Section: Community Medicine

Original Research Article

AVAILABILITY OF ESSENTIAL MEDICINES IN PUBLIC AND PRIVATE MEDICINE OUTLETS: A CROSS-SECTIONAL STUDY IN THE COASTAL CITY OF SOUTH INDIA

K Vanipriyanka[1]

[1]Assistant Professor, Department of Community Medicine, NRIIMS, Visakhapatnam, Visakhapatnam district, Andhra Pradesh, India.

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Corresponding Author:
Dr. K Vanipriyanka,
Email: vanipriyankakadiyam@gmail.com

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ABSTRACT

Background: According to the WHO, "Essential medicines are those that satisfy the priority health care needs of a population". They are intended to 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. Surveys done in different parts of India showed a lack of availability of Essential Medicines, especially in public facilities. With the view to know the present situation, the present study was aimed to assess the availability of essential medicines in Visakhapatnam, a Coastal city in South India. **Materials and Methods:** A descriptive cross-sectional study was conducted to assess the availability of essential medicines at medicine outlets which includes public health facilities, private medical stores and other generic stores for a period of two months at Visakhapatnam, a coastal city in South India with its district headquarters, in the state of Andhra Pradesh, south India. Six representative Mandalas were selected as survey areas through convenience sampling and a total sample of 30 medicine outlets were selected by simple random technique from these six survey areas based on the recommendations of WHO and HAI (Health Action International) methodology. **Results:** In the present study 50 key essential medicines were included of which 30 were from WHO- SEARO regional core list and 20 were supplementary list of medicines from National list of essential medicines (NLEM) of India. The mean availability of the the essential medicines at the public health facilities of the survey areas was 47.33%. Among the six survey areas, the percentage availability of the essential medicines was highest (84%) in the community health centre, pendurthi(P) and least (32%) in the primary health centre, Bheemunnipatnam(B). The mean availability of the all 50 essential medicines at private medicine stores is 67.2%. **Conclusion:** Overall, availability of the medicines at the surveyed medicine outlets is fairly high as per WHO/HAI criteria. Public facilities and generic stores were found with non-availability of few drugs compared to the private medicine outlets, which could be improved on proper monitoring of the drug accessibility based on the demand driven maintenance of the medicine stocks.

INTRODUCTION

According to the WHO, "Essential medicines are those that satisfy the priority health care needs of a population". The Expert Committee selects the drugs that go on this list with due regard to disease prevalence and public health relevance, evidence of efficacy and safety and comparative cost-effectiveness. They are intended to 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. The first Essential Medicine List was made in 1977 and the WHO updates the Model list of essential medications every two years and individual countries make minor changes/adaptations to this list based on the local healthcare scenario and needs.[1] India had last updated its list in 2015.[2]

Access to Medicine Foundation estimates that about 2 billion people worldwide do not have access to these medicines.[3] This indicates how serious the problem of availability of essential medications is across all the regions of the world. By improving access to essential medications, about 10 million lives per year could be saved.[4] Target 8e of MDG (Millennium Development Goals) stated that there is a need to improve the access of essential medicines,

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especially for low and low-middle income countries.[5]

According to a WHO report, the availability of generics in public sectors is less than 60% across all regions of the world and the availability of generics in private sector is also less than 60% in the Southeast Asian region.[6] In the developing countries, public sector availability of medications is low in all the regions and also lower than the private sector.[7]

India consists of 33 federal states/union territories that are ruled by different political parties.[8] Surveys done in different parts of India showed a lack of availability of Essential Medicines, especially in public facilities.[9] The health of both the hospitals and people living in a particular area are heavily affected by the availability of essential drugs in that area.[10]

With the view to know the present situation, the present study was aimed to assess the availability of essential medicines in Visakhapatnam, a Coastal city in South India.

Aims and Objectives

1. To estimate the availability of essential medicines in each medicine outlet of various public and private sectors of Visakhapatnam.
2. To estimate the availability of each essential medicine in all the medicine outlets of various public and private sectors of Visakhapatnam.

MATERIALS AND METHODS

Type of study and study design: A descriptive cross-sectional study is conducted to assess the availability of essential medicines at medicine outlets which includes public health facilities, private medical stores and other generic stores.

