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EVALUATION OF DRUG PRESCRIPTION PATTERN USING WORLD HEALTH ORGANIZATION PRESCRIBING INDICATORS IN TIKUR ANBESSA SPECIALIZED HOSPITAL: A CROSS–SECTIONAL STUDY

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ABSTRACT

Background: Irrational use of antibiotics is a worldwide problem that contributes to dramatically increasing resistance and causes significant mortality, morbidity, and increased health care costs. In order to ensure the quality of health and medical care for patients and the community as a whole the proper use of medicines is an important element. Evaluation of drug use patterns with the WHO core drug use indicators is showing progressively more essential to promote rational drug use in developing countries. The main aim of this study was to assess the drug prescription pattern using WHO prescribing indicators at the Medical Outpatient Pharmacy in Tikur Ambessa Specialized Hospital (TASH).

Methods: A retrospective cross-sectional survey was designed to the claim data .A sample of 2000 prescriptions was selected using systematic random sampling to determine the prescribing pattern from a total of 6,462 prescriptions written by medical interns, residents and senior physicians for a one -year period from February 2015 to January 2016. The raw data was cleaned, entered and analyzed using SPSS version 21.0 of the computer software. The results were summarized using texts and tables.

Results: The average number of drugs per encounter was 2.84 $\pm$1.58 in the range of 1 to 9. The total number of the drugs which were prescribed by generic name was 97.9%. Of these, the total number of prescribed drugs which were included in the Ethiopian National Essential Medicine List was 99.3%. The present study highlighted the under use of antibiotics which accounts 6.6% (378), with majority being Crystalline Penicillin 27.1 % (94), followed by Amoxicillin 17.8%(62) and Ciprofloxacin 14.1% (49). A total of 8.4% (480) drugs were prescribed as injections.

Conclusion: On the basis of the finding of this study, the drug prescription pattern did not meet the WHO core drug use indicators criteria. It seems that there is a need for improvement of the prescribing patterns in the hospitals. Therefore, the federal ministry of health and drug regulatory body's commitment will be required to bring about changes in drug use policies, organize health systems and legislative structures as required in order to foster rational drug use in the country.

Keywords: Prescribing Indicators, Prescription, Rational Prescribing.

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BACKGROUND

In order to ensure the quality of health and medical care for patients and the community as a whole the proper use of medicines is an important element. The World Health Organization (WHO) defined rational use of drugs as patients receiving medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community [1].

It has been estimated that 50% or more medicine expenditure is being wasted through irrational prescribing, dispensing and patient use of medicine. Concurrent use of multiple medications by a patient result in drug induced disease like adverse drug reactions (ADR), which is reported to be as high as 28%. Studies carried out in different areas of the globe, reveal divers drug use pattern. [2]. Irrational over use of medicines can stimulate inappropriate patient demand and lead to reduced access and attendance rates due to medicine stock outs and loss of patient confidence in health [3].

Bad prescribing habits lead to ineffective and unsafe treatment, exacerbation or prolongation of illness, distress and harm to the patient, and higher costs. They also make the prescriber vulnerable to influences which can cause irrational prescribing [4].

A method of measurement and a reference standard are useful to define the rational prescribing guide. The former is now available but the latter needs further development. To endorse rational prescribing by proven effective intervention in developed countries are treatment protocols based on wide consultation and consensus, properly introduced and with a possibility of feedback; face-to-face education focused on a particular prescribing problem in selected individuals; structured order forms; and focused educational campaigns[5].

Prescribers can only treat patients in a rational way if they have access to an essential drugs list and essential drugs are available on a regular basis.[2] Sometimes physicians say that they prescribe drugs to patients because patients demand them, so they are compelled to satisfy patients [6]. One of the roles of a professional body is to develop professional standards that are supportive, enabling and professionally challenging. There is a clear imperative for the providers of all pharmacy services to use professional standards to improve and develop services that are safe and put the needs of patients first [7].WHO and the International Network of Rational Use of Drugs (INRUD) have developed a set of drug prescribing indicators to be used as measures of prescribing performance in primary care [1]. The drug use indicators are best understood as first line measures, intended to stimulate further questioning and to guide subsequent action [8].

