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## COMPARATIVE EVALUATION OF DRUG PRESCRIPTION APPROPRIATENESS IN PUBLIC AND PRIVATE HEALTH INSTITUTIONS OF SOUTH WEST ETHIOPIA: THE CASE OF WOLKITE TOWN

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### ABSTRACT

#### Keywords:

Comparative, Evaluation of prescription, South West Ethiopia

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Irrational use of medicines results in poor patient clinical outcomes, adverse drug reactions, economic burden and antimicrobial resistance. The objective of this study was to evaluate drug prescription patterns in private and public health sectors in Wolkite town, South West Ethiopia. The drug prescriptions were evaluated in 11 private and public health facilities, Wolkite town, South west Ethiopia. Total patient records of 600 were collected by systematic random sampling technique from patients attended the facilities from January 1 to December 31, 2011, retrospectively. One thousand two hundred twenty seven drugs were prescribed for 385 patient encounters making the average number of drugs per encounter  $3.20 \pm 1.01$  (private=3.33, public= 2.89). Three hundred and one (78.2%) patients in private and public health facilities were prescribed with at least one inappropriate drug. Inappropriate choice of drug 108 (28.0%), over prescription of drugs 89 (23.0%) and inappropriate duration of treatment 28 (7.2%) were the three most prevalent cause of inappropriate prescriptions in the health facilities. Much remains to be done to promote rational prescription of drugs in primary health care facilities.

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**INTRODUCTION:** According to World Health Organization (WHO), rational drug use requires that patients receive medications appropriate to their clinical needs, in doses that meet their individual requirements for an adequate period of time, at an affordable cost <sup>1,2</sup>.

Rational drug use is achieved when there are a rational prescribing using medicines or drugs from an essential drugs list. Prescription drugs listed as essential are those which fulfill the real needs of the majority of the population in diagnostic, prophylactic, therapeutic and rehabilitative services using criteria such as risk-benefit ratio, cost effectiveness, quality, practical administration, patient compliance and acceptance <sup>3</sup>.

Drug use studies using aggregate data or health facility indicators may indicate that there is over- or under-consumption of medicines. However, such studies do not provide detail about the exact nature of the irrational use: incorrect medicine choices, incorrect dose, prescribing drugs that cause adverse drug reactions or drug interactions, and the use of expensive drugs. Such details of drug utilization are addressed by Drug Use Evaluation (DUE) <sup>4</sup>.

Drug use evaluation, as a term introduced officially in 1994, is a system of ongoing, criteria-based evaluation of drug use that will help ensure that medicines are used appropriately (at the individual patient level).

A DUE is drug- or disease - specific and can be structured so that it will assess the actual process of prescribing, dispensing or administering a drug <sup>4</sup>.

Drug use can be evaluated retrospectively or prospectively. Retrospective DUE is better than prospective one with regard to its suitability to perform since drug therapy is reviewed after the patient has received the medication and have an advantage of avoiding patient destruction during treatment. In retrospective DUE, patient medical charts or computerized records are screened to determine whether the drug therapy met approved criteria and aids prescribers in improving care for their patients, individually and within groups of patients <sup>5</sup>.

Issues commonly addressed by retrospective DUE are appropriateness of indication, over and under utilization, appropriate generic use, therapeutic duplication, drug-disease contraindications, drug-drug interactions, incorrect drug dosage, inappropriate duration of treatment, and clinical abuse/misuse <sup>6</sup>.

Prescriptions are considered inappropriate when there are contraindicated existing medical conditions, potential drug interactions, known documented allergies, wrong doses prescribed, inadequate monitoring, more than one drug prescribed when only one is necessary, drugs prescribed for which there is no indication <sup>7</sup>.

Common types of inappropriate medicines use include polypharmacy, inappropriate use of antimicrobials, failure to prescribe in accordance with clinical guidelines, and inappropriate self-medication, often with prescription-only medicines. Inappropriate use of medicines is harmful for patients in terms of poor clinical outcomes and adverse drug reactions. Overuse of antimicrobials exerts pressure to increase rates of antimicrobial resistance <sup>8,9</sup>.

Irrational use of drug is a common practice; nearly half of the world's patients receive their drug inappropriately. Ethiopia cannot be an exception as availability of essential medicines, trained health care providers and literacy level of patients is low which is in coherent with the countries low economic status <sup>10, 11</sup>.

Inappropriate medicines use wastes scarce economic resources that could be used for food or other necessities <sup>10</sup>. The share of out-of-pocket expenditure on drugs in Ethiopia is very high (47%). This results in low economic access to drugs, particularly by the poor, and creates equity problem <sup>11, 12</sup>.

