Availability of Essential Medicines and Supplies in War Affected Zones in Northern Ethiopia

Taye Zeru[1*], Asrat Agalu[2], Melashu Balew[1], Desalew Salew[1], Molalign Tarekegn[1], Girum Meseret Ayenew[1], Betelihem Belete[1], Zena Ameha[1], Birhanu Taye[3], Mezigebu Yitayal[1,5], Seid Legesse[1], Simeneh Ayalew[1], Getu Degu[1,4], Belay Bezabih[1], Gizachew Yismaw[1]

[1]Amhara Public Health Institute, Bahir Dar, Ethiopia
[2]Department of Pharmacy, Bahir Dar University, College of Medicine and Health Sciences, Bahir Dar, Ethiopia
[3]Amhara Regional Health Bureau
[4]Bahir Dar University, College of Medicine and Health Sciences, Bahir Dar, Ethiopia
[5]University of Gondar, College of Medicine and Health Sciences, Gondar, Ethiopia
[*]Corresponding Author: Taye Zeru: Email: zerutaye@gmail.com, Bahir Dar, Ethiopia,

ABSTRACT:

Background: *Essential medicines are intended to be available within the context of functioning health systems. It should be selected based on disease prevalence, public health relevance as well as evidence of efficacy and safety and cost-effectiveness. There had been major armed conflict resulting in large-scale displacement and impending the availability of essential medicines and supplies in Northern Ethiopia. The aim of this study was to assess the availability of essential medicines and supplies in war-affected zones in the Amhara region.*

Methods: *A cross-sectional study was conducted in 151 health care facilities from May 16-29, 2022. Data were collected using service availability and readiness assessment tool and a key informant guide. Finally, data was exported from ODK to excel and then to Statistical Package for the Social Sciences version 26 for analysis.* Descriptive statistics were computed, and presented in tables *and Thematic analysis was used to analyze the qualitative data.*

Results: *About 128 (84.8%) of health facilities were health centers among with 45% and 77.5% of them had procurement plan and ordered essential medicine, respectively. Vaccine availability ranges from 0% for measles to 88.7% Diphtheria, Tetanus, Pertussis (whooping cough), Hepatitis B, Homophiles influenza type B, and Polio vaccines. The availability of combined oral contraceptives was 65 (43%) whereas Coartem was 100 (66.2%), Anti-Retroviral Therapy adult 52 (34.4%), Antiretroviral pediatrics 25(17.2%), Anti- Tuberculosis drugs rifampicin, isoniazid, pyrazinamide and ethambutol 74 (49%), rifampicin, isoniazid adult 72 (47.7%), and rifampicin, isoniazid Pediatrics 53 (35.1%) were available in the health facilities and for non-communicable diseases or essential drugs were very limited which was less than 50% for all essential drugs.*

Conclusion and Recommendation: *In this study health facilities in war affected area did not have adequate essential medicines and supplies to provide health services. So strengthening collaborative efforts of the national and regional government, and other stakeholders to restore essential drugs in health facilities is urgently needed.*

Keywords: *Health care facility, Service availability, war zone, Amhara*

የጥናቱ ረቂቅ

የጥናቱ ዳራ: *ለህክምና አገልግሎቱ አስፈላጊ የሆኑ መድሃኒቶች እና የህክምና ግብዓቶች በጤና አገልግሎት ስርዓት ውስጥ መገኘት እንዳለባቸዉ ይታመናል። እነዚህ መድኃኒቶች በበሽታ ስርጭት፣ በማሕበረሰብ ጤና ሁኔታና አግባብነት፣ በመድሃኒቶች ውጤታማነት እና ደህንነት እንዲሁም በዋጋ አዋጭነት ላይ ተመስርተው መገዛት ይኖርባቸዋል። ነገር ግን በሰሜን ኢትዮጵያ የተከሰተዉ ጦርነት መጠነ ሰፊ ጉዳትና መፈናቀልን ያስከተለ ሲሆን በህክምና ተቋማት ዉስጥ አስፈላጊ የሆኑ መድሃኒቶች እና አቅርቦቶች እንዳይኖር ተፅእኖ አድርጓል። ስለሆነም የዚህ ጥናት አላማ በአማራ ክልል በጦርነት በተጎዱ ዞኖች ለህክምና አገልግሎት አስፈላጊ የሆኑ መድሃኒቶች እና አቅርቦቶች በጤና ተቋማት የመኖራቸውን ሁኔታ ለመዳሰስ ነበር።.*

የጥናቱ ስልት/ዘዴ: *በጥናቱ 151 የጤና ተቋማት ከግንቦት 16 እስከ 29 ቀን 2022 እ.ኤ.አ ተዳሰዋል። መረጃው የተሰበሰበው የአገልግሎት አቅርቦት እና አገልግሎቱን ለመስጠት ተቋማት ዝግጁ መሆናቸዉን በሚዳስስ መጠይቅ እና የቁልፍ የመረጃ ሰጪ መጠይቅ በመጠቀም ነበር። መረጃዉ ከተሰበሰበ በኋላ ወደ ኤክሴል ከዚያም ወደ SPSS-v 26 በመዉሰድ እንዲተነተን ተደርጓል። ትንተናውም በጤና ተቋማት የመድኃኒትና የህክምና ግብዓቶች ምጣኔ ያስቀመጠ ሲሆን ከዚህም በተጨማሪ ከቁልፍ መረጃ ሰጭ አካላት የተገኙ መረጃዎችን በየፈርጁ በማደራጀት ተቀምጧል።*