As much as possible choose a drug that is available, convenient and inexpensive to assure adherence and contain healthcare costs. The dose of drug varies according to a number of factors including age, weight, hepatic and renal functions, and severity of infection. The prescribing of the so-called "standard" dose in serious infections may result in failure of treatment or even death of the patient; therefore, it is important to prescribe a dose appropriate to the condition [7].

Thus it is important that a check and balance system should, at least, review the prescriptions that were made out to patients so that the ultimate health care is being provided by the health care provider. The significance of the study, in large, is that it will help create awareness in order to implement a check and balance system so that health care providers can come as close to perfection as possible. Therefore, the aim of this study was to assess the prescribing pattern of physicians using World Health Organization (WHO) prescribing indicators at Medical Outpatient Pharmacy of Tikur Anbessa Specialized Hospital (TASH), Ethiopia.

METHODS AND MATERIALS

Study Area and Period

The study was conducted at Tikur Ambessa Specialized Hospital (TASH), Addis Ababa, Ethiopia. TASH was established in September 1974 and accommodates more than 600 beds, has more than 1700 medical and non-medical staff, offers inpatient, outpatient and emergency services. TASH serves about 250,000 patients per year in its outpatient department and about 24,000 in the in-patient and same number in the emergency departments. It is an important part of Ethiopia's health system and provides complex curative care and is considered as a last referral level curative care facility [9].

The study was carried out at the medical outpatient pharmacy of TASH for a period of two months starting from March 22 to June 2, 2016 on prescriptions that dated from February 2015 to January 2016.

Study Design

A retrospective cross-sectional survey was conducted using WHO drug use indicators to evaluate the prescribing practice.

Data Collection and Measurement

This study was carried out in the outpatient pharmacy department of TASH, from February 2015 to January 2016. Prescriptions for the patients were spread throughout the year to reduce bias due to seasonal changes. A sample of 2000 prescriptions for the treatment of various diseases was selected using systematic random sampling to evaluate the prescribing patterns of the facility. Three was the sampling interval used to select the prescriptions for the study.

The World Health Organization prescribing indicator form was used as a standard data collection tool for evaluation of prescribing practices at health facilities and these include.

Indicator 1: It indicates the average number of drugs per prescription to measure the degree of polypharmacy. Average, calculated by dividing the total number of drug products prescribed, by the number of prescriptions surveyed. It is not relevant whether the patient actually received the drugs.

Indicator 2: This is the percentage of drugs prescribed by generic name and measured the tendency to prescribe by generic name. Percentage, calculated by dividing the number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100.

Indicator 3: This indicator describes the percentage of prescriptions with an antibiotic prescribed. The purpose is to measure the overall level of misused of antibiotic. Percentage, calculated by dividing the number of prescriptions in which antibiotics were prescribed, by the total number of prescriptions surveyed, multiplied by 100.

Indicator 4: This pointer shows the percentage of prescriptions with an injection prescribed. It measured the general level of overused and costly form of injectable drug therapy. Percentage, calculated by dividing the number of prescriptions in which injections were prescribed, by the total number of prescriptions surveyed, multiplied by 100.

Indicator 5: This determined percentage of drugs that were prescribed from essential drug list or formulary. It is helpful to measure the degree to which prescribing practices conform to Ethiopian National Essential Medicine List Fifth Edition. Percentage, calculated by dividing the number of drugs prescribed which are listed on the essential drugs list or local formulary by the total number of drugs prescribed, multiplied by 100.

Sampling and Sample Size

The sampling method was systematic random sampling. The sample size was 2,000 prescriptions from a total of 6,462 prescriptions. All Prescriptions that were prescribing by physicians during the study period were included in the cross sectional survey.

