

Assessment of Antibiotic Utilization Pattern, Comparison with Guidelines and Infection Diagnosis Strategies at the Clinic of Mizan Prison, Bench Sheko Zone, South-West Ethiopia-Retrospective Cross-Sectional Study

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Abstract

Antibiotics are strong and effective medicines which are used to treat most different **Background:** bacterial infections. Antibiotics prescribing should be appropriate and restricted since inappropriate use may contribute to the emergence of resistant microorganisms may lead to unnecessary adverse drug events and has been associated with increased health care costs.

Objective: The aim of this study was to assess antibiotic utilization pattern in clinic of Mizan prison. from August 1-October 30, 2023.

Methods: Retrospective cross-sectional study was conducted in clinic of Mizan prison to assess antibiotic utilization pattern from August 1-October 30, 2023. The data was analyzed by using Statistical Package for Social Sciences (SPSS) Version 21.0

Result: This study was intended to assess antimicrobial utilization pattern, a total of 187 medical records containing antimicrobial agents were evaluated and analyzed at clinic of Mizan prison. From a total patient, number of male patients 127(67.9%) and females 60(32%). Most of the patients were from 19-35 age and the least number of patients belonged to age group of ≥ 69 .

Conclusion: This study gives an overview of antibiotic utilization in clinic of Mizan prison. amoxicillin, metronidazole, ciprofloxacin were the most frequently prescribed individual drugs. Ineffective drug therapy, need additional drug therapy, unnecessary drug therapy most encountered drug therapy problem followed by dose too high, dose too low, adverse drug reaction and patient compliance.

Keywords: antibiotic; utilization; clinic; prison; pattern

Introduction

Antibiotics are powerful medicines that fight bacterial infections. If used properly, antibiotics can save lives. They either kill bacteria or keep them from reproducing. Your body's natural defenses can usually take it from there [1]. Antibiotic misuse or over-use may increase the emergence of resistant bacteria and as a result increase the selection pressure on physicians who tend to prescribe newer broad-spectrum agents for excessive periods of time. Antibiotic resistance has become a serious problem in both developed and developing nations [1,2,5,7,15,23]. Rational drug use is the process of appropriate prescribing, dispensing, and patient use of drugs for diagnosis, prevention and treatment of diseases. It encompasses rational prescribing, rational dispensing and rational patient use. The advantage of rational drug use is to foster better quality of pharmaceutical care, to minimize the cost of drug

therapy, to avoid preventable adverse drug reactions and drug interactions, to maximize therapeutic outcomes and to promote patient adherence [3].

Several strategies for controlling antibiotic usage have been proposed. Such as formulary replacement or restriction, introduction order form, health care provider education, feedback activates, and approval requirement from infectious disease specialist for drug prescription [4, 5]. Drug Use Evaluation (DUE) is an ongoing systematic process designed to maintain the appropriate and effective use of drug. It incorporates qualitative measure and emphasizes outcome including pharmacoeconomics assessment. DUE can identify problem in drug use, reduce adverse drug reaction, optimize drug therapy and minimize drug related expense it often includes intervention to ensure appropriate drug use [6]. DUE focuses on the area that shows greater potential for improvements. It involves on comprehensive review of

patient prescription and medication data, during and after dispensing in order to ensure appropriate therapeutic decision making and promote positive outcome [7].

Methods and Materials

Study Area and period

The study was conducted at clinic of Mizan prison which was found in bench Sheko zone, Mizan-Teferi town, south west regional state; which was located 565 km south west of Addis Ababa, the capital city of Ethiopia from August 1-October 30, 2023.

Study Design

Retrospective crosssectional study was conducted in clinic of Mizan prison to assess antibiotic utilization pattern from August 1-October 30, 2023.

Population

Source population

All the prisoners of Mizan prison.

Study population

Medical records of patient who treated at clinic of Mizan prison and who take antibiotic in 2023.

Inclusion criteria

All medical records prescribed with antibiotics in clinic of Mizan prison in 2023.

Exclusion Criteria

Patients who did not have antibiotic prescription for less than 24 hours.