**METHODS:** The study was conducted in public and private primary health care facilities of Wolkite town, South West Ethiopia from February 15 to March 15, 2012. Wolkite town which is located 150 kms from the capital city, Addis Ababa, is the second largest town in Southwest Ethiopia <sup>13, 14</sup>.

In the town there were one health center, two clinics, one health post and two pharmacies. Whereas the private health sector had six medium clinics, two lower clinics, and six drug shops <sup>14</sup>.

Patient medical card of one year, from January 1 to December 31, 2011, were reviewed retrospectively from 8 private clinics and 3 public health facilities. For determination of the sample size for drug use evaluation, usually the Joint Commission for Accreditation of Health Organizations (JCAHO) Criteria is followed which states; if the average number of cases per quarterly is more than 600, at least 5% of cases are reviewed <sup>10</sup>.

Accordingly 385 patient cases from the 11 private and public health facilities (35 cases from each facility) were evaluated for appropriateness using Ethiopian standard treatment guideline for health centers, American Hospital Formulary Systems (AHFS), American pediatrics association guideline, infectious diseases guidelines and the drug interaction software Thompson MICROMEDEX<sup>®</sup> as basis for comparison.

During the process of evaluation of patient prescription appropriateness, two internists and two clinical pharmacists were involved. The aforementioned professionals determined prescription appropriateness which include appropriateness of indication, over and underutilization, therapeutic duplication, drug-disease contraindications, preparation, administration, drug-drug interactions, incorrect drug dosage, and inappropriate duration of treatment.

**Data Analysis:** Data was checked for its completeness every day. The data outcome from those evaluations by the professionals was entered into Statistical Package for Social Sciences (SPSS) version-16.0 software to be edited, cleaned and analyzed. The data were summarized and described using cross tabulation and bivariate analysis with 95% confidence interval to infer associations and predictions.

Simple bivariate logistic regression analysis was employed to see the association between patients (age, sex, drug, disease, and education) and health sectors characteristics versus prescription appropriateness. Then, to control the effect of confounding factors, each variable was entered in to

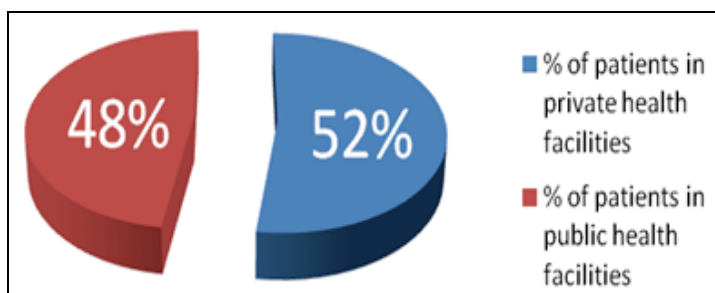
multiple logistic regression models as the independent variable with each medication use indicators being a dependent variable in order to identify independent predictors of process criteria and medication use indicators.

**RESULTS:** Patients' socio-demographics who attended the health facilities in Wolkite town are shown in **table 1**. The average age of patients was 24.7 (SD = 3.0) years. Male to female patients' ratio was 1.03, which showed comparable number of patients each gender visited the health facilities. Fifty (13.0%) patients were under the age of five. Two hundred eighty three (73.5%) patients were in the age range of 15-44 years. Nine (2.3%) patients had age of greater than 64 years.

**TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PATIENTS (N=385) WHO ATTENDED PRIVATE AND PUBLIC HEALTH FACILITIES, WOLKITE TOWN, SOUTH WEST ETHIOPIA, JANUARY TO DECEMBER, 2011.**

Characteristics	Health facilities			
	Private N (%)	Public N (%)	Total N (%)	
Sex	Male	140 (50.0)	55 (52.4)	195 (50.6)
	Female	140 (50.0)	50 (47.6)	190 (49.4)
Age Range	<5	42 (15.0)	8 (7.6)	50 (13.0)
	5-14	40 (14.3)	21 (20.0)	61 (15.8)
	15-30	111 (39.6)	46 (43.8)	157 (40.8)
	31-44	43 (15.4)	22 (21.0)	65 (16.9)
	45-64	37 (13.2)	6 (5.7)	43 (11.2)
	>64	7 (2.5)	2 (1.9)	9 (2.3)

Results of drug prescription evaluation in private and public health facilities are shown in figure 1 and table 2. Two hundred and twenty two (79.3%) patients in private and 79 (75.2%) patients in public health facilities were prescribed with inappropriate drug. Fifty two percent of inappropriate prescriptions were contributed by private health facilities while the remaining 48% by public health facilities. The differences between private and public facilities, however, were not statistically significant.



