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Assessment of Prescribing Practices through WHO Prescribing Indicators at Nekemte Referral Hospital, West Ethiopia

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Methods: This study was a descriptive cross-sectional survey which investigated the prescribing practices of prescribers using WHO core prescribing indicators at Nekemte Referral Hospital in west Ethiopia. 770 Prescriptions were retrospectively reviewed in outpatient pharmacy of the hospital selected through systematic random sampling over the period from January 2, 2015 to March 2, 2015.

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Assessment of Prescribing Practices through WHO Prescribing Indicators at Nekemte Referral Hospital, West Ethiopia

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Results: Of all prescriptions, the mean numbers of drugs per prescriptions were 2.1, the generic name prescribing practices were 98.26%, and prescriptions carrying antibiotics were 69 %, while those carrying injections were 21.94%. Out of all drugs prescribed in the hospital, 1.74% of them were not found in Ethiopian STG. Also 18.45% of them were with incorrect name and strength, 11.82% haven't the right doses, and 6% haven't right frequency, while 20.5% of them haven't right duration of treatment.

Conclusion: On the basis of the finding of this study, the prescribing practices for antibiotic use and poly Pharmacy show deviation from the standard recommended by WHO. These two commonly overused and high probability of drug side effect and interaction forms of drug therapy need to be regulated closely. Drug use evaluation should be done for some of the antibiotics to check whether they were appropriately prescribed or not. On the other hand, injection use, generic prescribing and prescribing from EDL were not found to be a problem in this study. Referral hospitals have a special responsibility to society to prescribe selectively with strong caution to save lives of patients as a final treatment facility.

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I. Introduction

The rational use of drugs requires that patients receive 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].

Rational use of medicines is a mechanism through which safe, effective and economic medication is provided. It is promoted through the collaborative efforts of prescribers, dispensers, patient and policymakers. Rational prescribing ensures adherence to treatment and protects medicine consumers from unnecessary adverse medicine reactions and wrong treatment practices [2].

Irrational or non-rational use is the use of medicines in a way that is not compliant with rational use as defined above. Worldwide more than 50% of all medicines are prescribed, dispensed, or sold inappropriately, while 50% of patients fail to take them correctly [3].

Common types of irrational medicine use are: The use of too many medicines per patient (polypharmacy); inappropriate use of antimicrobials, often in inadequate dosage, for non-bacterial infections; over-use of injections when oral formulations would be more appropriate; failure to prescribe in accordance with clinical guidelines; inappropriate self-medication, often of prescription only medicines [3].

Inappropriate use and over-use of medicines waste resources - often out-of-pocket payments by patients and result in significant patient harm in terms of poor patient outcomes and adverse drug reactions. Furthermore, over-use of antimicrobials is leading to increased antimicrobial resistance and non-sterile injections to the transmission of hepatitis, HIV/AIDS and other blood-borne diseases. Finally, 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 the health system [3].

Irrational use of medicines is a major problem worldwide. WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take them correctly. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards. Examples of irrational use of medicines include: use of too many medicines per patient ("poly-pharmacy"); inappropriate use of antimicrobials, often in inadequate dosage, for non-bacterial infections; over-use of injections when oral formulations would be more appropriate; failure to prescribe in accordance with clinical guidelines;

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inappropriate self-medication, often of prescription-only medicines; non-adherence to dosing regimes [4].

Without knowledge of how drugs are being prescribed and used, it is difficult to initiate a discussion on rational drug use or to suggest measures to improve prescribing habits [5].

Indicators of prescribing practice measure the performance of health care providers in several key dimensions related appropriate use of drugs. The indicators are based on the practice observed in samples of clinical encounters taking place at outpatient health facilities for the treatment of acute or chronic illnesses. World Health Organization developed a core prescribing indicators to measure the degree of polypharmacy, the tendency to prescribe drugs by generic name and the overall level of use of antibiotics and injections. The degree to which the prescribing practice conformed to the essential drug list, formulary or standard treatment guideline were also measured by searching for the number of drugs prescribed from essential drug list available [6].

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 [7].

