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# Systematic review and meta-analysis of medicine use studies in Ethiopia using the WHO patient care indicators with an emphasis on the availability of prescribed medicines

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## ABSTRACT

**Objective** To collate the findings of studies on patient care indicators in Ethiopia using the WHO/International Network for Rational Use of Drugs indicators with a focus on the availability of medicines to patients.

**Design** Systematic review and meta-analysis.

**Data sources** Embase, Global Index Medicus, Google Scholar, Medline (via PubMed) and Web of Science.

**Eligibility criteria** Medicine use studies employing the WHO patient care indicators across health facilities in Ethiopia.

**Data extraction and synthesis** Descriptive summary of the indicators and a random-effects meta-analysis were performed for quantitative synthesis of findings on the percentage of medicines actually dispensed. Meta-regression was performed to assess the moderator effects of different attributes of the studies.

**Results** A total of 25 studies conducted in 155 health facilities with 11 703 patient exit interviews were included. The median value of average consultation time was 5.1 min (25th–75th: 4.2–6.6) and that of average dispensing time was 78 s (25th–75th: 54.9–120.0). The median percentage of medicines with adequate labelling was 22.4% (25th–75th: 5.6%–50.0%). A concerning trend of decreasing dispensing times and adequacy of labelling were observed in more recent studies. The median percentage of patients with adequate knowledge of dosage schedules of medicines was 70.0% (25th–75th: 52.5%–81.0%). In the meta-analysis, the pooled estimate of medicine availability was 85.9% (95% CI: 82.1% to 89.0%). The multivariable meta-regression showed that geographical area and quality of study were statistically significant predictors of medicine availability.

**Conclusion** Short consultation and dispensing times, inadequate labelling, inadequate knowledge of patients on medicines and suboptimal availability of medicines were identified in health facilities of Ethiopia. Studies aimed at further exploration of the individual indicators like problems of inadequate labelling and patients' knowledge of dispensed medicines are crucial to determine the specific reasons and improve medicine use.

**PROSPERO registration number** CRD42020157274.

## Strengths and limitations of this study

- ► This review provides a comprehensive summary of the findings of a large number of medicine use studies in Ethiopia using the WHO patient care indicators.
- ► This review summarised studies on availability of medicines putting patients at the centre by measuring the extent of medicines actually dispensed to patients in Ethiopia.
- ► Several study-related factors were included in the review to explore their influence on medicine availability at the level of dispensing.
- ► Variations in the definition of the indicators on adequacy of labelling and patients' knowledge of their medicines may have contributed to differences in findings.

## INTRODUCTION

Rational use of medicines, as described by the WHO, requires that medicines provided to patients be appropriate to their clinical needs, in an appropriate dose, for the right duration at a cost affordable to them and their communities.[1] The lack of access to medicines and irrational use could lead to significant morbidity and mortality.[2]

Different measures have been used to assess medicine use including the WHO/International Network for Rational Use of Drugs (INRUD) medicine use indicators.[3] The WHO/INRUD indicators aim at measuring medicine use through limited objective indicators at a country, region, or health institution level and are categorised as core and complementary indicators.[3] The core medicine use indicators have three components, namely the prescribing indicators, patient care indicators and facility indicators. The patient care indicators are designed to address the experience of patients at health facilities and their preparedness to use the medicines prescribed

and dispensed to them. These indicators include: average consultation time, average dispensing time, percentage of medicines actually dispensed, percentage of medicines adequately labelled and patients' knowledge of correct dosage.[3]

Average consultation time measures the time medical personnel spend with patients in the process of consultation and prescribing, and it is intended to be sufficient to conduct proper history taking, complete physical examination, appropriate health education instructions and good physician–patient interaction to prescribe medications.[3 4] Consultation time often varies across settings and countries and is usually determined by both patient's and physician's characteristics. Some studies show that the average consultation time in primary care settings ranges between 10 and 15 min.[5 6] Consultation times ranging from 48 s in Bangladesh to 22.5 min in Sweden have been reported. In 18 countries that represent about 50% of the global population, primary care physicians spend 5 min or less with their patients.[7]

Average dispensing time measures the time the dispenser/pharmacy professional spends with patients and should be sufficient to explain the dosage regimen, adverse effects, necessary precautions, and appropriately label and dispense medicines.[3 4] How medicines are taken by patients is often influenced by the dispensing protocol and information given during dispensing.[8 9] One systematic review showed that the average dispensing time ranged from 20.5 s in Europe and Latin America to 86.1 s in the South Asia region.[10]

Percentage of medicines adequately labelled is designed to measure the degree to which dispensers record essential information on the medicine packages they dispense.[3] Studies have shown that variability in medicine labelling and the use of certain terminologies have a huge effect on a patient's understanding of medication instructions.[11 12] According to a global systematic review report, the proportion of medicines with adequate labelling was in the range of 38.4% in the Middle East and North Africa to 96.9% in South Asia.[10]

Patients' treatment adherence is directly associated with their knowledge on dispensed medicines. Insufficient knowledge of medicines by patients may result in their misuse which can lead to treatment failure and puts the health of the patient at risk.[4] In addition, inadequate knowledge may lead to unintended overdose or non-adherence to medication regimens, resulting in poor outcomes.[13] Globally, the proportion of patients with adequate knowledge of the dosage schedule of the medicines dispensed to them was reported to range from a median of 58.5% in South Asia to 81.6% in East Asia and Pacific Region.[10]

The indicator 'percentage of medicines actually dispensed' is designed to assess the ability of health institutions to avail prescribed medicines. Globally, nearly 2 billion people have no access to basic medicines resulting in preventable health problems.[14] One study reported that availability of medicines across WHO regions ranged from 29.4% in Africa to 54.4% in the Americas.[15] Another systematic review documented median proportions of actually dispensed medicines ranging from 59.8% in Europe and Latin America to 100% in East Asia and Pacific Region.[10] In studies conducted in Ethiopia, various findings were reported.[16 17] One study reported a 48% availability for locally produced medicines and 19% for imported ones in public health facilities.[18]

Ethiopia has a prevention-focused health policy released in 1993.[19] The policy is revised in light of the different changes in the country as well as globally over the preceding two decades. The mission focuses on provision of quality, equitable and accessible health promotion, disease prevention, treatment and rehabilitative health services.[20 21] Pharmaceutical service forms an important part in achieving this mission. The regulatory framework of the pharmaceutical sector has also seen recent updates in its regulation with the most recent proclamation on food and medicine administration released in 2019. Protecting the public from inefficacious and poor-quality medicines is among the rationale for the regulatory framework.[22]

In the context of assessing quality of pharmaceutical services at health facilities in Ethiopia, several studies were conducted on medicine use using the WHO patient care indicators. To the best of our knowledge, only one summary of such studies was presented in a recent systematic review by Mekonnen *et al*.[23] The present review adds to the Mekonnen *et al* review as the focus of the current review was specifically on the patient care indicators to highlight findings on the care patients received and their experience in health institutions. In addition, studies published as recently as 2021 have been included in the present review. Furthermore, a meta-analysis has been employed in the present systematic review in summarising studies on availability of medicine at the level of dispensing. Therefore, this systematic review and meta-analysis aimed to collate the findings of studies on the WHO/INRUD patient care indicators with a focus on the availability of medicines at the level of dispensing.