Incomplete medical records

Sample size determination and Sampling technique

Sample size determination

The sample size determined using the following formula:

$$n = z^2P(1 - p)/d^2$$

Where: n= sample size

p=prevalence of antibiotic utilization among medical ward patients

d=margin of sampling error tolerated

z=the standard normal value at confidence interval of 95%

Study done in 2017 on antibiotic utilization in a specialized teaching hospital in Addis Ababa, Ethiopia. out of 1645 patient included in the study the prevalence of antibiotic utilization was 81.6[25].

This value was taken to determine sample size

$$\text{So, } n = \frac{(1.96)^2(1-0.81)*0.81}{(0.05)^2} = \frac{3.8416*0.15}{0.0025} = 230$$

The number of patients was 800 per year which was less than 10,000, therefore it

Needs to be adjusted using finite population correction formula

$$\begin{aligned} \text{Adjusted } n &= n*N/n+N \\ &= 230*800/230+800 \\ &= 178 \end{aligned}$$

Where n was calculated sample size and N was the number of patients per year which was 800.

To compensate for incomplete prescription and errors 5% of the size will added and a total of 187 patient cards were taken from study population.

Sampling Technique

Systematic random sampling technique was used to select patient medical records while the first is obtained by lottery method there by every fourth patient medical records were selected from average total medical records of one year.

Data collection

Data collection instrument and techniques

For patients on antibiotic therapy, the provisional clinical diagnosis, any microbiological test results, the antimicrobial agents administered, whether the prescription was based on those results or empirically used and the dosage of the drug administered. The last section of the sheet was allocated to the type of inappropriate antibiotic use if there were any Errors.

Data quality control

A standardized data abstraction format was prepared in the English language based on previous literature reviews, related studies, and other standard protocols. The abstraction format was pre-tested before commencing the actual data collection and then the necessary adjustment was performed. Before data entry and analysis, data were cleared, categorized, compiled, coded, and verified to ensure completeness and accuracy.

Data processing, analysis and presentation

Data were checked for completeness and consistency and entered into SPSS version 21.0 by principal investigators, cleans, and analyzes. The result was presented using simple frequencies with percentages in appropriate tables to display the descriptive part of the result.

Operational definition

Antibiotic utilization: is using of the antimicrobial for treatment of bacterial infections. Kinetic treatment: - a kind of treatment that can be done after laboratory

identification of the causative agent (antibiotic therapy directed at final organism). Empirical treatment: is an administration of drugs without an identification of causative age. Rational drug use; generally, it can cover the appropriate prescribing, appropriate dispensing and appropriate patient use so it is the appropriate indication and use of antibiotics.

Results

Socio-demographic characteristics

This study was intended to assess antimicrobial utilization pattern, a total of 187 medical records containing antimicrobial agents were evaluated and analyzed at clinic of Mizan prison. From a total patient, number 127(67.9%) are Male and most of the patients were from 19-35 year (table 1).

Table 1: Socio-demographic characteristics of patients at clinic of Mizan prison (n=187).

Variables		Frequency	Percentage
Sex	Male	127	67.9%
	Female	60	32.1%
Age	15-24	46	24.5%
	25-34	62	33.1%
	35-44	35	18.7%
	45-54	28	14.9%
	55-64	15	8%
	Greater than 64	1	0.5%

The Most Commonly Prescribed Antibiotic at Clinic of Mizan Prison

Among all patients medical records containing antibiotics commonly used antibiotics includes;

Amoxicillin (36.96%) followed by metronidazole (13.04%), ciprofloxacin (8.70%), Tinidazole (8.70%), cloxacillin (7.61%), B.penicillin (7.07%) Albendazole(6.52%), doxycycline (6.52%) and gentamicine (4.89%), others (Figure 1).