In the absence of such facility related factors, the risk of irrational prescribing could raise several folds. Irrational use of drugs leads to different consequences including but not limited to ineffective treatment, unnecessary prescription of drugs particularly antimicrobials and injections, development of resistance to antibiotics, adverse effects and economic burden on both patients and society. It has been estimated that 50% or more medicine expenditure is being wasted through irrational prescribing, dispensing and patient use of medicine [8].

There was no published drugs prescribing practices assessment in this study area, even though periodic assessment of the prescribing practices in a health facility is necessary to identify specific drug use problems, sensitize practitioners on rational drug prescription and provide policy makers with relevant information that could be useful in review of drug procurement policies and implementation of policies on drug prescribing practices in the affected institutions and regions.

This retrospective basic cross-sectional survey was therefore meant to analysis the prescribing practice of clinicians using World Health Organization (WHO) prescribing indicators at Nekemte Referal Hospital found in west Ethiopia.

II. Methods

a) Study Setting

Nekemte is located in the western part of Ethiopia. The study was conducted at Nekemte Referral Hospital, in Nekemte, which is about 331km west of Addis Ababa. It is one of main referral hospitals in western regions of the Nation.

b) Study Design

A retrospective, quantitative, and cross-sectional survey designed to describe the current prescribing practices at Nekemte Referral Hospital.

c) Data Collection and Analysis

One well-trained pharmacy personnel collected data on prescribing indicators retrospectively by using prescriptions and prescription registration books. The specific types of data necessary to measure the prescribing indicators were recorded for each patient encounter and entered directly into an ordinary prescribing indicator form.

According to the WHO document "How to investigate drug use in health facilities," at least 600 encounters should be included in a cross-sectional survey to describe the current prescribing practices, with a greater number, if possible [6]. For this particular study, the total population, N=9,425, the level of precision, d=0.05, the probability of making prescribing error was not known in the area, so, p=0.5 was assumed, level of significance, α=0.05 were used as inputs to compute sample size. The total required sample size after doubling was almost 770. 770 prescriptions were collected retrospectively by doubling the sample obtained by the statistical method from prescriptions prescribed and issued from January 2 to March 2, 2015.

The sample was selected using a systematic random sampling method. First, total number of prescriptions written from January 2, to March 2, 2015 were selected and identified. Total numbers of prescription papers in the selected study period were 9,425. Then this number was divided for determined sample size (770), and the resulting number is used as sampling interval. Therefore, sampling interval is 12. After sampling interval is known, with interval of every 12 prescriptions, the desired prescription samples to be investigated were selected.

All data in the ordinary prescribing indicator recording form were first analyzed manually and then using Microsoft Excel 2007. In the statistical analysis, frequencies, averages/means, standard deviations and percentages were obtained.

d) Prescribing Indicators

The WHO prescribing indicators were used in this study. The indicators were pretested, and slight modification was made so that they could be used easily to provide accurate data. The final versions of the pretested indicators are described below. The prescribing indicators that were measured included:

1. *The average number of drugs prescribed per encounter* was calculated to measure the degree of polypharmacy. It was calculated by dividing the total

number of different drug products prescribed by the number of encounters surveyed. Combinations of drugs prescribed for one health problem were counted as one.

2. *Percentage of drugs prescribed by generic name* is calculated to measure the tendency of prescribing by generic name. It was calculated by dividing the number of drugs prescribed by generic name by total number of drugs prescribed, multiplied by 100.
3. *Percentage of encounters in which an antibiotic was prescribed* was calculated to measure the overall use of commonly overused and costly forms of drug therapy. It was calculated by dividing the number of patient encounters in which an antibiotic was prescribed by the total number of encounters surveyed, multiplied by 100.
4. *Percentage of encounters with an injection* prescribed was calculated to measure the overall level use of commonly overused and costly forms of drug therapy. It was calculated by dividing the number of patient encounters in which an injection was prescribed by the total number of encounters surveyed, multiplied by 100.
5. *Percentage of drugs prescribed from an essential drug list* (EDL) was calculated to measure the degree to which practices conform to a national drug policy as indicated in the national drug list of Ethiopia. Percentage is calculated by dividing number of products prescribed which are in essential drug list by the total number of drugs prescribed, multiplied by 100.

e) Operational Definitions

Generic Drugs: The essential drug list of Ethiopia is used as a basis to determine drugs as generic or brand name.