## METHODS

### Definition of terms

#### Average consultation time

The measurement involves recording the time a patient enters and leaves the consultation room (or observing consultation start and end in cases of multiple consultations in one room). This indicator is calculated as shown below.[3] We have used 10 min as a reference value to compare our findings as it has been used in previous studies.[10 24]

$$\textit{Average consultation time} = \frac{\textit{Total time of a series of consultations (minutes)}}{\textit{Number of consultations}}$$

### Average dispensing time

The measurement requires recording the duration between patients' arrival at the counter and leaving excluding waiting times. The calculation follows the following formula.[3] We used 3 min as a cut-off to determine a reference average dispensing time as it has been used in previous studies.[25 26]

$$\textit{Average dispensing time} = \frac{\textit{Total time of a series of dispensing encounters (seconds)}}{\textit{Number of encounters}}$$

### Percentage of medicines actually dispensed

It is calculated as follows.[3] Dispensing of 100% of the medicines prescribed to patients is considered the ideal value in the present review, similar to previous studies.[27 28]

$$\textit{Percentage of medicines actually dispensed} = \left(\frac{\textit{The number of medicines actually dispensed at the health facility}}{\textit{Total number of medicines prescribed}}\right) \times 100$$

### Percentage of medicines adequately labelled

The indicator is calculated as follows.[3] Labelling is considered to be fulfilled when 100% of the dispensed medicines are provided with the minimum possible information on the label, similar to previous studies.[27 28]

$$\textit{Percentage of medicines adequately labelled} = \left(\frac{\textit{Number of medicine packages containing at least patient name, medicine name and when the medicine should be taken}}{\textit{Total number of medicine packages dispensed}}\right) \times 100$$

### Patients' knowledge of correct dosage

The indicator is calculated as follows.[3] Failure to correctly describe the specified pieces of information for any of the medicines received is considered as inadequate knowledge. In the present review, an ideal level of knowledge among patients is when 100% of the patients can describe dosage schedule of all their medicines, similar to previous studies.[27 28]

$$\textit{Patients' knowledge of dosage schedule} = \left(\frac{\textit{Number of patients who can adequately report the dosage schedule for all medicines}}{\textit{Total number of patients interviewed}}\right) \times 100$$

## Review registration

The systematic review and meta-analysis followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[29] The protocol for this systematic review and meta-analysis has been registered on PROSPERO (CRD42020157274).

## Eligibility criteria

The review focused on studies conducted to assess medicine use in health facilities in Ethiopia using the WHO's patient care indicators. Scientific articles as well as technical reports or theses which were made public in the English language with no restriction on the year of publication were searched for inclusion. According to the WHO guidelines, patient care indicators are usually conducted among the general patient population through exit interviews after a visit to a health institution.[3]

## Information sources

The databases Embase, Global Index Medicus, Google Scholar, Medline (via PubMed) and Web of Science were searched from inception up to 10 November 2019. The search was further updated up to 31 October 2021. Searches were made with the main terms 'WHO', 'medicine', 'patient care indicators' and 'Ethiopia' combined with a variety of synonyms. The full search strategy employed in the different databases is provided in online supplemental table S1.

## Study selection

After removing duplicate records, the studies retrieved through a search of the different databases were screened to assess their eligibility for inclusion. The screening was performed independently by the authors, DKY and FST, with differences in the selection of studies resolved through discussion to reach an agreement. The screening was performed using Rayyan, a web application that aids the screening of studies for inclusion in a systematic review.[30] Studies falling within the eligibility criteria based on screening of titles and abstracts were selected for full-text review. In the full-text review, studies that did not use the WHO's patient care indicators and missed at least three of the five indicators and those categorised to be of low quality were excluded. For the meta-analysis, studies with complete data on the total number of medicines prescribed and medicines actually dispensed were included.

## Data extraction

Data extraction was performed on general characteristics of the studies and the WHO patient care indicators. These include author names, publication year, geographical area, number and type of health facilities, administration/ownership of health facilities, year of data collection and sample size. The information retrieved on medicine use concerns the five WHO's patient care indicators. The data extraction was performed using Microsoft Excel V.2013 by two of the authors, DKY and FST, independently. The extracted information was cross-checked and discussed to reach an agreement among the authors.

## Risk of bias in individual studies

In the assessment of the quality of studies, the checklist employed by Ofori-Asenso *et al*, in a similar study of prescribing indicators in the WHO African Region, was adapted for the present study.[31] In adapting the checklist, questions related to the WHO patient care indicators were added in place of the questions specific to prescribing indicators employed by Ofori-Asenso *et al*. This checklist was considered suitable as it enables a proper assessment of aspects that addressed medicine use practice. The full list of the adapted checklist is provided in the online supplemental table S2. The quality assessment looked into 14 expected features, when applicable, scored as 1 if fulfilled and 0 if not. The total score was then transformed into a percentage and the studies were

categorised into three categories based on these scores. Studies with a score of ≤50%, 51%–69%, and ≥70% were categorised as 'low', 'medium', and 'high', respectively, an approach employed in a similar review.[31]

### Summary measures

To summarise mean values reported in individual studies, a median value was used to summarise findings on average consultation and dispensing times. Percentage of medicines adequately labelled and patient's knowledge of the dosage schedule were also summarised by identifying the median value of the reported findings. In the meta-analysis, findings on the percentage of medicines actually dispensed were summarised.

### Synthesis of results

A random-effects meta-analysis was performed to quantitatively synthesise findings on the percentage of medicines actually dispensed (availability of medicines at the level of dispensing). In the transformation of the percentage of medicines actually dispensed, logit transformation was employed. The studies included in the meta-analysis were weighted using the inverse variance method. The between-study variance (tau squared) across the studies was estimated through the DerSimonian-Laird estimator and the presence of heterogeneity was checked through the Cochran Q test and the level of heterogeneity was presented as $I^2$. The mean proportion of medicines dispensed among the total prescribed was calculated from the included studies and it was presented with a 95% CI. Furthermore, a prediction interval of the possibility of the findings which could be reported by individual studies was also estimated.

Meta-regression was performed to assess the moderator effects of different attributes of the studies in the meta-analysis on the pooled findings on the availability of medicines with a p value of 0.05 as a cut-off for statistical significance. Specifically, univariable and multivariable meta-regression analyses were performed, with regression coefficients reported as measures of effects, to assess the effects of the variables: type of health facility, administration of health facilities, year of data collection, geographical area and quality of the studies. All analyses were performed using the software R V.3.6.2; the package 'meta' was applied to perform the meta-analysis component.[32 33]

### Funnel plot asymmetry and sensitivity analysis

The possibility of small study effects was assessed through a funnel plot (one with SE on the y-axis and another with sample size on the y-axis) and different statistical tests of funnel plot asymmetry including the Egger's test, rank correlation test and Peters' regression tests. To assess the influence of anyone's study on the overall pooled estimate of the percentage of dispensed medicines, a sensitivity analysis was performed through a leave-one-out approach.

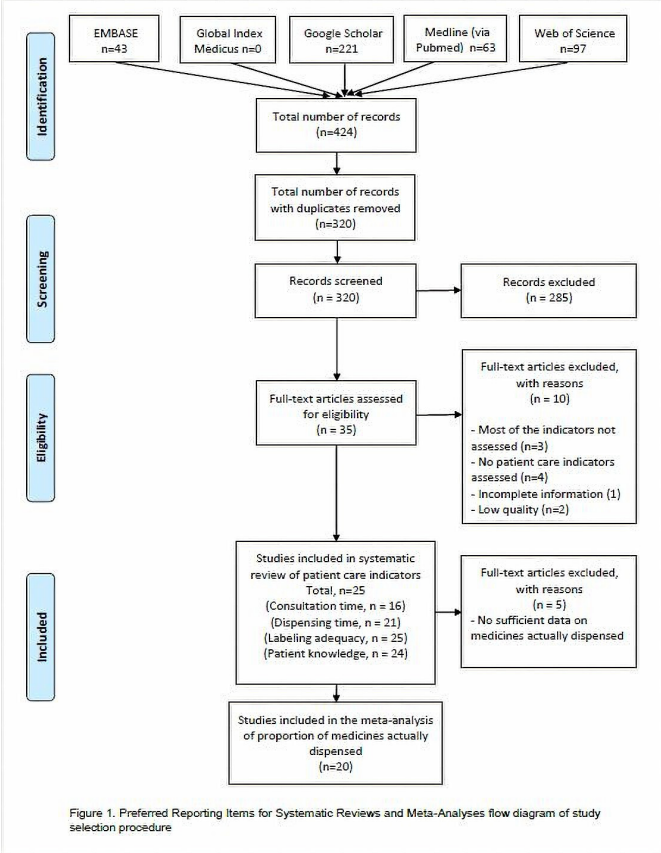


**Figure 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of the study selection procedure.

### Patient and public involvement

Patients/the public were not involved in the design, conduct, reporting or dissemination plans of this review.

