

Research Article

Availability of Essential Medicines in Ethiopia: A Systematic Review

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Objective: Essential Medicines (EMs) are those that satisfy the priority health care needs of the population. Access to health care including EMs is a fundamental human right. In Ethiopia, studies designate the frequent drug shortages in public health facilities. Hence, this review aimed to assess and evaluate the national availability of essential medicines in Ethiopia.

Method: A systematic searching for all study designs which are published and/or reported from inception to August 27/2019 strategy was conducted in two literature databases (Google Scholar and PubMed). Additionally, references of related articles were searched using different search engines. Data qualities were assessed by abstracting the quality procedures taken in each individual's studies and cross checked with Joanna Briggs Institute (JBI) quality appraisal criteria.

Results: A total of 256 studies, including duplicates, were primarily searched. Nine studies were met current study inclusion criteria. All included studies were published from 2003 to 2019 G.C. Consequently, reviewed studies conducted a total of 356 public and private drug outlets. All studies used cross-sectional study design. The most frequent concepts emerged in these documents were regarding availability and affordability of EMs (5 Articles), availability and pharmaceutical inventory management (3 Articles), one document on availability and price. The average national availability of EMs was precisely in public and private facilities scored about 70.16% and 70.1%, respectively. Results from the sub-national study indicate that, the national average stock out duration in primary health care facilities was 99.2 days, highest in Benishangul Gumuz (139 days). The most frequently reported stocked out drugs within the past 6-12 months at the time of study were; ORS, Amoxicillin syrup 125mg/5ml, Tetracycline eye ointment and tablet, Ergometrine injection in Adama and chloroquine syrup in Gondar. Whereas, carbamazepine 100mg/5ml syrup, diazepam 5mg/ml ampoule, gentamicin 20mg/2ml ampoule and ibuprofen 100mg/5ml suspension were not found in any drug outlets in both public and private sectors at the day of visit in West Wollega.

Conclusion: The finding of this review indicates the average national availability of essential medicines in Ethiopia is presently under the requirements of WHO recommendations. Moreover, the longer stockout period was also perceived in healthcare facilities. Thus, might need further attention of the respective stakeholders.

Keywords: Availability; Essential Medicine; Ethiopia

Abbreviations

EMs: Essential Medicines; EMCs: Essential Medicines for Children's; EML: Essential Medicine List; ENMP: Ethiopian National Medicine Policy; FMAHCA: Food Medicine and Health Care Administration; FMOH: Federal Ministry of Health; HC: Health Center; JBI: Joanna Briggs Institute for Quality Appraisal; NCDs: Non-Communicable Diseases; PHCFs: Primary Health Care Facilities; RDS: Regional Drug Stores; PDROS: Private Drug Retail Outlets; TTEO: Tetracycline Eye Ointment; WHO: World Health Organization

Introduction

WHO defines Essential medicines as those satisfy the priority

healthcare needs of the population. The first WHO essential drugs list was published in 1977, which described as a peaceful revolution in international public health [1]. The list helped to establish the principle that some medicines were more useful than others and that essential medicines were often inaccessible to many populations. Since then, the Essential Medicines List (EML) has increased in size; defining an EM has moved from an experience to an evidence-based process, including criteria such as public health relevance, efficacy, safety, and cost-effectiveness [2]. EMs are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford [3,4].

The implementation of the concept of essential medicines is intended to be flexible and adaptable to many different situations; exactly which medicines are regarded as essential remains a national responsibility [5]. Access to health care including EMs is a fundamental human right [6]. However, WHO estimates about one-third of the world's population is without the access to medicines they need, typically in Asia and Africa [7]. WHO recommends at least 80% availability of essential medicines in healthcare facilities [3]. However, in low/middle income countries this is still a major challenge [8]. In a study conducted in 36 countries, average availability of essential medicines was reported to be 38% and 64% in the public and private sector, respectively [9].