የጥናቱ ዉጤት: *በጥናቱ ዉስጥ ከተካተቱት ጤና ተቋማት 128 (84.8%) ጤና ጣቢያዎች ነበሩ። በጥናቱ ከተዳሰሱት ጤና ተቋማት 45% የመድኃኒት*

ግዥ እቅድ የነበራቸው ሲሆን 77.5% ደግሞ ለህክምና አገልግሎት አስፈላጊ የሆኑ መድኃኒቶች እና ግብዓቶች ለማሟላት በግዥ ሂደት ላይ ነበሩ። የክትባት አቅርቦት ሲታይ ሁሉም በዳሰሳው የተካተቱ ጤና ተቋማት የኩፍኝ ክትባት ሙሉ በሙሉ ያልነበራቸው ሲሆን የዲፍቴሪያ፣ የ ሄፓታይተስ ቢ እና ሆሞፊለስ ኢንፍሉዌንዛ ቢ እንዲሁም የፖሊዮ ጥቅል ምጣኔ ሲታይ ደግሞ 11.3% ከመቶ ተቋማት ላይ ምንም አልነበረም። ከተዳሰሱት የጤና ተቋማት 57% በመቶ የሚሆኑት በአፍ የሚወሰድ የእርግዝና መቆጣጠሪያ እንክብል አልነበራቸውም። የወባ መዲኃኒት ኮአርተም 100 (66.2%)፣ የአዋቂዎች ፀረ-ኤችአይቪ ህክምና መድኃኒት 52 (34.4%)፣የሕፃናት ፀረ-ኤችአይቪ ሕክምና መድሃኒት 25 (17.2%)፣ ለአዋቂዎች ፀረ-ቲቢ መድኃኒቶች (RHZE) 74 (49%)፣ ለአዋቂዎች ፀረ-ቲቢ መድኃኒቶች (RH) 72 (47.7%)፣ ለህፃናት የፀረ ቲቢ መድሃኒት (RH) 53 (35.1%) ጤና ተቋማት መድኃኒቱ ነበራቸዉ። ነገርግን ተላላፊ ያልሆኑ በሽታዎች መድኃኒቶች በጤና ተቋማት የመገኘት ምጣኔያቸዉ ውስን ነበር። ይህም ለሁሉም አስፈላጊ መድሃኒቶች የመገኘት መጠናቸዉ ከ50% በታች ነበር።

ማጠቃለያና ምክረ ሃሳብ: *ይህ ዳሰሳ ጥናት እንደሚያሳየው በጦርነቱ የተጎዱ በርካታ የጤና ተቋማት አገልግሎት ለመስጠት የሚያስችሉ አስፈላጊ መድኃኒቶች እና የህክምና ግብዓቶች አልነበራቸውም።*

የጥናቱ ቁልፍ ቃላት: *የጤና እንክብካቤ ተቋም፣ የአገልግሎት አቅርቦት፣ የጦርነት ቀጠና፣ አማራ*

BACKGROUND

Drugs are essential components of healthcare.[1] Access to drugs enhanced health outcomes and drastically reduced mortality rates.[2] This is assured through the provision of safe, effective, and reliable quality essential medicines.[3] According to WHO, essential medicines are those drugs which are selected based on local disease prevalence and public health relevance, evidence of clinical efficacy and safety, and comparative costs and cost-effectiveness so as to satisfy the priority health care needs of the population, and to save lives, reduce suffering and improve health.[4] In 2013, the national average for the availability of key essential drugs in health facilities in Ethiopia was 70%, 85% and 91% for public health facilities, regional drug stores and private drug retail outlets, respectively which were lower than the target set in Health Sector Development Plan-I.[5]

In adequate access to essential medicines and medical supplies might be affected by many factors. Low availability and uncontrolled prices are major concerns in developing countries hindering access to essential medicines in public health sector facilities.[6-10] In recent years, health systems are facing significant challenges in providing essential health services because of COVID-19 pandemic, which contributed for poor availability of essential drugs because of the direct impact on distribution, transportation, income, and cost of medicines. Armed conflict are double burdens in the health care systems, resulting in destruction and looting of health facilities and it would leave millions of people without access to essential healthcare services including essential drugs fueling challenges in already fragile health care systems and extremely restricted access to drugs and supplies.[10]

Since November 20220, in Northern Ethiopia there has been major armed conflict which resulted in large-scale displacement and destruction of health facilities resulting in dire humanitarian crisis.[11] This could increase the vulnerability of diseases in malfunctioned health facilities and already overburdened health care systems. Increased numbers of diseases that need medicine, stretching country pharmaceutical systems and budget. Thus, more resources are required for reliable and timely delivery of quality assured medicines as well as their appropriate utilization.[4] Thus, the aim of this study was to assess the availability of essential medicines and supplies to provide healthcare service in war affected areas in Amhara region, Northern Ethiopia.