Study setting: The study is conducted in Visakhapatnam, a coastal city in South India with its district headquarters, in the state of Andhra Pradesh. It was built along the seashore of the Bay of Bengal, surrounded by hills, beautiful beaches and lush green nature. The population of the district is 19.6 lakhs (as per 2011 Census), while the geographical area is 1049 sq. km.[11]

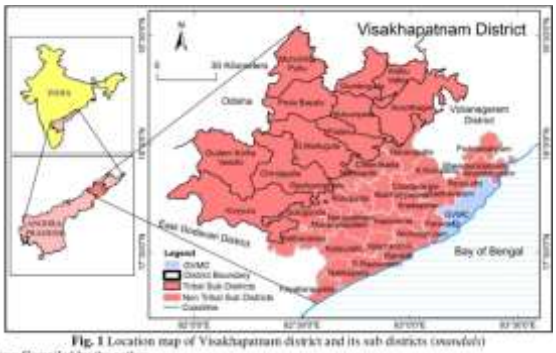

Fig. 1 Location map of Visakhapatnam district and its sub districts (mandals)

Source: Compiled by the author

Study Period: The study was conducted for a period of two months, from August 2022 to September 2022.

Study Population: The medicine dispensing outlets belonging to public and private sectors, along with the generic drug stores in Visakhapatnam.

Sample Size: Six representative Mandalas were selected as survey areas through convenience sampling and a total sample of 30 medicine outlets were selected by simple random technique from these six survey areas based on the recommendations of WHO and HAI (Health Action International) methodology.[12]

Selection Criteria:

- Among the 6 survey areas, one survey area will be the City's major urban Centre and remaining 5 survey areas will be selected by convenience, which can be reached within one day from the major Urban Centre.
- From each survey area, one public health facility medicine outlet, two private medicine outlets, and two generic drug medicine outlet will be selected randomly [Table 1].
- The medicine outlets that are not willing to participate in the study will be excluded.

Table 1: List of survey areas with medicine outlets

Survey areas	Medicine outlets			Total
	Public health facilities	Private stores	Generic stores	
Visakhapatnam Urban (VU)	1 phc	2	2	5
Visakhapatnam Rural (VR)	1 phc	2	2	5
Gajuwaka (G)	1 phc	2	2	5
Bheemunipatnam (B)	1 phc	2	2	5
Pendurthi (P)	1 chc	2	2	5
Anandhapuram (A)	1 sc	2	2	5
Total	5	12	12	30

- **phc – primary health centre; chc – community health centre; sc – sub centre**

Study Instruments:

A checklist of 50 key essential medicines were prepared as per WHO/HAI guidelines,[12] of which 30 medicines were selected from the Global and WHO-SEARO (South East Asian Regional Origin) regional core list and the remaining 20 medicines were supplementary list selected from the National List of Essential medicines (NLEM) of India (2015). [2]

Data Collection Procedure:

A one-time survey was conducted in each medicine outlet. Data was collected only after taking permission from the respective heads of the health facility authorities and private medicine outlets. Before visiting the medicine outlet, the checklist of

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medicines to be surveyed was kept confidential to avoid bias. The medicines were considered available only if:

- they are physically present on the day of the survey
- they are not expired and
- they are suitable for use.

Confidentiality: Throughout the study process, confidentiality was maintained to prevent any kind of bias.

Statistical Analysis: The data collected was entered in Microsoft Excel. All the 50 Essential medicines were surveyed from each medicine outlet. Descriptive statistics was used to describe the data on drug availability. Percentage availability of all the 50 surveyed medicines for each medicine outlet and percentage availability of individual medicines in all the medicine outlets of the survey areas was calculated.

- Percentage availability of all 50 medicines for individual medicine outlet =

$$\frac{\text{number of surveyed medicines available in medicine outlet}}{\text{total number of medicines surveyed}}$$

- Percentage availability of individual medicine in all medicine outlets =

$$\frac{\text{number of health facilities in which individual medicine is available}}{\text{total number of medicine outlets surveyed}}$$

Essential drug availability percentage of >80% will be considered as "High", 50-80% will be "Fairly High", 30-49% will be "Low" and <30% will be considered as "Very Low". Data was analyzed using Microsoft Excel.

