia for children under the age of 5 at University of Gondar Comprehensive Specialized Hospital, Ethiopia.

non-recommended medicines like paracetamol suppository and paracetamol syrup (Figure1).

About 167 (43.48%) of pneumonia cases were treated by amoxicillin dispersible tablet and 92 (23.95%) of the cases were treated by ceftriaxone injections. Surprisingly 125 (32.55%) of the case were treated by non-priority medicines, such as cephalexin syrup, amoxicillin syrup, and trimethoprim–sulfamethoxazole syrup, and azithromycin (Figure 2).

All (100%) of vitamin A deficiency problems were managed by vitamin A 2000IU. About 231 (60.15%) of Malaria case was managed by artemether/lumefantrine tablet and 153 (39.84%) of the cases were managed by artesunate injection. AZT+3TC+NEV–based regimen was utilized for 73.17% of the cases and ABC+3TC and LPV/r were utilized for (22.65% and 4.16%) of the cases, respectively. 134 (34.89%) of neonatal sepsis were managed by ceftriaxone: powder for injection, whereas most of 227 (59.11%) of neonatal sepsis were managed by non-priority medicines like ampicillin–gentamycin combination injection and Metronidazole 30 mg/kg (Figure 3).

Discussion

The overall average availability of priority medicines was 75% on the day of visit and the average stock-out duration in the last 6 months was 23.85 days. This was comparable with the study conducted in Ethiopia; the result revealed that the overall average availability of essential medicine was 19 (79.17%) and average stock out of medicine in the survey period was 5 (20.83%).[17] However, the findings of the current study showed a lower overall availability of essential medicines when compared to a study conducted in Gondar town 23.67 (91%).[18] The observed difference is probably because the health centers manage a limited number of medicines and they have a management effort.

This finding is higher than the study conducted in the western part of Ethiopia on the accessibility of essential medicines for children; the overall availabilities of EMs were below 50% in both the public sector and private sectors.[13] The observed difference might be because of better attentions gave to priority medicines by supply managers because the study conducted in the western part includes all essential medicines The above findings of the current study were also higher than the study conducted in the Tigray region, of Ethiopia; the finding revealed that overall availability was 34.1%.[19] Based on this finding, we observed that different results in the same country with the same medicine supply sources might be due to Ethiopia essential drug list provide an aggregate list of medications and only focus on systemic classification of medication, not for specific population groups which resulted in there is a different practice at different regions. Medicines supply sources of the country, ministry of health, policymakers, as well as facility managers should work in collaboration toward ensuring sustainable and consistent availability of priority medicines through the country.

Based on the findings of the current the study, availability of amoxicillin dispersible tablets was higher, there is no stock out in the last 6 months, while we were compared with the study conducted in Sri Lanka, in which amoxicillin was available in 90% of cases.[20] The observed difference could be due to countries having different strategies to combat the disease. The low availability of medicines in the appropriate formulations may limit access to medicines to children, which may result in morbidity and moralities which can be treated and prevented by cost-effective essential medications.

In this study, the availabilities of Vitamin A were higher when compared with a study conducted in western parts of Ethiopia.[13] All pediatric ART regimens were available on the day of data collection as well as in the last 6 months, which was comparable with the study conducted in Jimma. In this study, utilization for AZT+3TC+NEV–based regimen was 73.17%, and ABC+3TC-based regimen was 22.65%. This finding is consistent with a study conducted in the Jimma zone.[16]

The current study's findings were compared to those of a study conducted in Uganda the current study's utilization of priority medicines for diarrhea was higher 91.66% for both ORS and Zinc phosphate, whereas in Uganda, utilization for ORS and Zinc phosphate was 20 and 0%, respectively.[12] The observed