Antibiotics: Drugs such as penicillins, antibacterials, antiinfective dermatological drugs, and anti-infective opthalmological agents, antidiarrheal drugs with streptomycin, neomycin, and metronidazole are considered antibiotics when used in the context of antibiotics.

Combination of Drugs: Two or more drugs that are prescribed for a given health condition. For example, triple therapy for helicobacter pylori induced peptic ulcer is counted as one.

Generic Drugs: Is the established non- proprietary or common name of the active drug in drug product. The Essential Drug List of Ethiopia is used as a basis to determine drugs as generic or brand name.

Indicators: Are the variables one cause created and validated by the WHO as they have to measure rational use in health facilities

Prescribers: Any medical practitioner who is licensed or authorized to write prescription.

Prescription: Is an order for a medication issued by a physician, dentist or other properly licensed medical practitioner.

Brand Name: A proprietary name or a registered trade mark of drug product given by the manufacturer.

f) Ethical Consideration

Ethical approval was obtained from the Wollega University Pharmacy Department.

III. Results and Discussion

Samples of 770 patient encounter prescriptions were assessed retrospectively in the medical outpatient pharmacy of Nekemte Referral Hospital from January 2, 2015 to March 2, 2015. Data was collected and analyzed on the line of its objectives based on WHO core prescribing indicators to assess prescribing practices at the Hospital, out of which all of prescriptions contained patients' names; 79.48% bear sex of patients; 73.2% held ages of clients; 71.16% were written with card numbers. Whereas, none of the prescriptions contained weight and address of patients, while 18.44% of prescriptions were bearing diagnosis in the study facility.

a) The Average Number of Drugs Prescribed Per-Encounter

A total of 1616 drug products were prescribed on 770 prescription papers, thus, average number of drugs per encounter or mean was 2.1 (minimum 1 and maximum 6), specifically 25.19% of prescriptions were with one drug, 41.04% with two drugs, 17.66% with three drugs , while 16.62% of them were with four and above drugs on single prescription. This average (2.1) is higher compared with the standard (1.6-1.8) derived as ideal [9].

In a similar study performed in south west Ethiopia at Jimma Hospital, the average number of drugs per encounter was 1.59, which was in the acceptable range [10].

However, in a study on prescribing patterns in three hospitals in north Ethiopia, the average number of drugs per patient was 0.98 at Gondar Hospital, 1.8 in Bahirdar Hospital, and 2.2 in Debre Tabor Hospital [11].

A national baseline study on drug use indicators in Ethiopia in September 2002 also found the average number of drugs prescribed per encounter to be 1.9, which is similar to our finding [12].

In the study of drug use patterns in 3 developing countries, the average number of drugs per encounter was high in Nigeria (3.8), low in Sudan (1.4), and in Zimbabwe (1.3) [14].

Reasons of high average number of drugs per encounter might be due to shortage of therapeutically correct drugs; and/or lack of prescribers' therapeutic training; and/or lack of appropriate diagnostic equipments; and/or un reliable prescribers ability to

diagnose and treat common illness or may be prescribers were influenced by patients demands [6].

Poly pharmacy if present is one of the essential indicators of potential drug-drug interactions, risk of fatal combined or synergistic medication side effects, medication non-adherence and hence poor treatment outcomes that even can lead to death. As a measure of poly pharmacy, the average number of drugs per encounter as a whole was determined to be 2.1 in this study showing the presence of overprescribing in hospitals of west Ethiopia as per the WHO recommend limit which is less than 2 [13].

b) Percentage of Drugs Prescribed by Generic Names

The total numbers of drugs prescribed by generic names were 98.26% which is almost similar to the standard (100%) derived as ideal [9].

Use of generic names in prescription eliminate the chance of duplication of drug products and also reduce the cost of the patient [15].