Ethical considerations: For ethical clearance, approval from the Institutional Ethics Committee of NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam was taken. Also, approval from the administrative heads of the respective medicine outlets was taken.

RESULTS

In the present study 50 key essential medicines (Table 2) are included of which 30 are from WHO-SEARO regional core list [12] and 20 are supplementary list of medicines from National list of essential medicines (NLEM) of India [2].

Table 2: list of essential medicines in the survey areas along with the dosage forms and strength

S. No	Medicine	Dosage form	Strength
1	Salbutamol Inhaler	Inhaler	0.1 mg/dose
2	Metformin	Tab	500 mg
3	Bisoprolol	Cap/Tab	5 mg
4	Captopril	Tablet	25 mg
5	Simvastatin	Cap/Tab	20 mg
6	Amitriptyline	Cap/Tab	25 mg
7	Ciprofloxacin	Cap/Tab	500 mg
8	Co-trimoxazole	Suspension, 40+200 mg/5 ml	40+200 mg/5 ml
9	Amoxicillin	Cap/Tab	250 mg
10	Ceftriaxone	Injection	1 g/vial
11	Diazepam	Cap/Tab	5 mg
12	Diclofenac	Cap/Tab	50 mg
13	Paracetamol	Suspension	24 mg/ml
14	Omeprazole	Cap/Tab	20 mg
15	Glibenclamide	Cap/Tab	5 mg
16	Atenolol	Cap/Tab	50 mg
17	Hyoscine Butyl bromide	Tab	10 mg
18	Metoclopramide HCl	Tab	10 mg
19	Bisacodyl	Tab	5 mg
20	Oral rehydration salt	Powder	1Lit
21	Loperamide	Cap	2 mg
22	Amiodarone	Tab	200 mg
23	Furosemide	Tab	40 mg
24	Adrenaline	Injection	0.1%, 1:1000 1 mg/ml
25	Paracetamol	Tab	500 mg
26	Acetylsalicylic Acid	Tab	300 mg
27	Acetylsalicylic Acid	Tab	100 mg
28	Ibuprofen	Tab	400 mg
29	Fluoxetine	Cap	20 mg
30	Sodium Valproate	Tab	200 mg
31	Risperidone	Tab	1 mg
32	Haloperidol	Tab	5 mg (0.5 mg)
33	Carbamazepine	Tab	200 mg
34	Allopurinol	Tab	100 mg
35	Amoxicillin	Cap	500 mg
36	Ampicillin	Injection	500 mg in vial
37	Cloxacillin Sodium	Cap	500 mg
38	Penicillin G Benzathine	Injection	2.4, MIU In Vial
39	Azithromycin	Cap	250 mg
40	Ceftazidime	Injection	Injection 1 g in vial
41	Doxycycline	Cap	100 mg
42	Metronidazole	Cap	250 mg

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43	Co-trimoxazole	Tab	400 mg+80 mg
44	Fluconazole	Tab	200 mg
45	Clindamycin	Cap	150 mg
46	Hydrocortisone	Injection	50 mg/ml in 2 ml ampoule Solu
47	Propylthiouracil	Tab	50 mg
48	Ferrous sulphate + Folic Acid	Cap	200 mg+0.5 mg
49	Tetracycline HCl	Eye ointment	1%
50	Albendazole	Tab	200 mg

The mean availability of the the essential medicines at the public health facilities of the survey areas is 47.33% (range 32% to 84%). Among the six survey areas, the percentage availability of the essential medicines is highest (84%) in the community health centre, pendurthi(P) and least (32%) in the primary health centre, Bheemunnipatnam(B) (Figure 2).