Source Population

The Source population was all the prescriptions found in the medical outpatient pharmacy of Tikur Ambessa Specialized Hospital**.,** Addis Ababa**.**

Study Population

The target study populations were all antibiotic and non-antibiotic prescriptions from the source population. This included all dosage forms that were prescribed by physicians.

Inclusion Criteria

All prescriptions that were prescribed by physicians during the study period were included.

Exclusion Criteria

The prescriptions that had characterized by illegible handwriting, absent written date, inpatient prescription, the prescription that has biological products and prescription that were written out of this hospital were excluded.

Data Analysis

After the data was entered & cleaned carefully, all analyses were done using statistical package for social sciences (SPSS) version 21.0.Descriptive statistics including: frequency, percentage ,mean, standard deviation and range were used to summarize the prescribing indicators using the following formula adopted from the WHO's manual for prescribing indicators assessment. [10]. The results were summarized using tables.

Data Quality Assurance

The data was self-collected using WHO's manual for prescribing indicators assessment. Each and every prescription was seen analyzed thoroughly without inaptitude. Abstraction tool and data was checked for accuracy and completion. To maintain the quality of the data, a data collection checklist was pre-tested for its completeness for coverage of critical domains and on randomly selected 5% prescription.

Ethical approval

Ethical clearance to carry out this study was obtained from School of Pharmacy, College of Health Sciences, Addis Ababa University.

RESULTS

In this study, from a total of 6,462 prescriptions found at outpatient department of pharmacy in TASH that were written by medical interns, general practitioners, residents and senior physicians. We selected 2000 prescriptions using systematic random sampling to analyze the current drug prescribing practice at TASH and hence determine the trends in rational use of drugs in the institution.

The total number of medications summed to 5687. The average number of drugs per encounter was 2.84 $\pm$1.58 with the range of 1 to 9. Percentages of prescriptions which had only one drug were 8.4% (479) and the polypharmacy was 29.1% (1656). The total number of the drugs which were prescribed by generic name was 97.9 %(5569). High percentages 99.3% (5648) of drugs were prescribed from the list of Ethiopian National Essential Medicine Fifth Edition. The percentage of encounters with an injection and prescribed antibiotics was 8.4 %(480) and 6.6 % (378) respectively. (See in Table 1).

Table 1: Results of the study of drug-use through WHO prescribing indicators at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, February 2015 to January 2016 (n= 2000).

Prescribing Indicator	Number of drugs (N)	Percentage (%)	Standard
Number of drugs per encounter (mean±SD) (range)	2.84±1.584 (1-9)	-	-
Average Number of drugs per encounter	5687	2.8	1.6 – 1.8
Prescriptions with only one drug prescribed	479	8.4%	
Prescriptions with five or more drugs prescribed (polypharmacy)	1656	29.1%	
Prescriptions with injection drugs prescribed	480	8.4%	13.4%- 24.1%
Prescriptions with antibiotics prescribed	378	6.6%	20.0%-26.8%
Drugs prescribed by generic name	5569	97.9%	100%
Drugs included in the Ethiopian National Essential Medicine	5648	99.3%	100%

n: number of prescriptions sampled

From the total of 5687 prescribed drugs, the present study highlighted the under use of antibiotics which accounts 6.6% (378), with majority being Crystalline Penicillin 27.1 % (94), followed by Amoxicillin 17.8%(62) and Ciprofloxacin 14.1% (49). (See in Table 2).

Table 2: Most common antibiotics prescribed at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, February 2015 to January 2016 (n= 378).