METHODS

Study settings and period

A mixed-method study was conducted from May 16-29, 2022 in 151 health facilities in the war-affected zones in the Amhara region, Ethiopia. The study was conducted in North Wollo, South Wollo, South Gondar, North Showa, Wag Himra and Oromo special zones, and Dessie city administration. The estimated population of the areas was 11,926,815 and the total internally displaced people because of armed conflict were 6,142,944. A total of 65 Woredas, and 673 health facilities (81 hospitals and 592 health centers) were affected by armed conflict in this region.

Source and study population

Health facilities in the war-affected areas were the source population. Health facilities that were functional in the provision of services during the study period were the study population.

Study participants

All health care facilities in war affected zones in Amhara region were included in the study. Heads of the facility and departments were also included in the study as key informants to explore the extent of available essential drugs and supplies for the provision of health services.

Sample Size

A total of 151 health facilities during post war period were included in the survey to assess the availability of essential human and infrastructure resources and the readiness of health facilities to provide primary health interventions.

Variables of the study

The key variables were availability of essential medicines and supplies to provide essential health services in the health facilities including but not limited to family planning, child health services, primary and comprehensive obstetric care, HIV/AIDS, Tuberculosis, Malaria, and non-communicable diseases.

Data collection tool and Process

Prior to data collection two days training was given to data collectors, who do have experience in quantitative and qualitative data collection. Data were collected using the WHO recommended standard tool, Service Availability and Readiness Assessment (SARA) tool, which is designed to assess health facility service delivery and monitor the service availability and readiness of the health sector and to generate evidence to support the planning and managing of a health system.[12] The tool was customized to contextualize for local use. The questionnaire was designed based on open data kit (ODK) tool. Interview guide was developed for qualitative data collection.

Key interview guide was prepared and used to collect the data. The guide was prepared in English and translated into Amharic. The interview guide was pre-tested before the actual data collection. Five data collectors, were involved to collect the data. To harmonize the data quality, two days, workshop was conducted. Each interview was done by two data collectors to run the interview and arrange settings. Face-to-face interviews were carried out to observe participants' emotions. A digital audio recorder was used to record participants' own words. In addition, notes were taken to capture the feelings and expressions of participants. Interviewees were invited to tell their stories uninterrupted and in their own words, with the interviewer using conversational prompts. Transcriptions of audio records were done on daily bases.

Data quality assurance

Data were cleaned and checked on daily basis for internal consistency. Experienced data collectors were engaged in qualitative data collection and was strictly supervised. Contextual translations were done by individual data collectors and this was rechecked by research team members. The interpretation of the findings was derived from the data.

Data Analysis

Collected data was exported to excel from the ODK to SPSS version 26 for analysis. Descriptive statistics such as frequency and proportion were used to describe data and presented in tables. Thematic framework analysis was used to analyze qualitative data based on verbatim transcription. Open Cod 4.03 software was used for coding and synthesizing. Finally, quantitative data was triangulated.

RESULTS

This study assessed availability of essential medicines and supplies in war affected zones in post war period. A total of 151 health facilities were included in the assessment out of which 128 (84.8%) health centers and 23 (15.2%) were hospitals. The finding of the study is presented in the following sections.

Functional supply chain management system

From the surveyed health facilities, 45% had procurement plan and 77.5% ordered essential medicine; where as 90.1% ordered anti-tuberculosis drugs, 67.5% ordered anti-retroviral, 74.8% ordered laboratory supplies and 74.8% ordered nutrition supplies. Regarding stock card use and update, health facilities had stock cards updated for only some items. It was 17.2% for Artemether/Lumefant Artesunate, 12.6% for Amoxicillin, 17.2% for Measles Vaccine and only 2.6% health facilities updated for BCG vaccine. From the surveyed health care facilities, 72.2% had list of essential medicine, vaccines, and supplies and 58.9% had lists of laboratory reagents and supplies (Table 1)

Table 1. Functional supply management system in health care facilities in war affected zones of the Amhara region, Northern Ethiopia, May, 2022, [N=151]

Variables	Frequency (%)
Order anti tuberculosis	136 (90.1)
Order essential medicine	117 (77.5)
Order HIV testing kits	117 (77.5)
Order reproductive health supplies	117 (77.5)
Order laboratory supplies	113 (74.8)
Order nutrition supplies	110 (72.8)
Presence of essential medicine, vaccines and supplies list	109 (72.2)
Order anti -retroviral drugs	102 (67.5)
Presence of laboratory reagents and supplies list	89 (58.9)
Had minutes working improvement team	87 (57.6)
Health facilities have annual procurement plan	68 (45)
ADR/ADEs monitoring forms for immunization	44 (29.1)
Presence of Clinical guideline	38 (25.2)
Stock cards for Amoxicillin updated	26 (17.2)
Stock card for Oral rehydration salt (ORS) updated	25 (16.6)
Stock card for Oxytocin updated	25 (16.6)
Stock card for Vitamin A updated	24 (15.9)
Stock card for Nifedipine updated	24 (15.9)
Stock card depot medroxyprogesterone acetate updated	21 (13.9)
Stock card for rifampin (R), isoniazid (H) and pyrazinamide *(Z*) (RHZE) updated	20 (13.2)
Presence of redistribution Guidelines	16 (10.6)
Available HIV test kits	8 (5.3)
Stock card for Measles vaccine updated	4 (2.6)
Stock card for Pyrimethamine updated	4 (2.6)
Stock card for blood updated	3 (2.0)

Gaps in availability of essential drugs and supplies

Antibiotics for management of infectious diseases were very limited in number and were available in small number of health facilities. Except for Artemether Lumefantrine, Cefixime and Anti-Retroviral therapy (ART) drugs which was available in 100 (66.2%), 128 (84.8 %) and 125 (82.8%) of health facilities, respectively, other antimicrobials were available in less than 50% of health facilities (Table 2).