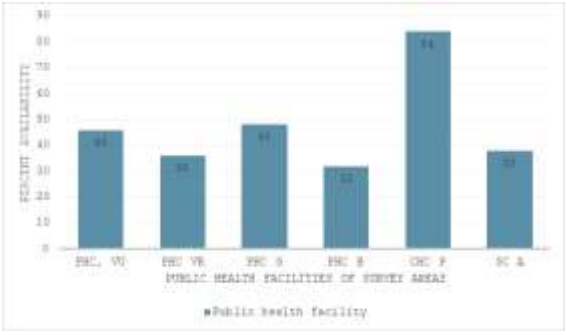

Figure 2: Availability of essential medicines in public health facilities of the survey areas

(PHC-primary health center; CHC – community health center; SC- sub center; VU – visakhapatnam urban; VR – visakhapatnma rural; G- gajuwaka; B- bheemunipatnam; P- pendurthi; A- Anandhapuram)

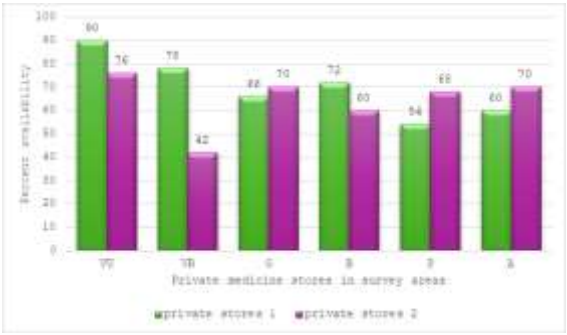

Figure 3: Availability of essential medicines in private medicine outlets of the survey areas

(VU – visakhapatnam urban; VR – visakhapatnma rural; G- gajuwaka; B- bheemunipatnam; P- pendurthi; A- Anandhapuram)

Among the 12 private medicine outlets, the private medicine stores 1 at Visakhapatnam urban area has 90% availability of all 50 essential medicines followed by 78% and 76% availability at private medicine stores 1 at visakhapatnam rural and private medicine stores 2 of visakhapatnam urban, respectively. The mean availability of the all 50 essential medicines at private medicine stores is 67.2% (range 42% to 90%) (Figure 3).

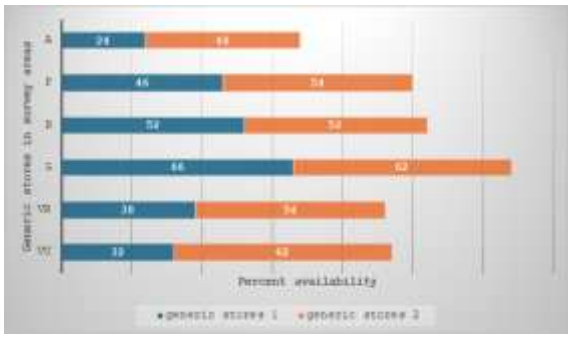

Figure 4: Availability of essential medicines in the generic stores

In the present study, 12 generic stores (2 in each survey area) are surveyed among which 66% of all 50 essential medicines are found available at generic stores 1 of Gajuwaka and 62% at generic stores 2 of Gajuwaka (G) Visakhapatnam urban (VU). The generic stores 1 at Anandhapuram, generic stores 2 at Visakhapatnam urban and Visakhapatnam rural has low availability of medicines with 24%, 32% and 38% respectively. The mean availability of the all the 50 essential medicines at the generic stores is 48.8% (Figure 4).

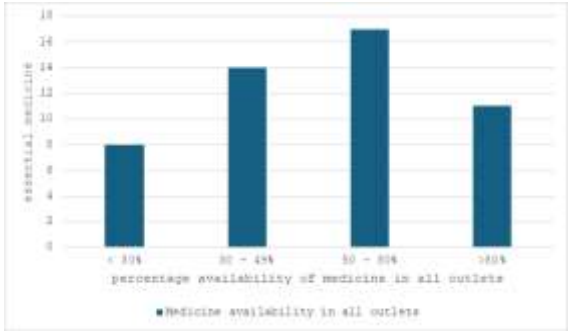

Figure 5: Grading based on the essential medicine availability at all outlets

Among all 50 essential drugs surveyed, availability of about 17 drugs is fairly high (50 – 80%) in all medicine outlets. Only 11 drugs have more than 80% availability and 8 drugs have <30% availability at all the medicine outlets (Figure 5).