## RESULTS

### Characteristics of search results

Of the total number of 424 records retrieved, 320 were screened after the removal of duplicate records. Following the exclusion of ineligible records, 25 studies were selected for inclusion in the systematic review and meta-analysis. Among these, different numbers of studies were included for the individual patient care indicators as presented in figure 1. Accordingly, 20 were included in the meta-analysis of findings on the availability of medicines at the dispensaries of the health facilities (figure 1). In both the systematic review and the meta-analysis, if a study reported separate findings on the WHO's patient care indicators for individual or groups of health institutions, these separate findings were included individually.

In the systematic review, the studies included 24 scientific articles and 1 technical report which were made public between 2013 and 2021. The studies were conducted in a total of 155 health facilities where a total of 11 703 exit interviews were performed (table 1). Half (78) of the health facilities included in the review were hospitals while more than a quarter (42) were health

Table 1 Background information of studies included in the systematic review of WHO's patient care indicators

| Author, year | Location | Number of health facilities | Type of health facility | Administration | Year of data collection | Number of patient encounters |
|---|---|---|---|---|---|---|
| Alehegn *et al*, 2021[39] | Northern | 1 | Hospital | Public | 2020 | 100 |
| Angamo *et al*, 2011[44] | Southern | 4 | Health centre | Public | 2009 | 140 |
| Anteneh *et al*, 2016[45] | Northern | 8 | Hospital (2), health centre (3), clinics (3) | Public (4), private (4) | 2013 | 406 |
| Asrade, 2019[46] | Northern | 1 | Hospital | Public | 2015 | 90 |
| Assefa *et al*, 2018[40] | Central | 1 | Hospital | Public | 2015 | 30 |
| Berasa, 2017[47] | Southern | 5 | Hospital | Public | 2015 | 175 |
| Bilal *et al*, 2016[48] | Eastern | 8 | Health centre | Public | 2014 | 708 |
| Etefa *et al*, 2013[49] | Southern | 1 | Hospital | Public | 2013 | 384 |
| Fereja and Lenjesa, 2015[50] | Western | 4 | Hospital | Public | 2013 | 160 |
| Gebremariam and Ahmed, 2019[51] | Western | 7 | Hospital | Public | 2018 | 1400 |
| Geresu *et al*, 2014[52] | Northern | 1 | Hospital | Public | 2012 | 110 |
| Ayalew Getahun *et al*, 2020[41] | Northern | 1 | Hospital | Public | 2019 | 600 |
| Gidebo *et al*, 2016[53] | Southern | 4 | Hospital | Public (2), private (2) | 2014 | 384 |
| Gudeta and Mechal, 2019[54] | Southern | 1 | Hospital | Public | 2018 | 357 |
| Mamo and Alemu, 2020[55] | Northern | 1 | Hospital | Public | 2019 | 150 |
| Mensa *et al*, 2017[56] | Southern | 2 | Hospital | Public | 2013 | 200 |
| Midaksa *et al*, 2015[57] | Eastern | 1 | Health centre | Public | 2014 | 302 |
| PFSA/FMHACA, 2017[58] | National | 68 | Hospital (15), health centre (21), PMRO (32) | Public | 2016 | 2031 |
| Sema *et al*, 2021[42] | Northern | 2 | Health centre | Public | 2020 | 60 |
| Sisay *et al*, 2017a[43] | Eastern | 1 | Hospital | Public | 2016 | 100 |
| Sisay *et al*, 2017b[59] | Eastern | 3 | Hospital | Public | 2014 | 600 |
| Tassew *et al*, 2021[60] | Northern | 2 | Hospital | Public | 2019 | 200 |
| Teklemariam, 2018[61] | Northern | 5 | Hospital | Public | 2011 | 384 |
| Wendie *et al*, 2021[62] | Northern | 3 | Health centre | Public | 2019 | 600 |
| Wogayehu *et al*, 2019[63] | Southern | 20 | Hospital | Public | 2018 | 2000 |

Private includes private for-profit, non-profit or other health institutions.
FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency; PMRO, private medicine retail outlet.

centres. Nearly two-thirds (99) of the health facilities were public institutions (table 2).

In terms of the quality of studies, of the 25 studies in the review, 16 were categorised as 'high' quality while the remaining were of 'medium' quality. The quality assessment scores of the included studies are provided in the online supplemental table S3.

### Findings of the systematic review on the WHO's patient care indicators

Overall, the median value of the average consultation time across the studies showed that patients spent about 5 min with physicians. This value seemed to be slightly higher among health centres (5.5 min) compared with hospitals (4.9 min). Findings from the public (5.1 min) and private (4.9 min) facilities were comparable. Similarly, comparable median values were found over the years (before 2015; 5.2 min vs from 2015; 5.1 min) as well. In geographical areas, studies from central (one study, 7.0 min) and western (6.2 min) parts of Ethiopia showed higher median values compared with other areas.

The median value of the average dispensing time across the studies was 78.0 s. The median average dispensing time in the health centres was 99 s while it was 70.8 s in hospitals. In terms of administration, a higher median value of 103.2 s was found in private healthcare facilities compared with a median of 78.0 s in public institutions. Concerning year of data collection, recent studies (conducted since 2015) reported a lower median average dispensing time (61.8 s), while in studies conducted before 2015, a median of 99.0 s was reported. In terms