Table 2. Essential drugs and supplies for infectious diseases in healthcare facilities in war affected zones of the Amhara region, Northern Ethiopia, May, 2022, [N=151]

Essential medicines and supplies available in-service delivery		Availability in the health facility (%)			
		Health centers	Hospitals	Total	
				Yes	No
STI commodities	Metronidazole	55 (43.0)	13 (56.5)	68 (45)	83 (55)
	Condoms	49 (38.3)	15 (65.2)	64 (42.4)	87 (5.6)
	Doxycycline	55 (43.0)	12 (52.2)	67 (44.4)	84 (55.6)
	IV Ceftriaxone	57 (44.5)	15 (65.2)	72 (47.7)	79 (52.3)
	Cefixime	16 (12.5)	7 (30.4)	23 (15.2)	128 (84.8)
Malaria commodities	Artemether Lumefantrine	82 (64.1)	18 (78.3)	100 (66.2)	51 (33.8)
	Artesunate injection	56 (43.8)	17 (73.9)	73 (48.3)	78 (51.7)
	Rectal Artesunate	23 (18.0)	6 (26.1)	29 (19.2)	122 (80.8)
HIV commodities	Nevirapine	39 (30.5)	14 (60.9)	53 (35.1)	98 (64.9)
	Cotrimoxazole 960mg	48 (37.5)	15 (65.2)	63 (41.7)	88 (58.3)
	Cotrimoxazole suspension	47 (36.7)	15 (65.2)	62 (41.1)	89 (58.9)
	ARVS adult (TDF,3TC, DTG) (ABC,3TC)	37 (28.9)	15 (65.2)	52 (34.4)	99 (65.6)
	ARVS (Pediatric) (ABC,3TC 120/60mg) (ABC,3TC, Pv)	18 (14.1)	8 (34.8)	26 (17.2)	125 (82.8)
	Anti-fungal	19 (14.8)	8 (34.7)	27 (17.9)	124 (82.1)
Anti TB drugs	Isonized (NIH)	54 (53.9)	15 (65.2)	69 (45.7)	82 (54.3)
	RHZE (75/150/275/400 mg)	60 (57.8)	14 (60.9)	74 (49)	77 (51)
	RH (150/75mg)	57 (56.3)	15 (65.2	72 (47.7)	79 (52.3)
	RHZ pediatric (60/30/150mg)	47 (45.3)	11 (47.8)	58 (38.4)	93 (61.6)
	RH pediatric (60/30mg)	45 (41.4)	8 (34.8)	53 (35.1)	98 (64.9)
	Pyridoxine	65 (64.1)	17 (73.9)	82 (54.3)	69 (45.7)

Reproductive maternal and child health commodities

About 88.7% of health facilities had DPT, HiB, HepB, and polio vaccines followed by 78.1% BCG vaccines, and 66.95% rubella vaccines. However, none of health facilities had measles vaccine. In similar way, 43% of facilities had combined oral contraceptives, and 35.8% had injectable contraceptives.

Assessment of basic obstetric care commodities revealed that, out of 151 health facilities, 62.9% had examination or surgical gloves and 61.6% had Partographs. Injectable antibiotics were available in 65% of health facilities. Newborn and childcare commodities were available in some but not in all health facilities (Table 3).

Table 3. Essential drugs and supplies for maternal, child and newborn health care in healthcare facilities in war affected zones of the Amhara region, Northern Ethiopia, May, 2022, [N=151]].