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Table 3: Availability of individual medicine at all medicine outlets

Essential medicine	Availability of each medicine in all medicine outlets				Percentage availability of individual medicine in all outlets (%)
	Public health facilities (n=6)	Private medicine stores (n=12)	Generic Stores (n=12)	Overall (N = 30)	
Salbutamol inhaler 0.1 mg/dose	2	10	8	20	66.66
Metformin Tablet, 500 mg	5	11	12	28	**93.33*** **
Bisoprolol Cap/tab, 5 mg	0	8	3	11	36.66
Captopril Tab, 25 mg	0	4	0	4	13.33
Simvastatin Cap/tab, 20 mg	1	6	2	9	30
Amitriptyline Cap/tab, 25 mg	1	9	5	15	50
Ciprofloxacin Cap/tab, 500 mg	6	12	12	30	**100*** **
Co-trimoxazole Suspension, 40+200 mg/5 ml	5	6	3	14	46.66
Amoxicillin Cap/tab, 250 mg	6	11	11	28	**93.33*** **
Ceftriaxone Injection, 1 g/vial	3	8	8	19	63.33
Diazepam Cap/tab, 5 mg	3	7	0	10	33.33
Diclofenac Cap/tab, 50 mg	6	11	12	29	**96.66*** **
Paracetamol Suspension, 24 mg/ml	3	10	11	24	80
Omeprazole Cap/tab, 20 mg	2	12	12	26	**86.66*** **
Glibenclamide Cap/tab, 5 mg	0	7	7	14	46.66
Atenolol Cap/tab, 50 mg	6	12	12	30	100
Hyoscine Butyl Bromide Tab, 10 mg	2	6	0	8	26.66
Metoclopramide HCl Tab, 10 mg	1	7	3	11	36.66
Bisacodyl Tab, 5 mg	5	7	9	21	70
Oral Rehydration Salt 1L powder	6	12	11	29	**96.66*** **
Loperamide Cap, 2 mg	1	12	11	24	80
Amiodarone Tab, 200 mg	0	5	4	9	30
Furosemide Tab, 40 mg	6	10	4	20	66.66
Adrenaline Injection, 0.1%, 1:1000 1 mg/ml	3	4	1	8	26.66
Paracetamol Tab, 500 mg	6	12	12	30	**100*** **
Acetylsalicylic Acid 300 Tab, 300 mg	1	6	3	10	33.33
Acetylsalicylic Acid 100 Tab, 100 mg	4	9	7	20	66.66
Ibuprofen Tab, 400 mg	1	10	9	20	66.66
Fluoxetine Cap, 20 mg	1	6	2	9	30
Sodium Valproate Tab, 200 mg	1	11	3	15	50
Risperidone Tab, 1 mg	1	6	3	10	33.33
Haloperidol Tab, 5 mg (0.5 mg)	1	2	0	3	10
Carbamazepine Tab, 200 mg	3	10	4	17	56.66
Allopurinol Tab, 100 mg	1	5	1	7	23.33

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Amoxicillin Cap, 500 mg	6	11	12	29	**96.66*** **
Ampicillin Injection (Sodium), 500 mg in vial	1	8	3	12	40
Cloxacillin Sodium Cap, 500 mg	0	4	2	6	20
Penicillin G Benzathine Injection 2.4, MIU In Vial	1	5	2	8	26.66
Azithromycin Cap, 250 mg	3	11	8	22	73.33
Ceftazidime Injection 1 g in vial	1	4	4	9	30
Doxycycline Cap, 100 mg	5	12	12	29	**96.66*** **
Metronidazole Cap, 250 mg	5	8	7	20	66.66
Co-trimoxazole Tab, 400 mg+80 mg	6	6	6	20	66.66
Fluconazole Tab, 200 mg	2	10	9	21	70
Clindamycin Cap 150 mg	3	10	5	18	60
Hydrocortisone Injection 50 mg/ml in 2 ml ampoule Solu	4	6	1	11	36.66
Propylthiouracil Tab 50 mg	0	2	0	2	6.66
Ferrous Sulphate + Folic Acid Cap 200 mg+0.5 mg	6	11	10	27	**90*** **
Tetracycline HCl Eye ointment 1%	2	6	1	9	30
Albendazole Tab,200 mg	3	5	7	15	50