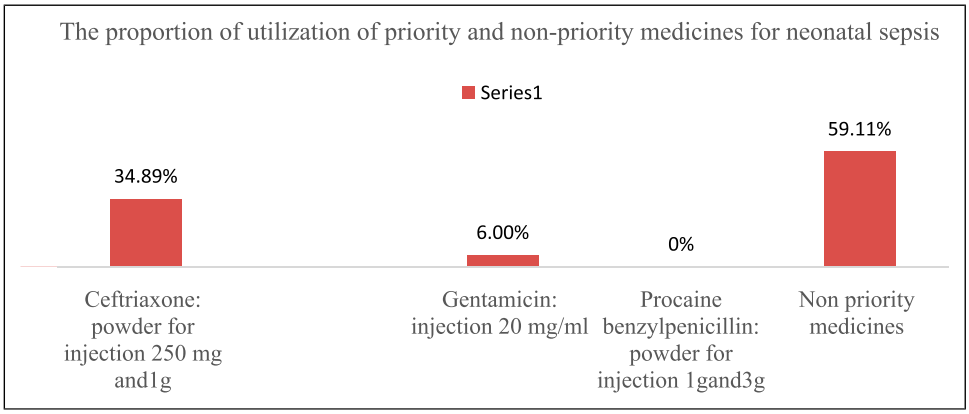

Figure 3. The proportion of utilization of priority and non-priority medicines for neonatal sepsis at University of Gondar Comprehensive Specialized Hospital Ethiopia.

difference might be due to the high utilization of non-priority medicine (32.55%) in the current study, which showed that poor adherence to WHO Recommendations and guidelines. National-based regulatory measure should be established and enforced to ensure rational utilization of recommended medicines, as well as in-service training for healthcare professionals, should be continuously provided to make them updated with newly developed guidelines, standard, and recommendations.

According to the current study, the utilization of antimalarial drugs was (60.15% for artemether/lumefantrine, 39.84% for artesunate injection, and 0% for artesunate rectal. This finding is higher than a study conducted in Uganda.[12] The observed difference could be due to different countries following diverse strategies to manage the disease.

Based on the findings of the current study, utilization for AZT+3TC+NEV–based regimen 73.17% ABC+3TC was 22.65% which was in line (100%) with the finding of the study conducted in the Jimma zone.[16] Because both AZT and ABC-based regimen was based on Ethiopia National pediatric ART guideline,[18] the observed similarity of the finding is most probably due to in Ethiopia; ART drugs are supplied from the common supply source and issued for all public sectors for free.

Based on the findings of the current study, availability and utilization of suggested medication for neonatal sepsis was low, while compared with Uganda`s study, utilizations of Procaine benzyl penicillin ranged from 82 to 86% at 3 different health centers.[12] But in the current study, utilization for this medication was 0%. The observed difference might be due to high utilization of non-priority medicines in the current study.

Conclusion and Recommendations

Availability and utilization of priority medicines for the management of antiretroviral infections, Vitamin A deficiency, malaria, and diarrheal cases were high, whereas availability and utilization of suggested medication for neonatal sepsis were very low. A significant proportion of children who hold pneumonia and pain was managed by non-priority medicines, despite the high availability of priority medicines for these conditions. Availability and utilization of artesunate rectal and gentamycin injection were null for the management of pneumonia and malaria, respectively. Medicines supply sources of the country, ministry of health, policymakers as well as facility managers should work in collaboration toward ensuring sustainable and consistent availability of priority medicines through the country. National-based regulatory measures should be established and enforced to ensure rational utilization of recommended medicines, as well as in-service training for healthcare professionals, should be continuously provided to make them updated with newly developed guidelines, standards, and recommendations.

Appendix A

Notation

3TC	Lamivudine
ABC	Abacavir
ART	Antiretroviral Therapy
EVF	Efavirenz
HIV	Human immunodeficiency virus
LPV/r	Lopinavir/ritonavir
NVP	Nevirapine
ORS	Oral rehydration salt
SPSS	Statistical Package Software for Social Sciences
TDF	Tenofovir disoproxil fumarate
USAID	United States Agency for International Development
WHO	World Health Organization

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval

The study protocol was approved by an ethical review committee of the School of Pharmacy, University of Gondar. Both written and verbal consent for data collection were obtained before conducting this study. Participants' information gained was kept confidential.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

ORCID iDs

Alem Endeshaw Woldeyohanins https://orcid.org/0000-0002-6034-0862
Zemene Demelash Kifle https://orcid.org/0000-0001-7030-2782

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