Essential medicines and supplies available in-service delivery		Availability in the health facility (%)			
		Health centers	Hospitals	Total	
				Yes	No
Family planning methods	Combined Oral contraceptives	51 (39.8)	14 (60.9)	65 (43)	86 (57)
	Injectable Contraceptives	41 (32.0)	13 (56.5)	54 (35.8)	97 (35.8)
	Condoms	48 (37.5)	14 (60.9)	62 (41.1)	89 (41.1)
	Moon beads	22 (17.2)	5 (21.7)	27 (17.9)	124 (82.1)
ANC commodities	Folic acid and non-iron	53 (41.4)	15 (65.2)	68 (45)	83 (55)
	Mebendazole albendazole	59 (46.1)	15 (65.2)	74 (49)	77 (51)
Tracer vaccines	Bacille Calmette-Guerin (BCG) vaccines	102 (79.7)	16 (69.6)	118 (78.1)	33 (21.9)
	Rubella vaccines	87 (68.0)	14 (60.9)	101 (66.9)	50 (33.1)
	Pneumococcal Conjugate vaccines	111 (86.7)	17 (73.9)	128 (84.8)	23 (15.2)
	Polio vaccines available	116 (90.6)	18 (78.3)	134 (88.7)	17 (11.3)
	DPT-HiB-HepB vaccines	117 (91.4)	17 (73.9)	134 (88.7)	17 (11.3)
	Human Papilloma Virus (HPV) vaccines available	62 (48.4)	8 (34.8)	70 (44)	81 (53.6)
	Rubella vaccines	87 (68.0)	14 (60.9)	101 (66.9)	50 (33.1)
	Measles	0	0	0	151 (100)
	Anti-rabies vaccines	0 (0.0)	3 (13.0)	3 (2)	148 (98)
Basic obstetric care commodities	Examination gloves	79 (61.7)	16 (69.6)	95 (62.9)	56 (37.1)
	Partographs	77 (60.2)	16 (69.6)	93 (61.6)	58 (38.4)
	Normal saline	80 (62.5)	18 (78.3)	98 (64.9)	53 (35.1)
	Infusion set	79 (61.7)	18 (78.3)	97 (64.2)	54 (35.8)
	Magnesium sulphate	77 (60.2)	18 (8.3)	95 (62.9)	56 (37.1)
	Injectable antibiotic	81 (63.3)	18 (78.3)	99 (65.6))	52 (34.4)
	Corticosteroids dexamethasone	51 (39.8	18 (78.3)	69 (65.7)	82 (54.3)
	Vitamin k stock card updated	61 (47.7)	15 (65.2)	76 (50.3)	75 (49.7)
New born commodities	tetracycline eye ointment stock card updated	84 (65.6)	14 (60.9)	98(64.9)	53 (35.1)
	Gentamicin stock card updated	70 (54.7)	14 (60.9)	84 (55.6)	67 (44.4)
	Ampicillin stock card updated	65 (50.8)	15 (65.20	80 (53)	71 (47)
	Ceftriaxone stock card updated	79 (61.7)	15 (65.2)	94 (62.3)	57 (37.7)
	Amoxicillin stock card updated	75 (58.6)	18 (78.3)	93 (61.6)	58 (38.4)
	Diazepam rectal stock card updated	8 (6.3)	3 (13.0)	11(72.3)	140 (92.7)
Child health commodities	Mebendazole/albendazole stock card updated	82 (64.1)	18 (78.3)	100 (66.2)	51 (33.8)
	Oral rehydration solutions (ORS) and stock card updated	83 (64.8)	18 (78.3)	101 (66.9)	50 (33.1)
	Zinc stock card updated	72 (56.3)	15 (65.2)	87 (57.6)	64 (42.4)
	Cotrimoxazole stock card updated	80 (62.5)	18 (78.3)	98 (64.9)	53 (35.1)
	Vitamin A stock card updated	78 (60.9)	15 (65.2)	93 (61.6)	58 (38.4)
	Amoxicillin stock card updated	73 (57.0)	18 (78.3)	91 (60.3)	60 (39.7)
	Paracetamol stock card updated	74 (57.8)	18 (78.3)	92 (60.9)	59 (39.1)

Drugs for Non-communicable diseases

Availability of drugs for selected non-communicable drugs in hospitals were very limited in number. The drugs were only available less than 50% of the health facilities where Phenytoin, Beta-blockers and glibenclamide, were available in 42 (27.8), 58 (38.4) and 68 (45) of health facilities, respectively among Antiepileptic, Diabetes and Antihypertensive drugs (Table 4).

Table 4. Essential drugs and supplies for non-communicable diseases in healthcare facilities in war affected zones of the Amhara region, Northern Ethiopia, May, 2022, [N=151]

Essential medicines and supplies available in-service delivery		Availability in the health facility (%)			
		Health centers	Hospitals	Total	
				Yes	No
Antiepileptic drugs	Diazepam Injection	29 (22.7)	14 (60.9)	43 (28.5)	108 (71.5)
	Carbamazepine	8 (6.3)	11 (47.8)	19 (12.6)	132 (87.4)
	Phenytoin	29 (22.7)	13 (56.5)	42 (27.8)	109 (72.2)
Diabetes drugs	Hydrocortisone	45 (35.2)	14 (60.9)	59 (39.1)	92 (60.9)
	Glibenclamide	53 (41.4)	15 (65.2)	68 (45)	83 (55)
	Insulin injectable	30 (23.4)	15 (65.2)	45 (29.8)	106 (70.1)
Antihypertensive drugs	Bendroflumethiazide	22 (17.2)	15 (65.2)	37 (24.5)	114 (75.5)
	Beta blockers	45 (35.2)	13 (56.5)	58 (38.4)	93 (61.6)
	Lisinopril or enalapril	62 (48.4)	18 (78.3	80 (53)	71 (47)
	Angiotensin II receptor antagonist	4 (3.1)	4 (17.4)	8 (5.3)	143 (94.7)

The quantitative data described from table 3-5 strongly supported by the qualitative findings. The key informant interview in most of health facilities supported inadequacy of essential drugs and supplies to provide services.

"*Despite we obtained chemistry and CBC machines through donation, the service is not yet provided because of lack of reagents. There are shortages of drugs and supplies. Our consumption is high. It is difficult to provide service starting from Monday. (…) Anesthesia needle and drugs are also problems. We are referring mothers because of lack of anesthesia needles and drugs." [28 years, medical director from hospital]*

"Because of reagents, we are not able to conduct organ function and others tests rather we prefer to refer patients for these simple tests." Another 28-year-old man from the hospital added that, "(…) the anesthesia medication shortage (like dexamethasone drug) makes us to be in fear of interruption of the OR service." [28 years, male participant from another hospital]

The problem was similar in health center too.