In Ethiopia, despite a high burden of disease, utilization of health services remains very low, with people visiting a health facility less than once every two years [10]. There are frequent drug shortages in public health facilities. A national survey estimated that only 70% of key essential medicines were available in the public sector [11,12]. Unavailability of medicines in the public sector compels patients to revert to the private sector. Consequently, drugs can take up more than half of the actual cost of a visit, increasing the chance of incurring catastrophic health expenditures and the associated risks of falling into poverty [13].

Ethiopia has a national drug policy aimed to ensure adequate supply of medicines which are required for treatment of diseases affecting the majority of the country's population [14], which gives the primary mandate to the government. To achieve this, the country developed national list of EMs based on the common health problems in the country starting from 1985 [15] which guides the decision of all health service providers with regard to selecting and availing the most needed medicines at every level of the healthcare system at all times with affordable cost [16]. Through its health and drug policies, the Government of Ethiopia has reaffirmed that the medicines used in health services within the nation shall be determined on the basis of the country's major health problems and capabilities. Thus, to materialize this objective, it is necessary to select medicines which are required for promotion, prevention, diagnosis, treatment/mitigation and rehabilitation of diseases affecting majority of the population [16].

Data on the availability and affordability of EMs help managers and policy makers to develop national policy, regulations and strategies to enhance access to them. In Ethiopia, even though limited data availability regarding EMs in Ethiopia, reviewing and analyzing the existing individual studies would be valuable as much as it provides the summary of data for in sighting the government and other policy makers, and the scientific society about the current status of national availability of EMs in the country. Therefore, the aim of the current review is to assess the overall availability of essential medicine in the country from different studies in the country and also enables to identify the gaps for the future research areas.

Methods

Inclusion criteria

All articles and reports published in English language with all type of study designs and Ethiopian study settings were selected and included. Publication year of the articles were from the inception

to 27/08/2019 G.C. Furthermore, studies done on public health facilities, private drug outlets, and other sectors of medicine outlets were selected. Studies on EMs and their empirical data on availability were included.

Exclusion criteria

Studies done outside Ethiopia. Documents discuss about general analysis/review, without empirical data; Guidelines; drug utilization patterns studies were also excluded.

Search strategy

A comprehensive literature search in PUBMED and Google Scholar was conducted using "mesh" terms like "essential medicine", "availability of medicine", "essential medicine in Ethiopia", "Ethiopia" by combining them with Boolean operators; "AND", "OR". And "availability of medicine" by "All fields" from August 23 up to August 27, 2019 for articles published in English language from inception to August 27, 2019. Studies were first selected on the basis of their titles and the abstracts, and full texts were searched for those potentially fulfilling the inclusion criteria.

Data extraction

Data was extracted from included articles by the investigator using abstraction tables. Data points extracted included author, year of publication, types of study design used and methods of analysis, primary outcomes and the number of study facilities and the type of facilities/drug outlets were involved. Nine (9) articles were selected based on pre-determined inclusion and exclusion criteria. Articles were searched, identified, screened and selected from different search engines which are published in English language. Out of a total of 256 articles gained, 15 were from Google scholars, 238 were from PubMed and 3 were gained through hand searching.

Quality assessment

Individual studies were checked and assessed based on some of the checklists which recommended by Joanna Briggs Institute (JBI) quality appraisal criteria [17] adapted for studies reporting cross-sectional such as: inclusion criteria; description of study subject and setting; valid and reliable measurement of interest; objective and standard criteria used; discussion of generalizability; identification of confounder; strategies to handle confounder; and appropriate statistical analysis (Table 1). Based on this, all documents were reviewed about their methodologies including sampling procedure, sample size selection, data collection methods and tools, number of selected essential drugs for surveying, criteria for selection of essential medicines, method of measurement of their availability and analysis, and outcomes values were abstracted by using tables (Table 2). All of them have their own standard procedures on the above respects on their methodological process. According to this, seven documents were checked for consistency and completeness of their data collection format at the end of the day by supervisors and data collectors. Data collection tools with incomplete data, wrong data collection on the specific medicine and not fulfilling the inclusion criteria were excluded during the time of analysis. However, two of the documents had no clearly mention about their quality management activity but, all have data collection methods which were based on interviewing the key informant (chief pharmacists) for both private and public pharmacies by using standard check list.