**Table 2** Summary of the findings on the WHO's patient care indicators in Ethiopia

| Variable | | Number of health facilities % (n) | Number of patient exit interviews % (n) | Average consultation time (min) (median (25th–75th)) | Average dispensing time (s) (median (25th–75th)) | Percentage of medicines adequately labelled (median (25th–75th)) | Percentage of patients with adequate knowledge of dosage schedule (median (25th–75th)) |
|---|---|---|---|---|---|---|---|
| All the included encounters | | 100.0 (155) | 100.0 (11 703) | 5.1 (4.2–6.6) | 78.0 (54.9–120.0) | 22.4 (5.6–50.0) | 70.0 (52.5–81.0) |
| Type of health facility | Hospital | 50.3 (78) | 69.0 (8077) | 4.9 (4.0–6.6) | 70.8 (51.6–110.4) | 16.2 (0.75–35.0) | 70.1 (61.4–81.3) |
| | Health centre | 27.1 (42) | 21.6 (2531) | 5.5 (4.3–6.5) | 99.0 (75.8–129.0) | 48.8 (17.3–64.9) | 71.4 (40.4–75.7) |
| | Clinic | 1.9 (3) | 1.2 (138) | —* | —* | 43.1 (42.8–43.6) | 41.3 (40.9–46.2) |
| | PMRO | 20.6 (32) | 8.2 (957) | —* | —* | 36.7 (36.7–36.7) | 92.7 (92.7–92.7) |
| Administration | Public | 63.9 (99) | 72.2 (8453) | 5.1 (4.1–6.6) | 78.0 (52.2–120.0) | 20.5 (5.1–50.0) | 68.8 (52.8–79.4) |
| | Private | 23.2 (36) | 10.7 (1250) | 4.9 (4.8–4.9) | 103.2 (99.6–106.8) | 36.7 (30.9–43.1) | 77.0 (51.1–81.0) |
| | Other† | 12.9 (20) | 17.1 (2000) | 6.6 (6.5–6.6) | 134.4 (97.8–171.0] | 28.0 (15.1–41.0) | 91.0 (90.6–91.4) |
| Year of data collection | Up to 2014 | 26.5 (41) | 32.6 (3810) | 5.2 (4.1–6.8) | 99.0 (74.7–155.1) | 36.0 (13.9–58.1) | 69.0 (43.5–77.6) |
| | From 2015 | 73.5 (114) | 67.4 (7893) | 5.1 (4.2–6.4) | 61.8 (46.0–88.9) | 16.4 (0.0–29.2) | 72.0 (69.5–93.0) |
| Geographical area | Central | 0.6 (1) | 0.3 (30) | 7.0 (7.0–7.0) | 61.8 (61.8–61.8) | 6.0 (6.0–6.0) | 70.0 (70.0–70.0) |
| | Eastern | 8.4 (13) | 14.6 (1710) | 4.9 (3.1–6.8) | 102.0 (60.0–151.8) | 51.6 (5.5–65.2) | 73.3 (61.9–82.0) |
| | Northern | 16.1 (25) | 23.3 (2732) | 4.3 (4.0–5.5) | 51.6 (40.3–112.0) | 19.6 (13.9–34.9) | 42.4 (34.2–67.3) |
| | Southern | 23.9 (37) | 31.1 (3640) | 5.0 (4.1–6.5) | 73.8 (51.0–88.5) | 50.0 (17.9–62.6) | 74.3 (65.0–80.0) |
| | Western | 7.1 (11) | 13.3 (1560) | 6.1 (4.8–15.3) | 85.8 (74.7–237.0) | 0.0 (0.0–20.5) | 69.0 (63.8–83.8) |
| | National | 43.9 (68) | 17.4 (2031) | —* | —* | 22.9 (20.4–29.8) | 91.8 (90.4–92.2) |

The total number of institutions and encounters are lower for indicators on which studies did not report relevant findings.
*No data reported.
†One study did not present separate findings for private and public institutions (combined findings reported).
.PMRO, private medicine retail outlet.

of geographical areas, studies in the northern part of the country reported the shortest median average dispensing time (51.6 s).

An overall median of 22.4% of the medicines dispensed was found to be adequately labelled. Concerning the type of health institutions, health centres (48.8%) recorded the highest proportion of adequately labelled medicines while the lowest was recorded among hospitals (16.2%). Adequate labelling was found to be higher among medicines dispensed in private health institutions (36.7%) compared with that in public institutions (20.5%). In the studies conducted since 2015, lower proportions of adequate labelling of medicines were reported compared with those studies conducted before 2015. Studies in the eastern (51.6%) and southern (50.0) parts of the country reported higher median proportions of adequately labelled medicines compared with other areas.

Across the studies, an overall median of 70.0% of patients were reported to have adequate knowledge of the dosage schedule of their medicines. The value among health centres and hospitals was 71.4% and 70.1%, respectively. The highest median proportion was reported among the private medicine retail outlets (PMROs) (92.7%).

### Findings of the meta-analysis on the availability of medicines at the level of dispensing

A total of 45 study findings from 20 papers (19 journal articles and 1 technical report) with 16 282 medicines prescribed in total were included in the meta-analysis. The overall mean percentage of medicines actually dispensed was 85.9% (95% CI=82.1% to 89.0%, $I^2$=98%). The prediction interval that an individual study could report on the availability of medicines at the level of dispensing is estimated to be between 47.6% and 97.6% (figure 2).

Assessment of small study effects using funnel plots showed a largely symmetric distribution of studies around the random-effects estimate of the percentage of medicines actually dispensed (figures 3 and 4). Statistically, while Egger's linear regression test (p=0.0008) of funnel plot asymmetry showed statistically significant asymmetry, rank correlation (p=0.1130) and Peters' (p=0.2104) linear regression tests showed no significant asymmetry.

A subgroup analysis showed no differences between hospitals (82.4% (95% CI=76.1% to 87.4%), $I^2$=98%) and health centres (88.0% (95% CI=84.9% to 90.6%), $I^2$=86%) although the point estimate was higher in health centres. Other health facilities (92.3% (95% CI=91.3% to 93.1%), $I^2$=0%) such as clinics and PMROs showed higher levels of availability of medicines than in hospitals or

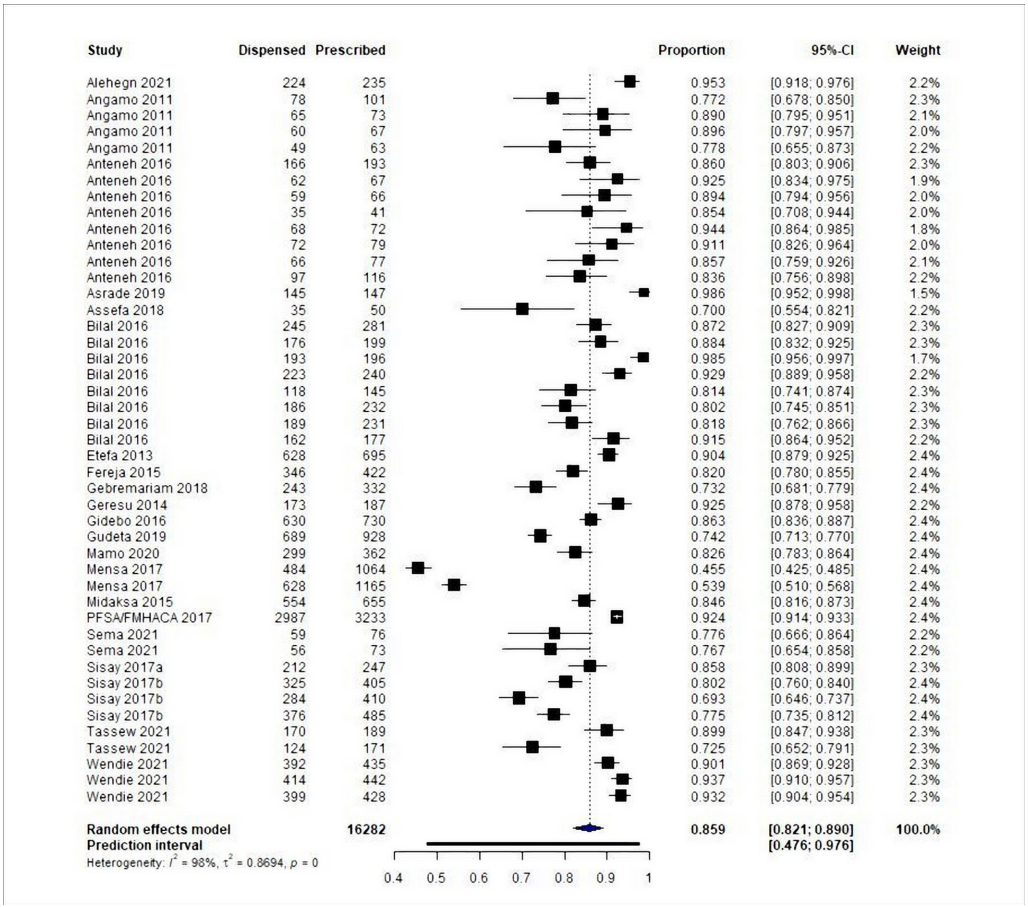


**Figure 2** Forest plot of percentage of actually dispensed medicines across the studies. FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency.