"(…) the big challenges are the supply and demand are not proportional to address all cases." [34 years' male participant from health center]

"(…) the main challenge is shortage of ART drugs and supplies." Which was the issue in hospitals stressed as, "(…) specially, there was high shortage of ART drugs. [28 years, female participant from hospital]

Mainly pediatrics ART drugs and other supply are challenges". [29 years old male participant from health center]

Storage conditions

From the surveyed health facilities, 94.7% had functional separated store from dispensary, 71% and had well ventilated store. Moreover, 67.5% had store only medicine in refrigerator and 19.2% health care facilities monitored store room temperature. When we see cold chain, 70.2% had functional freezer with compartment, and 74.2% had reliable electric power (Table 5).

Table 5. Availability of functional storage conditions in war affected zones of the Amhara region, Northern Ethiopia, May, 2022, [N=151]

Variables		Frequency (%)
Essential medicines and supplies	Separated store from dispensary	143 (94.7)
	No pests/harmful insects/rodents	128 (84.8)
	Medicine protected direct sunlight	117 (77.5)
	Clean store	117 (77.5)
	Good store ceiling	114 (75.5)
	Essential Medicines stored good condition	113 (74.8)
	Well ventilated store	108 (71.5)
	Only medicine store in refrigerator	102 (67.5)
	Expired Item stored in separate area	100 (66.2)
	Functional fire safety equipment	46 (30.5)
	The door to the store has 2 locks	35 (23.2)
	Store room temp monitored	29 (19.2)
Controlled substances	Apply FEFO, FIFO*	150 (99.3)
	Essential medicine and health supplies alphabetically arranged	115 (76.2)
	Proper storage of medicine	110 (72.8)
	Liquids stored middle shelves	100 (66.2)
	Surgical and condom stored at bottom shelves	95 (62.9)
	Controlled substances kept e.g., morphine Tab	25 **(16.6)**
Cold chain storage	Fridge tag presence	120 (79.5)
	Multi-dose vaccine returned to be well labelled	116 (76.8)
	Reliable Electricity power	112 (74.2)
	Functional compartment freezer	106 (70.2)
	Temperatures maintained between +2 and 8Oc	104 (68.9)
	Temperatures are monitored twice daily	86 (57)
	Temperature monitoring chart is fixed	84 (55.6)
	Reliable Solar power	23 (15.2)
	Reliable power source	16(10.6)

DISCUSSION

According to WHO, essential medicines should be available in functioning health systems at all times, in appropriate dosage forms, of assured quality and at prices individuals and health systems can afford.[3] Due to the destruction and/or looting during armed conflict, only limited number of certain essential drugs and supplies were available in the study area. According to Ethiopian Ministry of Health, immunization program is one of the most cost-effective health interventions with proven strategies to reach the most hard-to-reach and vulnerable populations in the country.[13] However, the current assessment revealed availability of limited vaccines

in the health facilities among twelve routine immunization programs.

The study revealed that available vaccines in the health facilities were DPT, HiB, and HepB vaccines134 (88.7%), Polio vaccines 134 (88.7%), Tetanus Toxoid vaccines 129 (85.4%), Pneumococcal Conjugate vaccines 128 (84.8%), BCG vaccines 118 (78.1%), Rubella vaccines101 (66.9%), and Human Papilloma Virus (HPV) vaccines 70 (46.4%) and none of the health facilities had Measles vaccine. This might have resulted in increased prevalence of vaccine preventable diseases, which had been remarkably resulted in reducing morbidity and mortality from vaccine preventable diseases.[13] One can clearly see the impact of armed conflict on infant immunization coverage, which is top priorities to reduce death of under five children in the country.

Although use of contraception is known to advance the human right of people to determine the number and spacing of their children, only about 60% of health facilities in this study area had at least one family planning methods. Combined oral contraceptives, injectable contraceptives and condoms were available in 65 (43%), 54 (35.8%) and 62 (41.1%) of health facilities respectively. Lack of family planning methods could be double burden resulting in unintended pregnancy and the transmission of sexually transmitted infections such as HIV,[14] and the armed conflict also resulted rape and gender-based violence.

Availability of services like parenteral antibiotics, oxytocic drugs, anticonvulsants for pregnancy induced hypertension, manual removal of placenta, removal of retained products (e.g., vacuum aspiration), assisted vaginal delivery (e.g., vacuum extraction, forceps, cesarean delivery and blood transfusion are key to emergency obstetric care. In this study only about 60-65% of the health facilities had oxytocin or misoprostol for basic obstetric care but examination and surgical gloves, injectable antibiotic, IV normal saline, Infusion set, magnesium sulphate and Partographs for basic obstetric care, and chlorhexidine for cord care and dexamethasone were available in 55.6% and 45.7% of health, respectively. The above services.[15] could not be performed without essential medicines and supplies.