*** ***High (more than 80%) availability at all medicine outlets***

Among the 50 key essential medicines surveyed, Paracetamol 500mg, Atenolol 50mg and Ciprofloxacin 500mg are present (100% availability) at all the surveyed public and private medicine outlets (Table 3). Six medicines (Propylthiouracil, Cloxacillin sodium, Amiodarone, Glibencliamide, Captopril, Bisoprolol) are not available at any of the surveyed public health facilities (zero percent availability). Five medicines (Propylthiouracil, Captopril, Haloperidol, Hyoscine butyl bromide, Diazepam) are not at all available at any of the surveyed generic stores (zero percent availability). Eleven medicines are found with more than 80% availability (Figure 4) and eight medicines (Figure 5) are found with less than 30% availability at all the surveyed medicine outlets. In descending order top eleven available medicines are Ciprofloxacin (100%), Atenolol (100%), Paracetamol (100%), Amoxicillin 500mg (96.66%), oral rehydration salts (96.6%), Diclofenac (96.66%), Amoxicillin 250mg (93.33%), metformin (93.33%), ferrous sulphate + folic acid (90%), omeprazole (86.66%) and doxycycline (83.33%) (Figure 6).

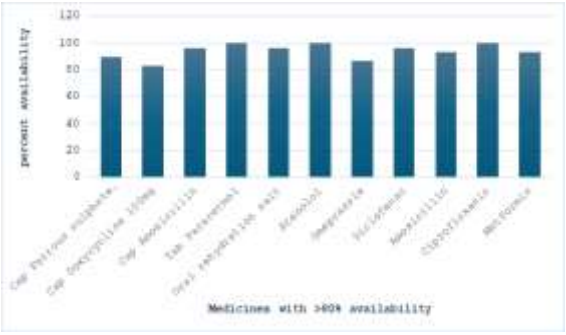

Figure 6: Medicines reported overall availability of more than 80% at medicine outlets

Figure 7: Medicines reported overall availability of less than 30% at medicines outlets

Tab propylthiouracil 50mg is the least available (6.66%) drug at the medicine outlets followed by Haloperidol (10%), Captopril (13.33%), cloxacillin sodium (20%), Allopurinol (23.33%), penicillin Inj.

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(26.66%), Inj. Adrenaline (26.66%) and hyoscine butyl bromide (26.66%) (Figure 7).

DISCUSSION

The concept of essential medicines was developed to promote rational use, lower cost and improve access. (18) WHO has outlined a framework that assists the policy makers to improve the access to essential medicine for universal health coverage 2030.[17] The availability and affordability are the preconditions for it and availability plays a major role in rational prescribing by primary care physicians.[17,18]

Various studies conducted in public healthcare sectors in developing and transitional countries provide evidence that successful implementation of essential medicines policies leads to rational and quality use of medicines.[18,26] WHO/HAI has set criteria for percentage availability of essential medicines, in which above 80% is high availability, 50 -80% is fairly high availability, 30-49% is low availability and less than 30% is very low availability.[12,15,18,27]

The present study has aimed to access the availability of essential medicines at public health facilities and private medicine outlets in the Visakhapatnam, coastal city of south India, which reported the overall mean availability of all the 50 essential medicines is 47.33%, 67.2% and 48.8% among the 30 medicine outlets, that includes six public health facilities, twelve private medicine stores and twelve generic medicine stores respectively. As per WHO/HAI criteria the percentage availability of medicines in public health facilities and generic stores falls in low availability (30% to 49%), whereas in private medicine outlets the availability is high (50% to 80%).[12]

In contrast to the findings in the present study, few studies reported otherwise. The overall mean availability of 50 key essential medicines in 10 surveyed public health facilities was 72.2%, 77% and 74% state PHCs, central PHCs and tertiary care teaching hospital respectively at Puducherry,[18] by Meena D K et al. Other study by Alefan et al., at Jordan reported 72% and 76% for low priced generics availability in 30 public sectors and 30 retail pharmacies respectively.[22] Also, in the study conducted at Vietnam, 63.2% and 47.9% availability were reported of 30 essential medicines among 30 surveyed public health facilities and 35 private medicine outlets respectively.[24]