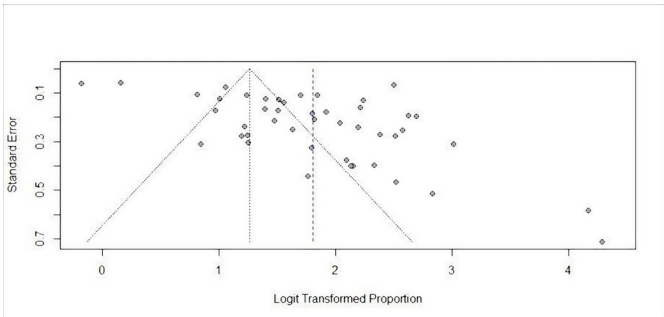


**Figure 3** Funnel plot (using SE).

health centres (figure 5). In terms of the administration of health facilities, no statistically significant difference was observed between public (85.8% (95% CI=82.46% to 88.6%), $I^2$=96%) and private (86.8% (95% CI=80.3% to 91.4%), $I^2$=9%) institutions (figure 6).

Studies from before 2015 (85.5% (95% CI=81.6% to 88.6%), $I^2$=96%) and those since (87.2% (95% CI=81.6% to 91.3%), $I^2$=97%) showed differences in the proportion of medicines actually dispensed (figures 7 and 8). No statistically significant differences were seen across many of the geographical areas in terms of the availability of medicines. Studies in the western parts (78.0% (95% CI=71.3% to 83.5%), $I^2$=76%) reported lower availability of medicines at the level of dispensing in comparison with the national study (92.4% (95% CI=91.4% to 93.3%), $I^2$=not applicable) and those in northern parts (89.5% (95% CI=86.2% to 92.1%), $I^2$=86%) (figure 9).

### Meta-regression

The findings of univariable meta-regression showed that none of the variables—type of health facility, administration of health facility, year of data collection and geographical area—showed a statistically significant effect on the pooled estimate of the availability of medicines. However, in the multivariable meta-regression geographical areas and quality of study showed statistically significant associations with the availability of medicines. Geographically, compared with a study from the central part of the country, studies in northern parts (1.64 (95% CI=0.03 to 2.26)) reported higher levels of availability of medicines at the level of dispensing. In addition, significantly higher proportions of medicine availability at dispensing were reported in studies categorised to be of medium quality (0.66 (95% CI=0.02 to 1.29)) (table 3).

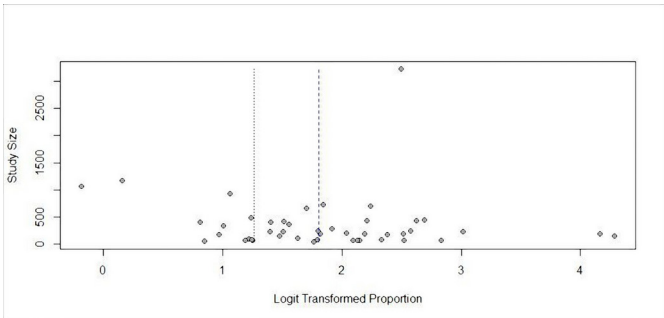


**Figure 4** Funnel plot (using sample size).

## DISCUSSION

### Summary of the main findings

This systematic review and meta-analysis summarised studies performed in Ethiopia between 2009 and 2020 using the WHO/INRUD patient care indicators with a focus on the availability of medicines. The findings showed that consultation time and dispensing time were 5 min and 78 s, respectively. The median proportions of adequately labelled medicines and patients with adequate knowledge of the dosage schedule of their medicines were around 22.4% and 70%, respectively. The meta-analysis showed that 86% of the prescribed medicines were dispensed to patients.

### Comparisons of findings with other studies

The median value of the average consultation time was around 5 min which was much shorter than the reference value of 10 min[24] and findings from studies in Europe and Latin America (14.2 min).[10] However, the finding was largely comparable with a systematic review of medicine use indicators from different World Bank regions including East Asia and Pacific Region (4.1 min), Middle East and North Africa (5.5 min) as well as sub-Saharan Africa (4.4 min).[10] On the contrary, studies from South Asia (2.3 min) showed much shorter duration than the present review.[10] Among original studies, findings from hospitals (1.2 min)[34] and health centres (2.2 min)[35] in Pakistan, a rural hospital in Delhi, India (2.8 min)[36] and health centres in Nepal (3.6 min)[37] reported much shorter average consultation times, while a comparable finding was reported by a study in public health centres in Kenya (4.1 min).[28] The longer consultation time found among health centres in comparison with hospitals was also shown in studies in Pakistan (health centres, 2.2 min vs hospitals, 1.2 min).[34 35] One of the possible reasons for the longer consultation times at health centres in the present review may be related to a relatively lower patient load in health centres compared with hospitals.

The median of average dispensing times in the present review of 78 s (1.3 min) was longer than in the studies from Pakistan in hospitals (8.7 s)[34] and health centres (38 s)[35] and in Kathmandu, Nepal (54.4 s).[37] However, it was shorter than half of the commonly referred acceptable duration of 3 min.[25] A finding comparable with the present review was reported by a study in India (1.2 min),[36] while longer average duration was reported in Kisi, Kenya (131.5 s).[28] The cited systematic review showed varying findings in different regions most of which were shorter than the present study including in the sub-Saharan Africa region (45.5 s). However, slightly longer duration was reported in South Asia (86.0 s).[10] Longer duration of dispensing times was observed in health centres compared with hospitals. The studies from Pakistan showed similarly longer duration among health centres than hospitals,[34 35]

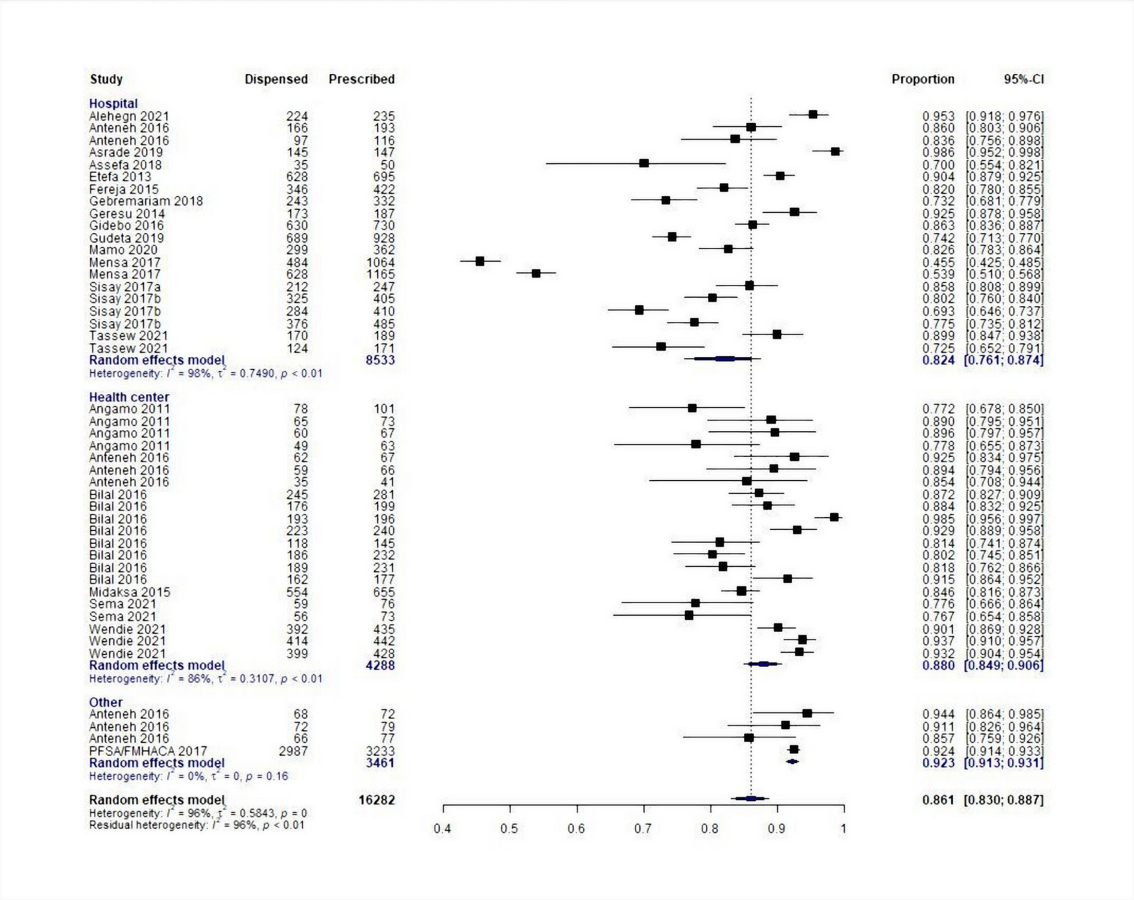


**Figure 5** Forest plot of percentage of actually dispensed medicines by health facility type. FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency.

although both were much shorter than the findings in the present review. An important concerning trend observed in the present review was the shorter dispensing time in the recent studies since 2015 which may require further investigation to be conducted to identify the specific reasons.