Table 1: Standard criteria used for the assessment and scoring the quality of included articles.

Name of Studies	Inclusion Criteria Used	Description of Study Subject and Setting	Valid and Reliable Measurement of Outcome	Objective and Standard Criteria Used	Discussion of Generalizability	Identification of Confounder	Strategies to Handle Confounder	Appropriate Statistical Analysis	Total N (%)	Level of Quality
Lemma, 2003, sub-national	1	1	1	1	1	0	0	1	6(75%)	High
Carasso, 2009, Amhara	1	1	1	1	1	0	0	1	6(75%)	High
Abiye, 2013, Jimma	1	1	1	1	1	1	1	1	8(100%)	High
Fentie, 2015, Gondar	1	1	1	1	1	0	0	1	8(75%)	High
Sado, 2016, West wollega	1	1	1	1	1	1	1	1	8(100%)	High
Tefery, 2016, sub-national	1	1	1	1	1	0	0	1	8(100%)	High
Abrha, 2018, Tigray	1	1	1	1	1	0	0	1	6(75%)	High
Gutema, 2018, A/A	1	1	1	1	1	1	1	1	8(100%)	High
Kefale, 2019, Adama	1	1	1	1	1	1	1	1	8(100%)	High

The score was ranges from 0 up to 1 and the score given "0" implies the lowest quality and "1" is the highest quality of a study with the respective standard criteria. Below 50% considered low quality, 50-75% medium quality and above 75% given high quality standard.

Methods of reporting

The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guideline was used to report the result of this systematic review [18].

Data collection and handling

Each included individual studies were reviewed for the variable of interest and data were collected and handled by the abstraction table (Table 2).

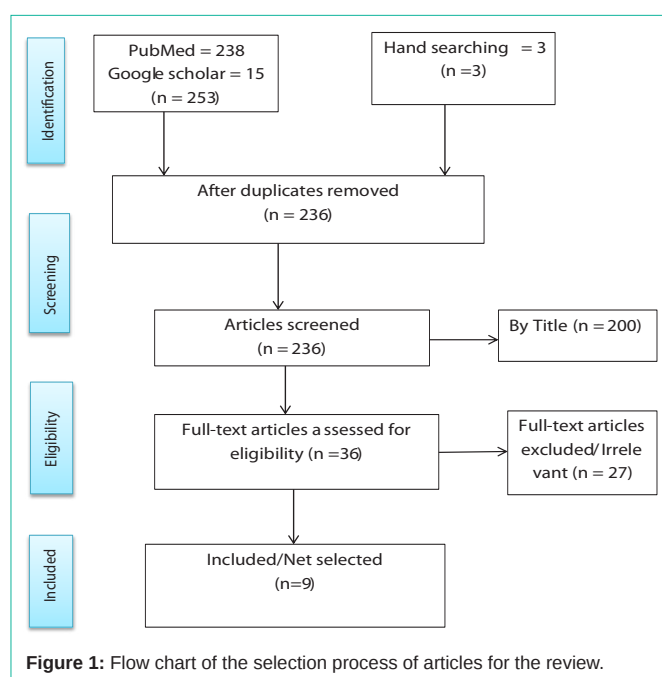
Data analysis

All collected data on the variable of interest across nine documents would be analyzed by using Microsoft Excel 2016. Results would be presented by using tables and charts.

Results

Initially a total of 253 articles were searched from PubMed and Google scholars and 3 other additional articles were found by hand searching using article references.