Few studies reported similar findings as of the present study. Sisay et al., conducted a study to investigate essential medicines at 60 medicine outlets in Eastern Ethiopia, observed the mean availability of the low generic brands was 46.97% (public: 42.5%; private: 50.8%).[17] Similarly, Sun x, Wei J, Yao Y et al. conducted a cross-sectional survey in six cities of Jiangsu province China at 60 medicine outlets and reported mean availability of lowest generic brands was 34.2% in public sector and 29.4% in the private sector.[19] A study conducted by Khuluza F & Haefele-abah C had reported 48.5% in public facilities and 71.1% in retail pharmacies.[21]

The present study reported 100% availability of ciprofloxacin, atenolol and paracetamol and eleven drugs (ferrous sulphate + folic acid, amoxicillin 250mg, Amoxicillin 500mg, doxycycline, metformin, paracetamol, oral rehydration salt, omeprazole, ciprofloxacin, atenolol, diclofenac) with >80% availability in the surveyed medicine outlets. Six medicines (Propylthiouracil, Cloxacillin sodium, Amiodarone, Glibencliamide, Captopril, Bisoprolol) are not available at any of the surveyed public health facilities (zero availability).

Likewise, in the study conducted by Sisay et al. At Eastern Ethiopia, only eight low generic drugs were available in 80% or more of the facilities surveyed. In descending order, amoxicillin 500 mg caps (93.3%), omeprazole 20mg cap (90%), ceftriaxone 1 g inj. Vial (88.3%), doxycycline 100 mg cap (88.3%), metformin 500 mg tab (83.3%), metronidazole 250 mg cap (83.3%), and diclofenac 50 mg tab (80.0%) were the top eight drugs available during the study.[17] Similar reports of zero availability and low availability of some essential drugs were present in the studies conducted by Rathish et al,[20] Khuluza et al,[21] and Alefan et al.[22] Non availability of the essential medicines leads to nonadherence

Also, in the present study the overall availability of the medicines in the public medicine outlets and generic stores is low compared to the private retail medicine outlets. There were also some studies which showed some pharmacies the originator brand medicines were less available as compared to the generics.[23] It could result from various factors such as low budget allocation for medicines, purchasing non-essential medicines, inability to forecast the needs accurately and inefficient drug supply chain management.[14,18, 28]

Few studies showed some older generic drugs have become very expensive. It could be due to drug shortages, supply disruptions and consolidations in the generic drug industry.[13]

The difference in the availability of essential medicines at public and private medicine outlets in different survey areas of different regions could depend on the accessibility of the health care facilities and resource availability. On comparison between the public and private medicine outlets, most of the studies,[17,21,22] reported high availability in private outlets, whereas few showed otherwise.[19,24] These differences could be due to the pricing, affordability and accessibility of medicines among the medicine outlets in different regions. The assertion by Kapczynski,[16] in her perspective article about the intellectual property system engineered in India fails to resolve the true challenges to patient access to the medicines.

Overall, availability of medicines at the surveyed medicine outlets is fairly high in the present study. But it is often suboptimal around the globe especially in the severe low-income countries.[17] Besides

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improving the availability and affordability of essential medicines is likely to enhance their use and help in achieving the WHO target of 50% use of key medicines by 2025.[17]

Recommendations

1. Considering low availability of medicines at public outlets, thorough surveillance on the health care facilities and regular monitoring and evaluation of the stocks could improve the results.
2. Continuous medical education is needed in enlightening the prescribing doctors on importance of utilizing medicines available at national list of essential medicines.

Limitations

1. In this study, the data on essential medicines was collected at a single point at each outlet, which may not reflect their average availability over time.
2. Availability of the selected list of the medicines does not account for the availability of the alternate strengths or dosage forms or therapeutic alternatives.
3. Could not access the reasons for the non-availability of the medicines, either due to less demand or non-utilization some drugs get expired or due to improper monitoring of stocks in spite of their use.

CONCLUSION

Overall, availability of the medicines at the surveyed medicine outlets is fairly high as per WHO/HAI criteria. Public facilities and generic stores are found with non-availability of few drugs compared to the private medicine outlets, which can be improved on proper monitoring of the drug accessibility based on the demand driven maintenance of the medicine stocks.

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Consent for Publication: Not Applicable
Competing Interests: Not Applicable
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