**FIGURE 1: COMPARISON OF INAPPROPRIATE DRUG PRESCRIPTIONS IN PRIVATE AND PUBLIC HEALTH FACILITIES, WOLKITE TOWN, SOUTH WEST ETHIOPIA, JANUARY 1 TO DECEMBER 31, 2011.** P value = 0.37; OR (95%CI) = 5.6 (0.13-10.9). Reference = Public health facilities.

Eighty six (30.1%) patient encounters in private and 22 (21%) patient encounters in public were prescribed with at least one inappropriate medication (table 2). Such inappropriate prescriptions include prescribing chloroquine for malaria without identifying the parasite species, dipyron (obsolete drug) for pain, ciprofloxacin for intestinal parasite, amoxicillin for malaria and paracetamol for arthralgia.

Fifty six (20%) and 33 (31.4%) patients in private and public health facilities, respectively, received unnecessary additional drugs or obsolete drug treatment (**table 2**). Such over prescriptions include prescribing chloroquine together with Artemether + Lumefantrine for treatment of unidentified malaria plasmodium species, amoxicillin with chloroquine for treatment of malaria, ciprofloxacin with Artemether + Lumefantrine for treatment of malaria, amoxicillin, ciprofloxacin, and doxycycline for a patient with diagnosis of acute respiratory infection.

**TABLE 2: DRUG PRESCRIPTION APPROPRIATENESS EVALUATION IN PRIVATE (N= 280) AND PUBLIC (N=105) HEALTH FACILITIES PATIENT ENCOUNTERS, WOLKITE TOWN, SOUTH WEST ETHIOPIA, JANUARY 1 TO DECEMBER 31, 2011.**

Appropriateness criteria	Yes (%)	No (%)	OR (95% CI)	P value
<b>Inappropriate indication</b>				0.02
Private health F.	86 (30.1)	194 (69.9)	2.9 (2.1-3.7)	
Public health F.	22 (21.0)	83 (79.0)	1	
<b>Over or under utilization</b>				0.00
Private health F.	56 (20.0)	224 (80.0)	1	
Public health F.	33 (31.4)	72 (68.6)	1.9 (1.1-3.0)	
<b>Inappropriate duration of Rx</b>				0.00
Private health F.	19 (6.8)	261 (93.2)	1.5(1.1-1.9)	
Public health F.	9 (8.6)	96 (91.4)	1	
<b>Inappropriate dosageform/ route</b>				0.89
Private health F.	15 (5.4)	265 (94.6)	0.9 (0.4, 2.5)	
Public health F.	9 (8.6)	96 (91.4)	1	
<b>Inappropriate dosage regimen</b>				0.13
Private health F.	16 (5.7)	264 (94.3)	3.1 (0.7, 13.8)	
Public health F.	2 (1.9)	103 (98.1)	1	
<b>Therapeutic duplication</b>				0.99
Private health F.	14 (5.0)	266 (95.0)	8.5 (.000, )	
Public health F.	1 (1.0)	104 (99.0)	1	
<b>Drug-drug interaction</b>				0.99
Private health F.	8 (3.0)	272 (97.0)	4.8 (.000, )	
Public health F.	2 (1.9)	103 (98.1)	1	
<b>Drug-disease contraindication</b>				0.29
Private health F.	8 (3.0)	272 (97.0)	3.1 (0.4, 24.8)	
Public health F.	1 ( 1.0)	104 (99.9)	1	

Under prescription was demonstrated by not prescribing anti-inflammatory drug for a patient with diagnosis of arthritis.

Inappropriate duration of drug treatment was observed in 19 (6.8%) private and 9 (8.6%) public facilities patient encounters. Such wrong courses of treatment include prescribing iron sulfate for anemia for 10 days instead of three months at least; ciprofloxacin for gastroenteritis for 7 days instead of 5 days; ciprofloxacin for typhoid fever for 10 days instead of 7 days, and amoxicillin for bacillary dysentery for 7 days instead of 14 days.

Fifteen (5.4%) patients from private and 9 (8.6%) patients from public health facilities received at least one inappropriate drug dosage/ route. For example, procaine penicillin fortified Intramuscular (IM) injection for 7 days for a patient with diagnosis of pneumonia, and prescription of diclofenac IM injection for 5 days, while the patients were able to take oral medications.

Therapeutic duplication was observed solely in private encounters of 14 (5%). Such prescriptions include IM benzathine penicillin and amoxicillin for tonsillitis; cotrimoxazole and ciprofloxacin for bacillary dysentery; doxycycline and ciprofloxacin for pneumonia; ibuprofen and diclofenac for Non Specific Arthritis (NSA); and omeprazole and aluminum hydroxide + magnesium hydroxide for gastritis.