During the screening process, 20 articles were removed due to duplication and 200 articles were excluded due to title irrelevance or do not meet the inclusion criteria. From 36 eligible articles, full document assessments were done to check whether the interest variable was empirically included and among these 27 articles were excluded and finally 9 articles were included for the final review (Figure 1). The most frequent concepts that emerged in these documents were: about availability and affordability of Ems (5 documents), availability and pharmaceutical inventory management (3 documents), one document on availability and price. 2 studies assess the availability of essential medicines sub-nationally i.e., in six regions of the country, while two studies assess the availability of



selected essential medicines for children in Tigray region and West Wollega, whereas the rest were done on limited number of public and private facilities in a specific setting. However, the studies were touching most regions of the country except Somali, Direedewa and Gambella [8,15,19-23].

All included studies were cross sectional and found published between 2003 up to 2019 but 7 of the articles were emerged from 2013. This indicates that despite of the inclusion criteria starts from

Table 2: Summary of general characteristics of individual studies included for the systematic review.

Studies	Sampling Procedure	Sample Size	Data Collection Method and Tools	No of Selected Essential Medicines	Criteria for Selection of Medicines	Method of Analysis	Availability by Type of Outlets		
							Public Facilities	Private Drug Outlet	Other Sectors
Gutema, 2018, TASH	Selecting TASH as reference WHO/ HAI methodology	14 (5 from public and 9 from private sectors)	Standard checklist & interviewing chief pharmacist	13	Commonly prescribed antibiotics	WHO/HAI's MS Excel, % facilities with specific drug	98.50%	92.30%	--
Sado, 2016, West Wollega	Random selection from random selected districts by WHO/ HAI methodology	58 (15 public, 41 private & 2 from other sectors) 1 from private and 2 of other sectors excluded	5 data collectors standard data collection format specific to the EMS	23 but 1 medicine excluded during the analysis due to incompleteness	WHO "Better Medicines for Children Project" & prevalent child illness	WHO/HAI's MS Excel, % facilities with specific drug	43% low priced	42.8% low priced	Excluded, not fulfilling the WHO/ HAI criteria
Fentie, 2015, Gondar	Primary health facilities in Gondar town	Totally 8 but 2 were excluded due to incompleteness	Standard check list form, by trained data collectors	26 tracer medicines	Ten top morbidities of the study area (adults and children).	Microsoft excels, average % of drugs in all facilities	23.67 (91%) during survey	--	--
Kefale, 2019 Adama	All HCs of Adama town	6 health centers	Observational checklist, by two trained druggists pretest, check for consistency	11 tracer medicines	Representativeness of EMs & expected to be found in HCs	SPSS 21.0 version average % of drugs in all facilities	76.4% during survey period	--	--
BS Carasso, 2009 Amhara	PHCs & PDOs 25 km away from the main road in the regional capital	Five public and 7 private outlets	Checklists and interview the key informant	12	Based on Leading cause of morbidity in the region	Epidata, % of outlets of availability of medicines	91%	90% (excluding antimalarial drug)	--
Abiye, 2013 Jimma	Jimma health center	1 health facility	Standard check lists, pretested, check for completeness	230	Based on list of drugs for health centers	Physical presence of EMs	55.65%	--	--
Tefery, 2013 Multi regional	6 regions of the country including Addis Ababa WHO/ HAI methodology	34 outlets public, 30 from private and 17 from other sectors	Check lists Data collectors worked in pairs, checked by supervisor training	25	6 were based on WHO/HAI global list & 19 on national importance	Physical presence of drugs during visit	64%	73%	76%
Lemma, 2003 Nation wide	Random selection of 5 regions from 9 regions, lottery method to select outlets from regions and Addis Ababa/ WHO/ HAI methodology	From Six region including AA, 111 PHCFs, 5 RDSS, & 24 PDOs	Standard Check lists training for super. & data 6 collectors/checked for consistency & completeness	12 key essential drugs	Used to treat the most common health problems in the country,	Physical presence of drugs during visit /excel 2002	70% in PHCFs and 85% in RDS	91%	--
Abreha, 2018 Mekele	WHO/ HAI methodology by selecting the main public hospital in Mekele	10 public, 31 private and 2 nonprofits	Standard data collection format by trained pharmacists. Checked for completeness & consistency.	27	List of "Priority life-saving medicines for women and children" developed by WHO in 2012	Physical presence at the day for visit	41.90%	31.50%	--