In the present review, the median proportion of medicines with adequate labelling was very low with only one-fifth categorised as adequate which was much lower than the reference value of 100%. The two studies from Pakistan (100% each)[34 35] and another from Delhi, India (73%)[36] reported much higher proportions of adequately labelled medicines. A systematic review of patient care indicators also showed consistently higher proportions of adequate labelling in the different World Bank regions globally (ranging from 38.4% in Middle East and North Africa to 96.9% in South Asia) than in the present study.[10] In contrast, comparable proportions of adequate labelling were reported in Kisii, Kenya (22.6%),[28] while much lower proportions were reported in Kathmandu, Nepal (0%),[37] and Alexandria, Egypt (0%).[38] In the present review, higher proportions of medicines prescribed at health centres had adequate labelling compared with medicines prescribed at hospitals. This could, similar to the above indicators, be related to the higher patient load at hospitals. Similarly higher proportions of medicines prescribed from private health facilities were adequately labelled compared with those from public facilities. As to the trend over time, studies conducted since 2015 showed decreased proportions of adequate labelling. This should be studied further and solutions suggested as it is important to ensure the rational use of medicines. Besides the possible differences in service provision, one important issue related to the large variations observed between the studies included in the present review and also among the other studies cited in this study could be related to the operational definitions of the indicators. Although the WHO/INRUD indicators specify criteria for adequacy of labelling, different operational definitions were employed in the various studies potentially contributing to variations.

The proportion of patients with adequate knowledge of the dosage schedule of the medicines dispensed to them was 70%, which was much lower than an ideal reference value of 100%. It was also lower than the findings of studies in Saudi Arabia (79.3%),[27] Egypt (94.0%),[38] sub-Saharan Africa (76.4%), East Asia and Pacific region (81.6%), and the Middle East and North Africa (78.5%).[10] However, findings with lower proportions of patients with adequate knowledge were reported by studies in Pakistan (hospitals, 61.6%; health centres, 62.1%),[34 35] Nepal (50%),[37] Kenya (54.7%)[28] and India (51.7%).[36] Insufficient

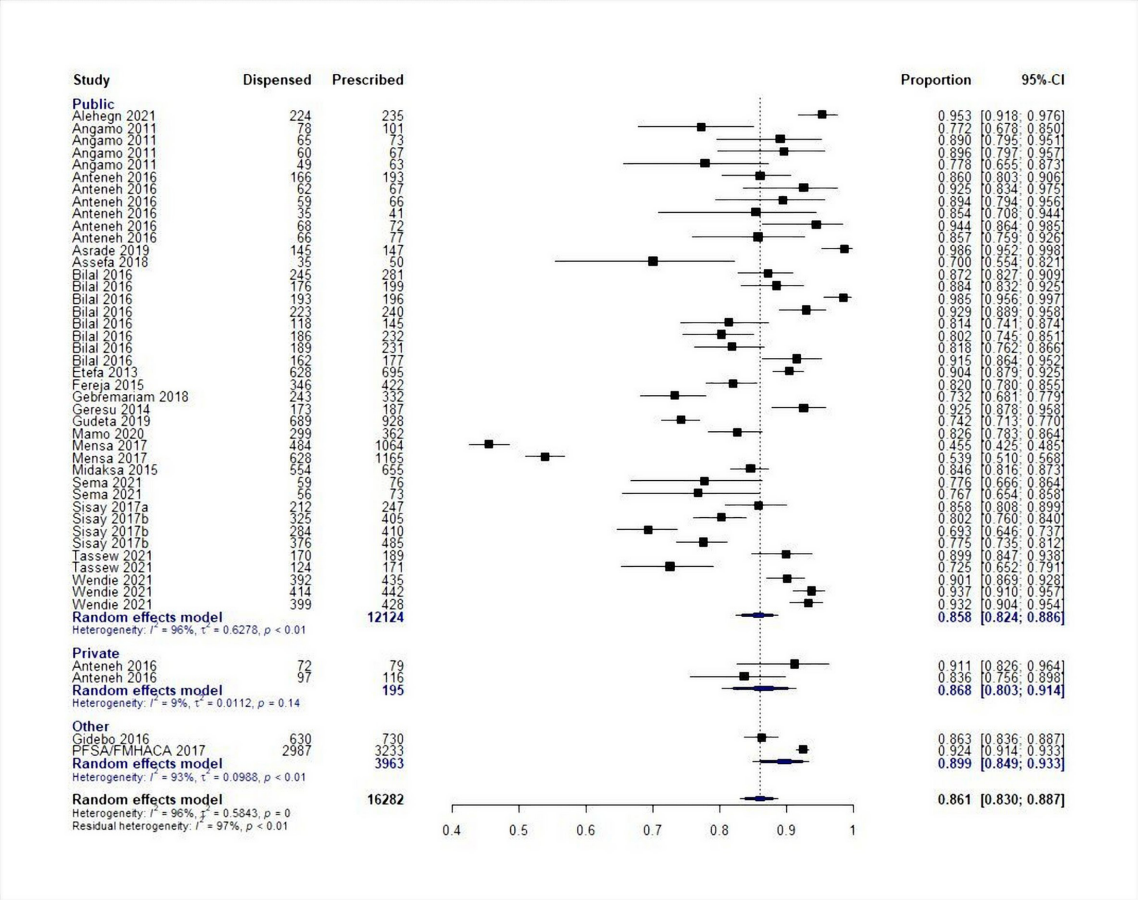


**Figure 6** Forest plot of percentage of actually dispensed medicines by administration. FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency.

knowledge of patients about the medicines they take may result in misuse which can lead to treatment failure and put the health of the patient at risk.[4] Similar to the case of adequacy of labelling, there were large variations in the criteria the studies employed in the assessment of patients' knowledge despite the specific criteria stated in the WHO guide.[3]

The meta-analysis on the availability of medicines at the dispensaries of health institutions showed about 86% of all the prescribed medicines were actually dispensed. However, this finding was lower than the reference level of 100%. Higher proportions of availability at the level of dispensing were reported in studies from hospitals (97.3%) and health centres (90.9%) in Pakistan[34 35] and Egypt (95.9%).[38] Similarly higher proportions were reported at dispensing level in most of the regions covered by studies in the systematic review of patient care indicators.[10] In contrast, lower proportions were reported from Nepal (76.6%)[37] and Kenya (76.3%).[28] However, comparable findings were reported in the study from India (86.7%)[36] and another study on the availability of medicines at dispensing in Ethiopia (84%).[16]

In the subgroup analyses, the meta-analysis showed statistically significant higher availability in clinics and PMROs other than hospitals and health centres. The findings of the national study also showed significantly higher percentage of actually dispensed medicines than studies in the geographical regions except those in northern part of the country. However, no statistically significant differences were shown by administration and year of study. The findings of the univariable and multivariable meta-regression showed no statistically significant difference by health facility, administration or year of study. Comparable levels of availability were also reported among hospitals[34] and health centres[35] in the studies from Pakistan.