In 9 (2.0%) patient encounters contraindicated drugs were prescribed. Diclofenac for a patient with diagnosis of gastritis, aspirin for children with diagnosis of upper respiratory tract infection, mebendazole for pregnant woman with a diagnosis of acute gastroenteritis, and aspirin for a child with diagnosis of tonsillitis were such examples.

Eight (2.0%) patient encounters only from private health facilities were prescribed with potentially interacting drugs. Among them iron sulfate with aluminum hydroxide + magnesium hydroxide was the most frequent.

Eighteen (4.7%) patient encounters had prescriptions of inappropriate dosage regimen. For example, iron sulfate was prescribed BID for anemia instead of TID, amoxicillin BID for tonsillitis instead of TID, chloroquine phosphate tablet (strength- 150 mg) dosage regimen of 3, 3, 2 in three consecutive days for a patient age 29 years instead of 4, 4, and 2. The differences in inappropriate drug prescriptions among patient age groups and between male and female genders, at 95% confidence, was not significant.

No Statistically significant difference (Confidence: 95%) was shown between private and public health facilities in most of the indicators. But the likelihood of getting inappropriate indication among private was 2.9 (95% CI: 2.1-3.7 with P value 0.02) times that of public health facilities. The odds of over utilization of drugs in public health facilities was 1.833 (95% CI: 1.1-3.0 with P value 0.001) times that of private health facilities and the odds of therapeutic duplication in private was 1.5 (95%CI: 1.1-1.9 with P value 0.000) times that of public health facilities.

Class of drugs most frequently associated with inappropriate prescriptions is shown in Figure 2. Out of 1181 drugs prescribed for 350 patient encounters, 760 inappropriate drugs prescribed were observed. In other words, an average of 2.17 inappropriately prescribed drugs was received by patient encounters during their visit to the health facilities. Antibiotics (30%) were the most inappropriately prescribed drugs followed by analgesics (29.2%), and antiprotozoals (18.0%).

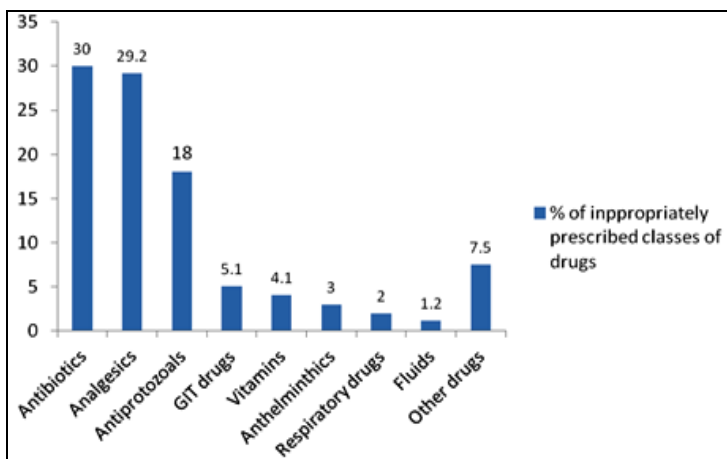


FIGURE 2: CLASS OF DRUGS MOST FREQUENTLY ASSOCIATED WITH INAPPROPRIATE DRUG PRESCRIPTIONS (N=760), WOLKITE TOWN, SOUTH WEST ETHIOPIA, JANUARY 1 TO DECEMBER 31, 2011.

Drugs frequently associated with inappropriate prescriptions are shown in Figure 3. These drugs comprised 61.4% (467) of the total inappropriately prescribed drugs. Among the ten drugs shown, diclofenac, chloroquine, ciprofloxacin, paracetamol and amoxicillin were the top five drugs frequently associated with inappropriate prescriptions. Except vitamin B- complex, all drugs in this figure shown are from three classes of drugs: antibiotics (four drugs), analgesics (two drugs) and antimalarials (two drugs).