The hyphen (--) indicates not studied facilities or excluded due to study's inclusion criteria.

the inception, almost all of them were recent and which helps us to have a recent understanding on the current status of medicine availability in our country. The studies conducted in a total of 356 facilities and grouped by the type of facility; 193 public facilities (hospital pharmacies, health centers, health stations), 5 regional drug stores owned by PHARMID at a time, 110 private drug outlets and 17 from other sector facilities (municipality pharmacies, Red Cross health facilities, Family Guidance Association health facility and NGO health facilities). Table below shows the summery of data on the reviewed articles in the chronological order of year of publication. Based on this finding Average availability of essential drugs in the nine articles (Table 3) varied between 41.9% (Tigray region) and 98.5% (Addis Ababa) in public facilities and similarly, in private 31.5% and 98.2% with the above respective areas.

Half of the studies select their essential medicines to include on

the study check list based on leading cause of morbidity in the study area [11,14,15,20]. Whereas, some were conducted on the health centers were select based on the representativeness and expected to be found in HCs [21,23] and others were based on commonly prescribed antibiotics, WHO "Better Medicines for Children Project"; priority lifesaving medicines for under-five children by WHO; and overall national importance [8,14,19].

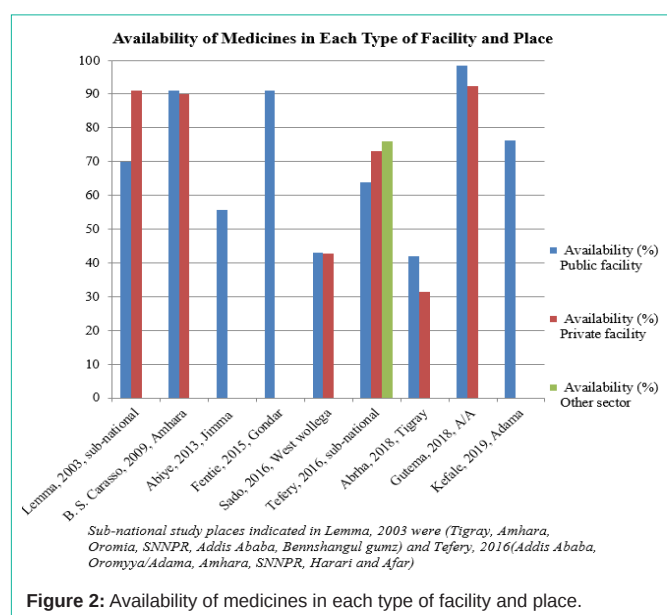
As shown from the Figure 2, studies from three places namely, Addis Ababa, Gondar and rural health facilities from Amhara region shows better availability of medicines both in public and private outlets. But there is still lower report of availability in Tigray, West wollega and Jimma.

From the report of all documents, the total average percentage availability of public facilities from all articles and private facilities

Table 3: Summary of each study characteristics on availability of essential medicines at the day of visit.