Geographically, studies in the northern part of the country showed higher levels of availability of medicine than the study from central Ethiopia. However, this finding should be interpreted carefully as only one study was found from central Ethiopia besides those included in the national study. The significant influence of quality of studies on availability of medicines in the multivariable regression shows the need for uniform and high-quality studies to help ensure findings will not be affected by possible lack of quality.

### Methodological issues in the reviewed studies

There were important issues such as lack of sampling uniformity. The original studies had differing interpretations of the sampling recommendations provided in the WHO guide to conduct studies of medicine use in health facilities.[3] In some studies, a sample size of 600 exit

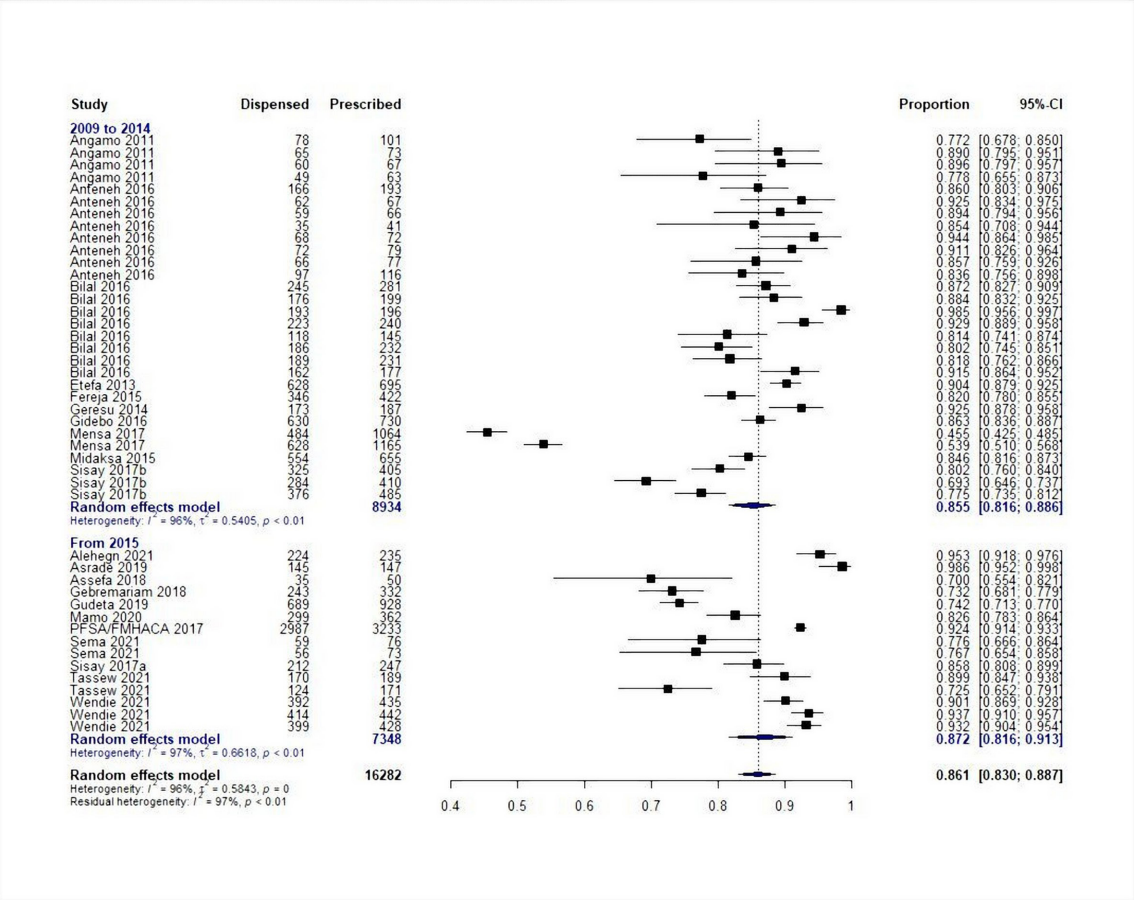


**Figure 7** Forest plot of percentage of actually dispensed medicines by year of study. FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency.

interviews was employed, while 100 were used in others with many other studies using a sample size of 30 exit interviews among patients.[39–43] Adhering to the sampling recommendations will help conduct studies in a manner that will help assess medicine use more reliably and enable better comparisons across studies.

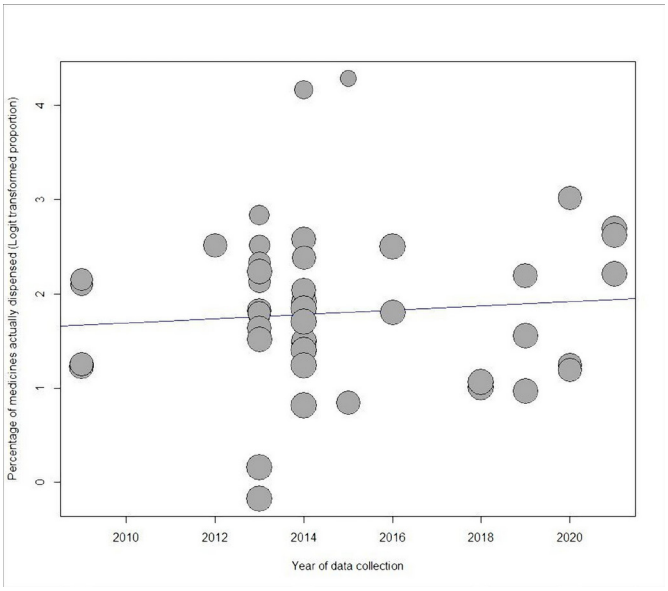


**Figure 8** Bubble plot of percentage of actually dispensed medicines by year of study.

A lack of clarity on how consultation time, dispensing time, adequacy of labelling and patients' knowledge of their medicines was measured was noted across the different studies despite the provision of specific definition/criteria in the WHO guide.[3] Improving clarity of how each of the indicators are measured and following the guide's recommendations on study procedures are crucial to effectively assess medicine use and identify possible problems in a reliable manner.

## Limitations of the review

The present review has some limitations which should be taken into consideration when interpreting the findings. Studies in private health institutions included in the review are much fewer compared with those from public institutions. As such, the findings comparing private and public health institutions should be interpreted with this consideration. Another important limitation in the present study concerns the findings related to the adequacy of labelling and knowledge of patients on the dosage schedule of medicines prescribed to them. Owing to different applications of the operational definition of adequate labelling as well as adequate knowledge among patients, varying findings, which seem to be due