Generic medications offer a cheap alternative to name-brand prescription drugs. Generic drugs can save thousands of dollars in costs. Filling prescriptions with generic versions to can save both the company and the patient money. The Food and Drug Administration (FDA) states that a generic drug is "identical" to a name-brand drug in terms of its "bioequivalence." According to the FDA, bioequivalence includes "dosage form, safety, strength, route of administration, quality, performance characteristics, and intended use." By these standards, the FDA seeks to ensure that the active ingredients in generic drugs are exactly the same as in their name-brand counterparts, but that's where the uniformity may end. "Identical does not mean 'same,'" there is variation which is allowed according to the FDA, which states that a generic must provide "roughly" the same blood level of the active ingredient as the name-brand. Those blood levels can range between 80 to 125 percent of what the name-brand drug achieves. This could be the reason that people have different reactions when they switch from a name-brand drug to a generic. Differences in generic medications likely exist for all conditions and treatments, but it may not be significant [16].

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 [7].

c) Percentage of Encounters in which an Antibiotics

The percentage of encounters in which antibiotics were prescribed at Nekemte Referal Hospital was 69.1%, which is very high compared to the standard (20.0%-26.8%) derived to be ideal [9]. A national baseline study on drug use indicators in Ethiopia in September 2002 also showed that the percentage of encounters in which an antibiotic was prescribed was 58.1%, less than this finding [12]. In the drug use pattern study in 4 developing countries, the percentage of encounters in which an antibiotic was prescribed was higher in Sudan (63%), lower in Uganda (56%), and Nigeria (48%) and Zimbabwe (29%) compared to current study [14].

This finding suggests that antibiotic prescribing at this facility needs to be regulated. Frequent and inappropriate use of antibiotics can cause bacteria or other microbes to change so antibiotics don't work against them. This is called bacterial resistance to antibiotics. Treating these resistant bacteria requires higher doses of medicine or stronger antibiotics. Because of antibiotic overuse, certain bacteria have become resistant to even the most powerful antibiotics available today.

Antibiotic resistance is a widespread problem, and one that the Centers for Disease Control and Prevention (CDC) calls "one of the world's most pressing public health problems." Bacteria that were once highly responsive to antibiotics have become more and more resistant. Among those that are becoming harder to treat are pneumococcal infections (which cause pneumonia, ear infections, sinus infections, and meningitis), skin infections, and tuberculosis [17].

In addition to antibiotic resistance, overusing antibiotics can lead to other problems. Antibiotics kill many different bacteria, even the good ones that help keep the body healthy. Sometimes taking antibiotics can cause a person to develop diarrhea due to a lack of good bacteria that help digest food properly. In some cases, bad bacteria, like *Clostridium difficile*, may overgrow and cause infections [18].

The average patient facing an antibiotic-resistant infection can expect a medical bill of between $18,588 and $29,069 in 2009 dollars, totaling $20 billion in health care costs each year in the U.S., according to estimates from the Alliance for the Prudent Use of Antibiotics at Tufts University. In 2000, the U.S. lost $35 billion because of premature deaths, hospital stays, and lost wages related to antibiotic-resistant infections, Tufts researchers found [19].

The high percentage of antibiotics prescribed in current study setting may be due to cultural beliefs of community about antibiotics, high percentage of patient expectation to receive certain antibiotics, or prescribers' belief that the therapeutic efficacy of antibiotics is low or lack of sophisticated laboratory facilities for differential diagnosis that lead to empirical therapy [6].

d) Percentage of Encounters with Injections

The percentage of encounters in which an injection was prescribed at Nekemte Referal Hospital was 21.94%, which is with in higher limit range of the standard derived (13.4%-24.1%) to serve as ideal [6]. Possible reasons for the high use of injections could be (i) beliefs and attitudes of patients and health professionals about the efficacy of injection versus oral medication or (ii) our study setting is a referral hospital where patients with serious conditions are treated, and

injectable forms produce faster onset of action. A national baseline study on drug use indicators in Ethiopia in September 2002 found that the percentage of encounters with an injection was 23%, which is some what higher than this finding and in the acceptable range [12]. In a prescription pattern study in 6 developing countries, the percentage of encounters in which an injection was prescribed were very high in Uganda (48%) and Sudan (36%) but very low in Zimbabwe (11%), and in the acceptable range in Indonesia (17%), Ecuador (17%), and Mali (19%) [14].