In this study, adult dose ARVs (TDF,3TC, DTG) (ABC,3TC) and Nevirapine were available only in 53 (35%) of health facilities but adult dose ABC,3TC, and LPV were available in 26 (17.2%) health facilities. HIV/AIDS, which is one of a major global health tragedy,[16] which was decreasing in prevalence and AIDS related mortality in most regions of the world due to availability of ART drugs,[17] could be fueled in the areas, which were under armed conflict for months and still lacking essential ART drugs. In availability of condoms 68 (45%), anti-fungal drugs 27 (17.9%), and cotrimoxazole 960mg 63 (41.7%) in most health facilities could result in highest burden of disability and premature deaths from AIDS related complications[16] and it could affect human development index.[18] Lack of Anti-TB drugs in more than 50% of health facilities would be double burden.[19] In this study, RHZE (75/150/275/400 mg), RH (150/75mg), RHZ pediatric tablet (60/30/150mg), Isoniazid tablet (NIH) were only available in 74 (49%), 72 (47.7%), 58 (38.4%) and 69 (45.7%) of health facilities. This could be of great problem for TB-HIV patients who could have been benefited from early initiation of anti-TB drugs.[19]

Studies showed that 71% of essential medicines for health centers and 78% of essential NCD Drugs for hospitals were available.[8] In this study, leaving the available amount aside, only limited number of health facilities had at least one essential drug for management of hypertension, epilepsy, and diabetes. Lisinopril or Enalapril, Glibenclamide and Phenytoin were available in 80 (53%), 68 (45%) and 42 (27.8%) of health facilities respectively. In Ethiopia, non-communicable diseases such as cardiovascular disease and diabetes mellitus are growing concern,[20] which could be complicated due to lack of essential drugs fueled by armed conflicts. Of the surveyed health, facilities 77.1% had clean store and 71.1% had ventilated store however WHO suggests that storage areas should be of sufficient capacity to allow the orderly storage of the various categories of materials and products. Moreover, 84.5% of health facilities had free of pests/rodents and harmful insects and, WHO suggests storage areas should be clean, and free from accumulated waste. Only 57% of health facilities monitored temperature twice daily and 69.8% of the facilities maintain the temperature between 2 - 8 ^{o}c. However, the WHO recommended that the equipment used for monitoring should be checked at suitable predetermined intervals and the results of such checks should be recorded and retained.[21] This difference might be due to the destruction of the facilities by the armed conflict and lack of power source. About 79.5% of the surveyed health facilities had fridge tags while WHO vaccine management handbook,[22] recommends using 30 day temperature records temperature monitoring devices in vaccine refrigerators as a minimum standard.[22] This difference might be happened due to the damage/looted conditions of the frig tags. In the surveyed health facilities, 74.2% had electric power, which was lower than a study conducted in west Wollega zone in which 82.61% health facilities had

operational electricity.[23] This difference is due to unavailability of power source due to damage of electric power source and the study settings.

One of the aftermaths of armed conflicts is destruction of the systems and infrastructures.[10] Functional supply chain management system are keys for availability of essential drugs by tracking the storage and movement of goods at every level within the supply system and storage to stocks ready for use in health facilities.[24] To restore the functional supply management system the health facilities had started and had procurement plan (45%) and ordered essential medicine (77.5%) including ordered anti-tuberculosis drugs (90.1%), ordered anti-retroviral therapy (67.5%), and ordered laboratory supplies (74.8%) in the health facilities.

As limitation, the study didn't conduct inventory of available essential drugs and supplies. It only assesses availability of items and basic infrastructures to restore health facilities and strengthen available services in the health facilities. It didn't address post-pre-Armed conflict to compare the damaged on the essential medicines and supplies.

In conclusion, more than half of the health facilities didn't have essential drugs and supplies to provide basic lifesaving services. Although the health care facilities are committed and ready to provide services in armed conflict-affected areas to the community they are suffering from lack of resources. Therefore, strengthening collaborative efforts of the national and regional government, and other stakeholders to restore the health care service delivery system in war-affected area of the Amhara region is urgently needed.

ACKNOWLEDGEMENT

We want to extend our heartfelt appreciation to the Zonal Health Departments, District Health Offices, Hospitals and Health Centers, study participants, data collectors and supervisors. Finally, we acknowledge Amhara National Regional State Health Bureau and Amhara Public Health Institute for financial and technical support.

REFERENCES

[1.] Alefan Q, Amairi R, Tawalbeh S. Availability, prices and affordability of selected essential medicines in Jordan: a national survey. BMC Health Serv Res. Oct 19 2018;18(1):787. doi:10.1186/s12913-018-3593-9

[2.] Ahmadiani S, Nikfar S. Challenges of access to medicine and the responsibility of pharmaceutical companies: a legal perspective. Daru. May 4 2016;24(1):13. doi:10.1186/s40199-016-0151-z

[3.] FMHACA. National Drug Policy of Transitional Government of Ethiopia. Accessed 10/12/2022, : http://www.fmhaca.gov.et/publication/national-drug-policy

[4.] WHO. Model List of Essential Medicines -22nd List. 2021.

ABBREVIATIONS

AIDS: Acquired Immunodeficiency Virus, ANC: Antenatal Care, ART: Antiretroviral Therapy, ARVs: Anti-retroviral, BCG: Bacille Calmette-Guérin, DHS: Demographic and Health Survey Report, FEFO: First Expired First Out, FIFO: First in First Out HIV: Human Immunodeficiency virus, ,HPV: Human Papilloma Virus, IRB: Institutional Review Board, ODK: Open Data Kit , ORS: Oral Rehydration Solutions, SARA: Service Availability and Readiness Assessment, STI: Sexually Transmitted Infections WHO: World Health Organization

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

To obtain the consent and cooperation of relevant organizations, we obtained ethical approval from the Amhara Public Health Institute Ethical Review Board. Respondents to the assessment provided verbal informed consent. There were no longer any personal identities. The Declaration of Helsinki was followed when conducting the study.