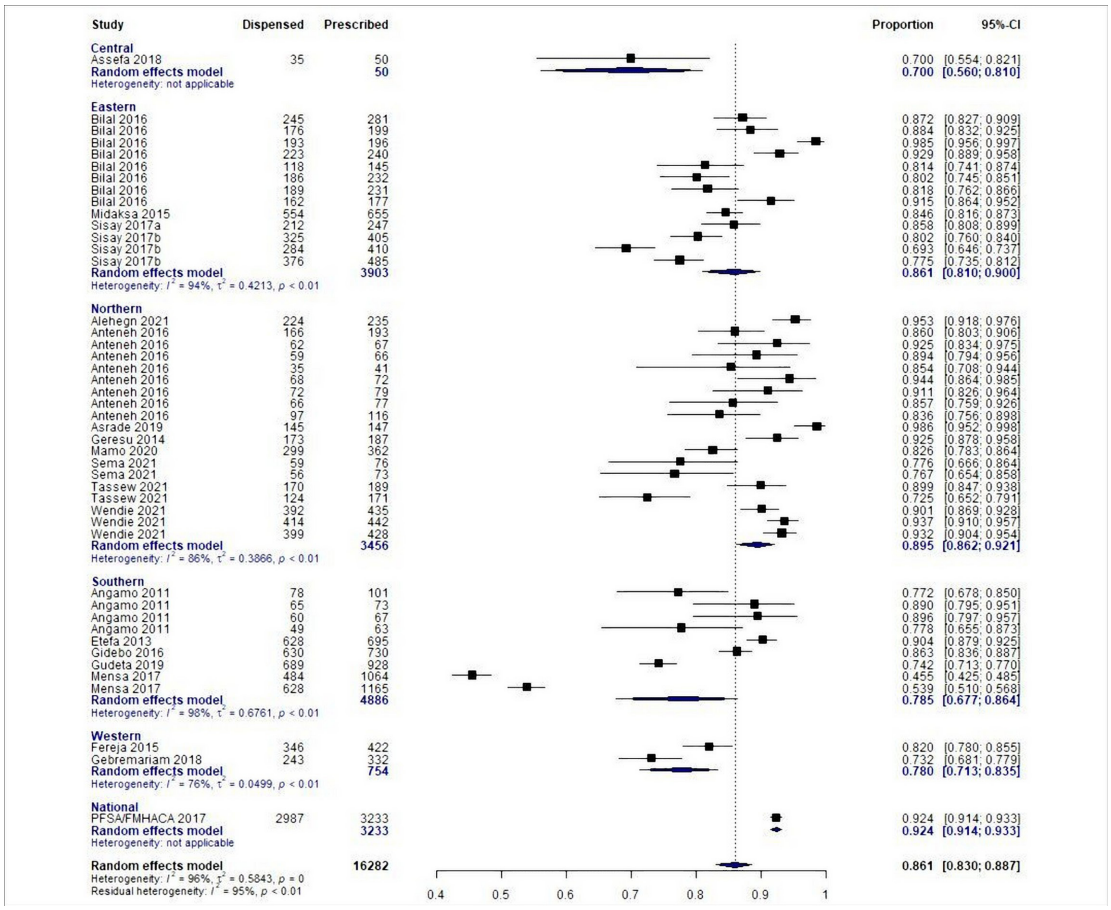


**Figure 9** Forest plot of percentage of actually dispensed medicines by geographical area. FMHACA, Food Medicine and Healthcare Administration and Control Authority; PFSA, Pharmaceuticals Funding and Supply Agency.

not only to differences in practice but also to the definitions applied, were observed. So, these findings should be looked into with these issues in consideration.

### Implications of the findings

The present study has added to the recently published review reporting a similar overall finding that reviewed studies showed deviations from patient care indicators.[23] The specific focus on patient care indicators and the inclusion of the most recent studies (published up to 2021) in the present review are notable. The quantitative summary of the findings of the studies reviewed and the use of meta-analysis provided summarised quantitative estimates of the patient care indicators. In addition, the summarised findings were presented and compared across study characteristics such as type of health facilities studied, administration of health facilities, the year of data collection as well as the geographical area of the studies.

The review revealed the five patient care indicators had lower values than the reference values indicating a number of specific issues to conduct further research. One aspect is the very low proportion of adequately labelled medicine which calls for studies focused on understanding the reasons for the problem and potential solutions. The short dispensing times together with the nearly one-third of patients without adequate knowledge of the dosage schedule of their medicines require further studies to understand the content of the counselling patients receive. This can help determine the reasons for inadequate knowledge of patients and possible interventions to improve it. Another important area of research findings of the present review suggest regarding suboptimal availability of medicines to patients. On the basis of the finding in the review, studies looking into the specific medicines patients are not able to get at health facilities will be helpful in determining possible interventions to improve their availability.

## CONCLUSION

The findings of the current review provide a summary of the literature to identify important aspects of medicine use at the level of patient care in health facilities of Ethiopia. The time physicians and pharmacy professionals/dispensers spend with patients was found to be short. The review also revealed that very low proportion of medicines was labelled adequately. Both dispensing times and adequacy of labelling showed worsening trends in recent studies which requires attention. Inadequacy of knowledge of the dosage schedule among patients is

Table 3 Univariable and multivariable meta-regression of factors influencing the percentage of medicines actually dispensed

| Variable | Number of studies | Univariable meta-regression: Estimate (regression coefficient) (95% CI) | SE | P value | Multivariable meta-regression: Estimate (regression coefficient) (95% CI) | SE | P value |
|---|---|---|---|---|---|---|---|
| Type of health facility | | | | | | | |
| Hospital | 20 | Reference (0) | | | Reference (0) | | |
| Health centre | 21 | 0.47 (–0.02 to 0.96) | 0.18 | 0.059 | 0.32 (–0.16 to 0.81) | 0.25 | 0.196 |
| Other | 4 | 0.84 (–0.04 to 1.72) | 0.45 | 0.062 | 0.42 (–0.65 to 1.49) | 0.55 | 0.437 |
| Administration | | | | | | | |
| Public | 41 | Reference (0) | | | Reference (0) | | |
| Private | 2 | 0.19 (–1.11 to 1.49) | 0.66 | 0.775 | –0.14 (–1.32 to 1.03) | 0.60 | 0.812 |
| Other | 2 | 0.40 (–0.82 to 1.62) | 0.62 | 0.523 | 0.79 (–0.62 to 2.20) | 0.72 | 0.273 |
| Year of data collection | | | | | | | |
| Before 2015 | 30 | Reference (0) | | | Reference (0) | | |
| From 2015 | 15 | 0.13 (–0.43 to 0.69) | 0.29 | 0.652 | –0.06 (–0.65 to 0.53) | 0.30 | 0.835 |
| The geographical area of studies | | | | | | | |
| Central | 1 | Reference (0) | | | Reference (0) | | |
| Eastern | 13 | 0.95 (–0.64 to 2.54) | 0.81 | 0.241 | 0.89 (–0.71 to 2.48) | 0.81 | 0.276 |
| Northern | 19 | 1.26 (–0.32 to 2.84) | 0.81 | 0.117 | **1.64 (0.03 to 2.26)** | **0.82** | **0.046** |
| Southern | 9 | 0.42 (–1.19 to 2.04) | 0.82 | 0.608 | 0.79 (–0.91 to 2.50) | 0.87 | 0.361 |
| Western | 2 | 0.41 (–1.43 to 2.25) | 0.94 | 0.661 | 0.71 (–1.04 to 2.46) | 0.89 | 0.427 |
| National | 1 | 1.65 (–0.44 to 3.74) | 1.07 | 0.112 | 1.09 (–1.65 to 3.83) | 1.40 | 0.436 |
| Quality of the study | | | | | | | |
| High | 32 | Reference (0) | | | Reference (0) | | |
| Medium | 13 | 0.33 (–0.29 to 0.96) | 0.34 | 0.296 | **0.66 (0.02 to 1.29)** | **0.33** | **0.044** |

Statistically significant estimates are marked in bold

also noteworthy. Less than the optimal level of medicine availability to patients was found in the meta-analysis. As the patient care indicators provide a general overview of the services provided to patients in the facilities, the findings highlighted warrant further studies focused on the specific indicators. Health authorities, together with academia, should look further into investigating the problems in the individual indicators further to design pertinent interventions that will improve the pharmaceutical services patients receive at health facilities in Ethiopia.

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**Contributors** FST conceived the systematic review and meta-analysis. FST and DKY designed the protocol, and performed study selection, quality assessment, and data extraction. FST performed the analysis for the systematic review and meta-analysis. FST and DKY drafted the manuscript. DKY and BLW revised the manuscript for its intellectual content. All authors read and approved the submission of the manuscript. FST is the guarantor.

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**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** In the conduct of the present systematic review and meta-analysis, approval from an ethics review board was not sought as it focused on summarising findings of studies made public. However, the procedures followed clear steps from the literature search to the synthesis of findings.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplemental information.



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