Injections are very expensive compared to other dosage forms and require trained personnel for administration [14]. All methods of injecting are potentially extremely harmful - of all the ways to get drugs into the system, injection has the most risks by far as it bypasses the body's natural filtering mechanisms against viruses, bacteria and foreign objects. There is a greater risk of overdose, infections and health problems [21].

They can some times lead to the following health problems especially if health professional is not well experienced:

1. Increased chance of infection which lead to abscessed infections of injection sites due to lack of hygiene and aseptic technique, and some times to serious systemic infections such as HIV/AIDS, Hepatitis and other blood-born diseases;
2. Increased chance of overdose - because IV injection delivers a dose of drug straight into the bloodstream, it is harder to gauge how much to use. In addition, because of the rapid onset, overdose can occur very quickly, requiring immediate action;
3. Scarring of the peripheral veins- this arises from the use of blunt injecting equipment. This is particularly common with users who have been injecting re-use disposable syringes. IV drug use for an extended period may result in collapsed veins;
4. Arterial damage- arterial aneurysms may form at injection sites, which can rupture, potentially resulting in hemorrhage, distal ischemia, and gangrene. Inadvertent intra-arterial injection can also result in endarteritis and thrombosis, with ultimately similar consequences [20].

e) The Percentage of Drugs Prescribed from the Essential Drug List

The percentage of drugs prescribed from the essential drug list for Nekemte Referral Hospital in the study period was 98.96%, which is almost similar with the standard (100%) derived to serve as ideal [9]. A study of the patterns of prescription at Jimma Hospital, south west Ethiopia, showed similar results, where almost all drugs prescribed for the health problems were on the essential drug list of the country, but few drugs prescribed out of the list were those that were on the national drug list of Ethiopia [8]. A national baseline study on drug use indicators in Ethiopia in September 2002 showed that the percentage of drugs prescribed from the essential drug list were 99%, which is very encouraging [12]. In a study of prescription patterns from 2 developing countries, the percentage of drugs prescribed from the essential drug list were 88% in Tanzania and 96% in Nepal [14].

Essential drugs offer a cost-effective solution to many health problems in developing countries. The national EDL were selected regarding to disease frequency, be affordable, with assured quality and be available in appropriate dosage forms [22].

f) Limitations

The study used the WHO prescribing indicators, which are supposed to record exactly what is prescribed to patients, but not why. In order to explain why, other techniques are needed. The prescribing indicators measure aspects of outpatient treatment. They are designed for use in health centers, dispensaries or hospital outpatient departments.

The prescribing indicators are less useful in specialty outpatient clinics in referral hospitals where the drug use pattern is more complex.

IV. Conclusion

On the basis of the finding of this study, the prescribing practices for antibiotic use show high deviation from the standard recommended by WHO. Also there are slightly higher poly pharmacy cases. These two commonly overused antibiotics and polypharmacy of drug therapy need to be regulated closely. Drug use evaluation should be done for some of the antibiotics to check whether they were appropriately prescribed or not. On the other hand, percentage of injection use, generic prescribing, and prescribing from Essential Drug List were not found to be a significant problem in this study. Baseline data gathered by this study can be used by researchers and policymakers to improve prescribing practice at Nekemte Referral Hospital.

Several activities have proved useful and effective in promoting rational drug use and should be recommended for general use. These are acting according to national standard treatment guidelines; essential drug lists; establishing drug and therapeutic committee; problem-based basic training in pharmacotherapy; targeted continuing education; improving drug availability, improving drug accessibility, and ensuring supply of affordable drugs of a good standard; drug information centers establishment; expansion of drug use evaluation system and preparation and dissemination of drug bulletins.

Abbreviations

AIDS: Acquired immuno-deficiency syndrome;
HIV: Human immune deficiency virus

IV: Intravenous
WHO: World Health Organization

Competing Interest

As the authors (03 in number) of this manuscript, we declare that we have no competing interests.

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