AVAILABILITY OF DATA

All the datasets analyzed during the current study are available from the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors declare no competing interests.

FUNDING

Funding was not received from any organization, but APHI has covered data enumeration costs.

CONTRIBUTION OF AUTHORS

TZ, AA, MB, DS and GY conceived the study, carried out the overall design, analyzed, and interpreted the data, statistical analysis. All Authors review the manuscript.

AUTHOR'S INFORMATION

TZ has Masters in General Public Health.

[5.]FMOH. Assessment of the Pharmaceutical Sector in Ethiopia. Accessed 12/10/2022 2022. www.who.int/medicines/areas/coordination/ethiopia_pharmaceutical.pdf

[6.]Saeed A, Saeed H, Saleem Z, Fang Y, Babar ZU. Evaluation of prices, availability and affordability of essential medicines in Lahore Division, Pakistan: A cross-sectional survey using WHO/HAI methodology. PLoS One. 2019;14(4):e0216122. doi:10.1371/journal.pone.0216122

[7.]Emmanuel Awucha N, Chinelo Janefrances O, Chima Meshach A, Chiamaka Henrietta J, Ibilolia Daniel A, Esther Chidiebere N. Impact of the COVID-19 Pandemic on Consumers' Access to Essential Medicines in Nigeria. Am J Trop Med Hyg. Oct 2020;103(4):1630-1634. doi:10.4269/ajtmh.20-0838

[8.]Mukundiyukuri JP, Irakiza JJ, Nyirahabimana N, et al. Availability, Costs and Stock-Outs of Essential NCD Drugs in Three Rural Rwandan Districts. Ann Glob Health. Sep 25 2020;86(1):123. doi:10.5334/aogh.2729

[9.]Dong Z, Tao Q, Sun G. Survey and analysis of the availability and affordability of essential drugs in Hefei based on WHO / HAI standard survey methods. BMC Public Health. Sep 15 2020;20(1):1405. doi:10.1186/s12889-020-09477-9

[10.]Leyh BM, Gispen ME. Access to Medicines in Times of Conflict: Overlapping Compliance and Accountability Frameworks for Syria. Health Hum Rights. Jun 2018;20(1):237-250.

[11.]OCHA. - Northern Ethiopia Humanitarian Update Situation Report, 9 Accessed 12/12/2022, https://reliefweb.int/report/ethiopia/ethiopia-northern-ethiopia-humanitarian-update-situation-report-9-dec-2021

[12.]WHO. Service Availability and Readiness Assessment (SARA): An annual monitoring system for service delivery. 2022.

[13.]MOH. Expanded Program on Immunization in Ethiopia Accessed 12/10/2022 https://www.moh.gov.et/site/Expanded_Program_on_Immunization_%28EPI%29

[14.]WHO. Family planning/contraception methods. Accessed 12/10/2022 https://www.who.int/news-room/fact-sheets/detail/family-planning-contraception

[15.]Pearson L, Shoo R. Availability and use of emergency obstetric services: Kenya, Rwanda, Southern Sudan, and Uganda. Int J Gynaecol Obstet. Feb 2005;88(2):208-15. doi:10.1016/j.ijgo.2004.09.027

[16.]Mabaso MLH, Zama TP, Mlangeni L, Mbiza S, Mkhize-Kwitshana ZL. Association between the Human Development Index and Millennium Development Goals 6 Indicators in Sub-Saharan Africa from 2000 to 2014: Implications for the New Sustainable Development Goals. J Epidemiol Glob Health. Dec 2018;8(1-2):77-81. doi:10.2991/j.jegh.2018.09.001

[17.]Govender RD, Hashim MJ, Khan MA, Mustafa H, Khan G. Global Epidemiology of HIV/AIDS: A Resurgence in North America and Europe. J Epidemiol Glob Health. Sep 2021;11(3):296-301. doi:10.2991/jegh.k.210621.001

[18.]Misganaw A, Mariam DH, Ali A, Araya T. Epidemiology of major non-communicable diseases in Ethiopia: a systematic review. J Health Popul Nutr. Mar 2014;32(1):1-13.

[19.]Maemun S, Mariana N, Rusli A, Mahkota R, Purnama TB. Early Initiation of ARV Therapy Among TB-HIV Patients in Indonesia Prolongs Survival Rates! J Epidemiol Glob Health. Jun 2020;10(2):164-167. doi:10.2991/jegh.k.200102.002

[20.]Health Sector Development Programme IV 2010/11 – 2014/15 (2010).

[21.]WHO. Guide to good storage practices for pharmaceuticals, WHO Technical Report. 2003.

[22.]WHO. How to develop a repair and maintenance system for cold chain equipment. 2017.

[23.]Kebede O, Tilahun G, Feyissa D. Storage management and wastage of reproductive health medicines and associated challenges in west Wollega zone of Ethiopia: a mixed cross-sectional descriptive study. BMC Health Serv Res. Apr 1 2021;21(1):297. doi:10.1186/s12913-021-06291-w

[24.]Roy C, Das JK, Jha HK, Bhattacharya V, Shivdasani JP, Nandan D. Logistics and supply management system of drugs at different levels in Darbhanga District of Bihar. Indian J Public Health. Jul-Sep 2009;53(3):147-50.