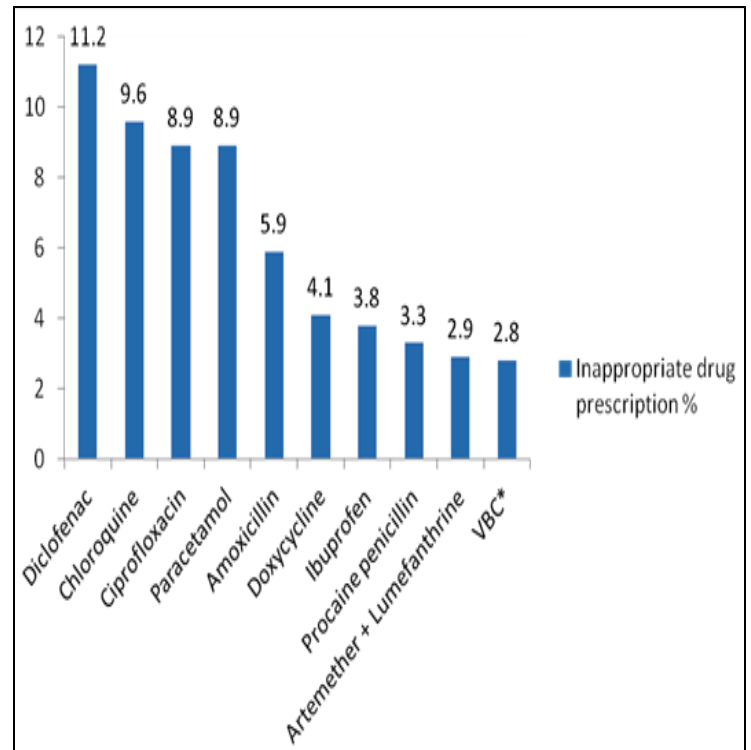


FIGURE 3: INDIVIDUAL DRUGS MOST FREQUENTLY ASSOCIATED WITH INAPPROPRIATE PRESCRIPTIONS (N= 760), WOLKITE TOWN, SOUTH WEST ETHIOPIA, JANUARY 1 TO DECEMBER 31, 2011. \* VBC- Vitamin B-Complex

**DISCUSSION:** Studies have shown that 15% to 21% of prescriptions contain at least 1 inappropriately prescribed drug<sup>15, 16</sup>. In a recent survey, 16% of patients reported to receive inappropriate medication and two-thirds of cases were outpatients<sup>17</sup>. In another study performed, 11% of Adverse Drug Events were due to inappropriate medications<sup>18</sup>.

Overall 33.7% of drugs prescribed to patients in the health facilities were found to be inappropriate. This finding was actually higher than findings from United Kingdom, United States of America and Saudi Arabia but lower than that of the Mexican finding<sup>19-22</sup>.

Twenty eight percent of encounters received one or more inappropriate indicated prescriptions in their visit to the private and public health facilities. This was comparable to findings from Mexico but lower than USA and higher than a study from India<sup>19, 23, 24</sup>.

Inappropriate medicines use wastes scarce economic resources that could be used for food or other necessities. Unnecessary over use of medicines can stimulate

inappropriate patient demand and lead to medicine stock-outs and loss of patient confidence in the health system<sup>10</sup>. Over/ underutilization of medications were seen in 23% of patient encounters. This figure was quite higher than that of Bahraini and Mexican study findings<sup>19, 25</sup>.

Seven percent of patients obtained prescriptions with inappropriate duration of treatment. This is quite very high when compared to the study from Bahrain<sup>25</sup>.

About 4.7% of patient encounters received prescriptions of inappropriate doses. This value was indeed lower than that shown in India and Mexico but higher than that of Canada<sup>19, 24, 26</sup>. Most studies in Middle East and Europe showed dosage regimen as the top drug problem in primary health care facilities<sup>20, 23, 27</sup>, but in the present study dosage regimen was the fifth top problem only above therapeutic duplication, drug disease contraindication and drug-drug interaction. This could be because no complex drugs dosage regimen seen in the study set up as infectious disease prevalent unlike the developed countries where chronic diseases are prevalent which need drugs like digoxin, theophylline and others whose dosage regimen adjustment is very complicated.

Six percent of patient encounters obtained inappropriate dosage form/ route of administration prescriptions. This finding was higher than what was seen in Bahrain, USA and Mexico<sup>19, 24, 28</sup>. Therapeutic duplication was seen in 3.4% of patient encounters prescriptions. This result was comparable to that found in Mexico but higher than a finding from Canada<sup>19, 26</sup>. Two percent of patient encounters received contraindicated drugs. This was much lower than findings from Canada<sup>26, 29</sup>.

Again 2% of patient encounters received potentially interacting drugs. This was lower than what was found from Bahrain, India, and Mexico but higher than what was seen in Canada<sup>19, 24, 25, 26</sup>.

**Limitations of the Study:** In drug prescription appropriateness evaluations, patient medical records were used. So it is difficult to be sure whether patients took the drugs as prescribed by the prescribers or not.

**CONCLUSIONS:** The present study shows that inappropriate prescription is being practiced both in private and public health facilities in the study area which might give a clue for prescription practice in the country. This needs immediate attention to correct the malpractice.

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