Items prescribed	Frequency	Percentage (%)
Crystalline Penicillin	113	29.9
Amoxicillin	61	16.1
Ciprofloxacin	48	12.7
Metronidazole	27	7.1
Co-trimoxazole	23	6.1
Cloxacillin	18	4.8
Doxycycline	16	4.2
Azithromycin	14	3.7
Clarithromycin	14	3.7
Ceftriaxone	13	3.4
Norfloxacin	12	3.2
Cephalexin	12	3.2
Ceftazidime	7	1.9
Total	378	100

n: number of prescribed antibiotics

A total of 8.4% (480) drugs were prescribed as injections. From these, the most frequently prescribed injection was Crystalline Penicillin 112 (23.3%), followed by NPH 19.37% (93) and Tramadol 16.87 % (81 %) (See in Table 3).

Table 3: Most commonly prescribed injection drugs at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, February 2015 to January 2016 (n= 480).

Items prescribed	Frequency	Percentage (%)
Crystalline Penicillin	112	23.3
NPH Insulin	93	19.4
Tramadol	81	16.8
Warfarin	79	16.5
Diclofenac	72	15.0
Diazepam	23	4.8
Metronidazole	10	2.1
Cloxacillin	5	1.1
Ceftriaxone	5	1.0
Total	480	100

n: number of prescribed injections

A total of 22 prescriptions were found to have exhibited polypharmacy in which the prescription containing antibiotics. The most frequently prescribed combined antibiotics were Amoxicillin and Crystalline Penicillin by 18.18% followed by Ciprofloxacin and Doxycycline by 13.63%. Amoxicillin was the most frequent drug to have been prescribed in conjunction with other antibiotics. (See in Table 4).

Table 4: Number of prescribed antibiotics in a prescriptions with five or more drugs at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, February 2015 to January 2016 (n= 22).

Items prescribed	number of prescription	Percentage (%)
Amoxicillin and Crystalline Penicillin	4	18.2
Ciprofloxacin and Doxycycline	3	13.6
Amoxicillin and Clarithromycin	2	9.1
Amoxicillin and Ciprofloxacin	2	9.1
Azithromycin and Crystalline Penicillin	2	9.1
Clarithromycin and Crystalline Penicillin	2	9.1
Amoxicillin and Ceftazidine	1	4.5
Amoxicillin and Co- trimoxazole	1	4.5
Amoxicillin and Doxycyline	1	4.5
Amoxicillin and Metronidazole	1	4.5
Ciprofloxacin and Co- trimoxazole	1	4.5
Crystalline Penicillin and Norfloxacin	1	4.5
Doxycycline and Metronidazole	1	4.5

n: number of polypharmacy prescriptions having antibiotics

DISCUSSION

The average number of drugs per prescription at the medical outpatient pharmacy in TASH was 2.84. This is higher than the ideal which is 1.6-1.8 [11] and lower than reported by Lalan *et.al* (2012) in Maharashtra (west central India) is also 3.62 [12]. In addition, the finding of this study is also somewhat higher than that of previous studies like in Hawassa University Hospital which reported an average number of 1.9 drugs per encounter [13] and the average number of drugs per patient was 0.98 in Gondar, 1.8 in Bahir Dar and 2.2 in Debre Tabor hospitals [14]. The reason for this could be due to the higher prevalence of co-morbid conditions especially related to cardiovascular disorders. However, these values were close to the limit of two drugs per encounter recommended by WHO [15] and similar to or lower than figures reported for other countries [16, 17]. In addition , they were found to be in line with previous reports by Bharti *et.al* (2008) in India where the average number of drugs per prescription was 2.8 [18].

The percentage of drugs prescribed in generic name at the medical outpatient pharmacy in TASH was 97.9% which is acceptable compared to the ideal 100% [11]. In a similar study conducted in Hawassa University Hopsital the percentage of drugs prescribed in generic name was 98.7% which is slightly higher than our finding [13]. Another drug prescribing pattern study conducted in three hospitals in north-west Ethiopia indicated prescribing by generic names was more or less uniform among the hospitals but generally lower compared to the finding in this study (Gondar Hospital, 72.6%; Bahir Dar Hospital, 70.5%; and Debre Tabor Hospital, 84.1%) [14]. In contrary to this study, small portion of drugs was prescribed in generic name 5.13% [19].