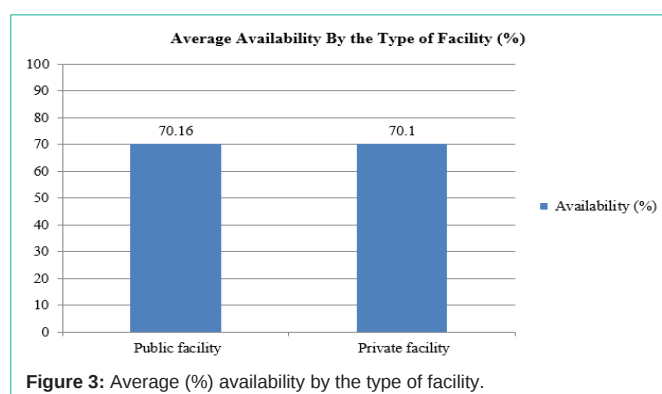
Name of Studies	Place of Study	Study Design	Sample Size	Method of Sampling	Number of Selected Ems	Average Availability by (%)		
						Public	Private	Other Sectors
Lemma, 2003	Sub-national (six regions)*	Cross sectional	111 PHCFs, 5 RDSS, &24 PDROs	Stratified sampling method	12	70	91	Not studied
Carasso, 2009	Amhara	Cross sectional	Five public PHC and 7 privates	Systematic selection	12	91	90	"
Abiye, 2013	Jimma	Cross sectional	1 health center	Purposive as the main health center	230	55.65	--	"
Fentie, 2015	Gondar	Cross sectional	Six health centers	All health centers of Gondar town	26	91	--	"
Sado, 2016	West Wollega	Cross sectional	55 (15 public, 40 private)	WHO/HAI methodology	22 (Children)	43	42.8	"
Tefery, 2016	Sub-national (six regions)*	Cross sectional	34 outlets public, 30 from private and 17 from other sectors	WHO/HAI methodology	25	64	73	76
Abrha, 2018	Tigray	Cross sectional	10 public, 31 privates	WHO/HAI methodology	27 (Children)	41.9	31.5	"
Gutema, 2018	Addis Ababa	Cross sectional	14 (5 from public and 9 from private sectors)	WHO/HAI methodology	13	98.5	92.3	"
Kefale, 2019	Adama	Cross sectional	Six health centers	All HCs of Adama town	11	76.4		"
Total Average Availability						70.16	70.1	76

*Sub-national for two studies implies places. For Lemma, 2003 (Tigray, Amhara, Oromia, Southern Nations, Nationalities, and Peoples' Region (SNNPR), Addis Ababa, Benshangul gumz) and for Tefery, 2016 (Addis Ababa, Oromiya/Adama, Amhara, SNNPR, Harari and Afar).

**Figure 2:** Availability of medicines in each type of facility and place.

from six articles were almost equal i.e., 70.16% and 70.1% respectively (Figure 3). However, two sub-national studies conducted on relatively larger sample size facilities showed that private facilities had much better availability than public facilities [14,24].

To measure the historical availability of essential drugs to treat common health problems, a retrospective survey was undertaken by three studies (one sub-national and two were in Gondar and Adama) by reviewing the stock cards of the facilities covering a period of 6-12 months [14,15,21]. Results From the sub-national study indicate that, the national average stock out duration in Primary Health Care Facilities (PHCFs) was 99.2 days and highest in Benishangul Gumuz (139 days). The average stock out duration for Gondar and Adama health centers were 30.5 and 72.9 days respectively [15,21]. The most frequently reported stocked out drugs within the past 6-12 months were; ORS, Amoxicillin syrup 125mg/5ml, Tetracycline Eye Ointment

**Figure 3:** Average (%) availability by the type of facility.

(TTEO), FEFOL tab and Ergometrine injection in Adama and chloroquine syrup in Gondar [15,19,21]. Whereas, carbamazepine 100mg/5ml syrup, diazepam 5mg/ml ampoule, gentamicin 20mg/2ml ampoule and ibuprofen 100mg/5ml suspension were not found in any drug outlets in both public and private sectors at the day of visit in West Wollega [20].