A total of 8.4% (480) drugs prescribed were injectables at the medical outpatient pharmacy of TASH which is lower than the ideal range of 13.4%-24.1% [11] and much lower compared to reports from Hawassa University Hospital (38.1%) [13], Ayder Referral Hospital (23.6%) [20], and Debre Markos Referral Hospital (48.36%) [21]. The reason behind the low values from TASH may be associated with the knowledge and attitude of general practitioners favoring more drug formulations like oral formulations with regards to having options of an underlying disorder. Another good reason may be the nature of the disease conditions that do not require emergency resolution since most ambulatory cases do not require parenteral interventions.

Pertaining to the injectable drugs, the most commonly prescribed injectable medications were Crystalline Penicillin (23.3%), followed by NPH (19.37%) and Tramadol (16.87%) at TASH. This finding differs from the previous studies[13] that reported Ampicillin (21.4%), Cloxacillin (13.4%), and Crystalline Penicillin (12.4%).

Antibiotics are the most commonly prescribed class of drugs and have been reported to account for almost 50% of the pharmacy budget in hospitals [22]. It is also agreed that in many hospitals a very high percentage of antibiotics are inappropriately prescribed [23]. However , in this study, the percentage of antibiotic encounters was 6.64% (378) which is very low compared to the standard or ideal (20%-26.8%) [11] and values reported by many other studies [13, 20, 21, 24-30]. This may be due to the burden of various co-morbid diseases mainly associated with cardiovascular disorders and the extent to which medications specific to the condition were prescribed. Since TASH usually deals with chronic diseases the medications mostly prescribed could be non-antibiotic by their nature [31].

Most commonly prescribed antibiotics were Crystalline Penicillin (27.08%), Amoxicillin (17.8%), and Ciprofloxacin (14.1%). This is somehow consistent with

previous reports [13, 27]. Among the prescribed drugs the ones that were included in the Ethiopian National Essential Medicine List was 5648 (99.3%). This was found to be close to the ideal 100% (11), and strengthens the finding by Desalegn *et.al* (2013) [13] . Whereas, drugs prescribed from the formulary in four selected hospitals of West Ethiopia ranged from 73.5 to 100% [32].

Polypharmacy is often resulting from the inappropriate prescribing of more drugs than clinically necessary. Polypharmacy has been shown to result in drug- drug interaction, risk of fatal combined or synergistic medication adverse drug events (ADEs), medication nonadherence and hence patients leads to substantial worsening of disease, death and increased health care costs. To evaluate polypharmacy in this study, the average number of drugs per prescription was noted to be 2.8 showing the practice of overprescribing in TASH compared to the WHO recommend limit of less than 2 [10].

CONCLUSION

In general, the findings of this study are in line with what had been reported locally and globally. Prescription of drugs from essential medicines list and use of generic name drugs were found to be satisfactory. The prescribing patterns of antibiotics and injectable medications were low compared to the ideal or standard. On the contrary, the extent of polypharmacy was observed to be much higher than the recommended values and hence inappropriate. The best intervention (s) for improving polypharmacy involves an inter-professional approach that often includes a clinical pharmacist. Since majority of the cases handled in TASH are chronic diseases, the number of medications per prescription could be high.

Practical recommendation for policy makers and practitioner to monitor and improve the prescribing and consumption practices. Attempts should be made to provide reviewed and updated standard treatment guideline and on job training for all levels of health care within the rapid introduction of new drugs and advanced therapeutics, continuing education, and therapeutic audit. Good prescribing requires a sound and up to date knowledge pharmacology and applied therapeutics. Ethiopian clinical pharmacists also have a key role in rational drug use through patient education, provision of prescribing information and provision of pharmaceutical care in an outpatient setting.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

ABB identified the study area, designed the study, supervised data collection, did the analysis and reviewed the manuscript; NS coordinated the study, collected the data and prepared the manuscript. Both authors read and approved the final manuscript.

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