Discussion

Studies indicate that the concept of EMs has significantly reduced morbidity and mortality in many countries of the world in the past 30 years, particularly in developing countries [25]. So, the aim of this review is primarily to assess and evaluate the national availability of EMs in Ethiopia based on the studies available across the country. To the best of my knowledge, there was no review on availability studies in Ethiopia till this time so; this systematic review provides the first comprehensive assessment of essential medicine availability in the country based on the WHO recommendations criterions and prevalent disease across the country.

This review reported that the overall average availability of EMs was below the requirement level which might be an indicative of a substantial challenge in clinical practice in the country especially on pediatrics managements. The national average availability of selected

EMs across the study both in public and private facilities was 70.167% and 70.1% respectively. This finding was far apart from the WHO recommendation, availability of EMs should be 100% [26] and still below the minimum requirement of WHO (80%) to be available in public facilities [27]. However, it is higher than a study conducted in 36 countries; average availability of essential medicines was reported to be 38% and 64% in the public and private sector, respectively [4] and still higher from mean availability of essential medicines of the public sector in 24 countries around the globe [28].

Studies on availability of children EMs shows still below 50% ranges from (31.5%-43%) both in public and private facilities. This may due to factors like poor availability of pediatric dosage formulation in the facility and lack of focus from the government policy. The finding on this regard has similar in ranges with studies done in Australia (38%), New Zealand (35%) but slightly less than from the percentages found in the United Kingdom (59%), USA (54%) and Netherlands (48%) [29-34] and comparable to a study conducted on the availability and prices of the WHO's EMs for children in Guatemala revealed that availability of EMs is less than 50% in both private and public sector [3]. This confirms that the limited availability of medicines for children is a global rather than regional problem. However, data comparison of all these studies should, be considered in view of methodological difference. Studies suggest that government and private drug outlet organizations should strengthen activities to increase availability of EMs like; promoting competition for lower-cost on the market efficient government procurement such as buying lower-priced quality-assured generics, negotiating prices with suppliers eliminating stock-outs through adequate forecasting, adequate and sustainable financing, Efficient distribution, and eliminating taxes and tariffs on essential medicines [5]. It was noted that, even though the nature of study affects the type of study designs to be used, all studies were used cross sectional study designs and their quality could be considered low according to their weak designs. On the other hand, included literatures were from PubMed and Google scholars. So, studies which are not indexed to these databases were not included in the study which may lead us to a suspicious on publication bias. The other limitation was availability on this review refers to the day of data collection which did not reflect availability over time, although it does reflect the situation people experience when going to facilities.

Conclusion

The review was done from nine studies conducted in a total of 356 public and private facilities from which the overall average percentage availability was almost equal which is 70.16 in public and 70.1 in private facilities. The finding indicates that the availability is low compared with the WHO recommendations minimum requirements i.e., 80%. Based on this finding Average availability of essential drugs in the nine articles varied between 41.9% (Tigray region) and 98.5% (Addis Ababa) in public facilities and it is slightly wider in private facilities which ranges from 31.5% up to 98.2% with the above respective areas. Studies from three places namely, Addis Ababa, Gondar and rural health facilities from Amhara region shows better availability of medicines both in public and private outlets. But there is still lower report of availability in Tigray, West Wollega and Jimma. Despite of its global wide problem, two studies on children's essential medicine reported that the availability was significantly low

ranges from (31.5-43%) which needs an attention of any stake holders as an alarming problem.

As a result, identifying and analyzing the potential factors affecting the availability of essential medicines will be necessary for not only has the low resulted of this review but also to have reach information on the gap for launching strategic solution for the problem. So, the government of Ethiopia, academic institutions and other researchers should consider this gap for their future research areas.

Declaration

Authors' contributions: DT designed the study. DT and GA collected scientific studies, assessed the quality of the study, extracted and analyzed the data. WA commented on the review. GA also prepared the manuscript for publication. All authors have read and approved the manuscript.

Availability of data and materials: All data generated and analyzed during this study are included in this published article and publicly available.

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