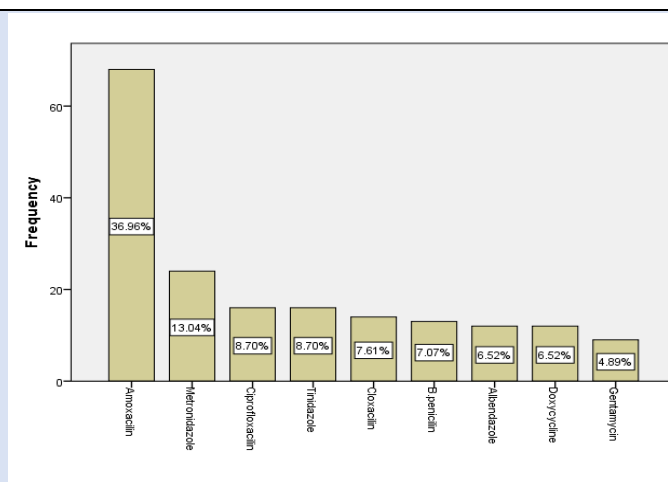


Figure 1: The most commonly prescribed individual antibiotics at clinic of Mizan prison (n=187)

Common diagnosis at clinic of Mizan prison

The most common reasons for which antibiotic prescribed was condition like community acquired

pneumonia 60(31.25%), Typhoid 28(14.58%), Giardiasis 20(13.02%), Urinary Tract Infection 25(10.42%), Amobiasis 14 (7.29%), Diarrhoea (6.25%), Tonsillitis 5(3.13%) and others 33(14.06%).

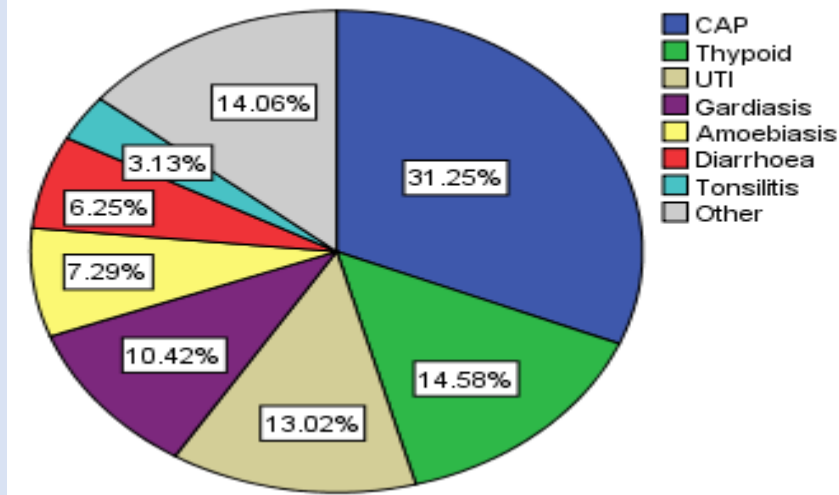


Figure 2: Common diagnosis at clinic of Mizan prison (n=187)

Diagnosis Strategies at Clinic of Mizan Prison

Out 187 patient 119(63.6%) were treated empirical, whereas 24(12.8%) were stool, urine analysis 17(9%) and other 27(14.4%) (table 2).

Table 2: Diagnosis Strategies at Clinic of Mizan Prison (n=187).

Diagnosis	Frequency	Percentage
Empirical	119	63.6%
Stool	24	12.8%
Urine analysis	17	9%
CBC	0	0
Other	27	14.4%

Average treatment duration, Reinfection and/or Relapse Status of Patient over the past 28 Days Majority 125(66.8%) of the patient were treated

below three to five days and 65(34.8%) were visit the clinic again for the same sign and symptoms over the past 28 days. (Table 3).

Table 3: Average treatment duration, Reinfection and/or Relapse Status of Patient over the past 28 Days

Variable	Frequency	Percentage	
Duration of treatment	1-2 days	27	14.4%
	3-5 days	125	66.8%
	> 5 days	35	18.7%
	total	187	100%
Next visit over 28 days	Yes	65	34.8%
	No	122	65.2%
	total	187	100%

Common Route and dosage of Administration

Majority of antibiotic Prescribed by Oral route 140(75.3%), Followed by Parental route 13(6.9%).

Regarding the dosage form of antibiotic Capsule 92(49.7%), Tablet 48(25.6%) and eye drop 14(7.4%) were the most commonly prescribed dosage form (figure 3).

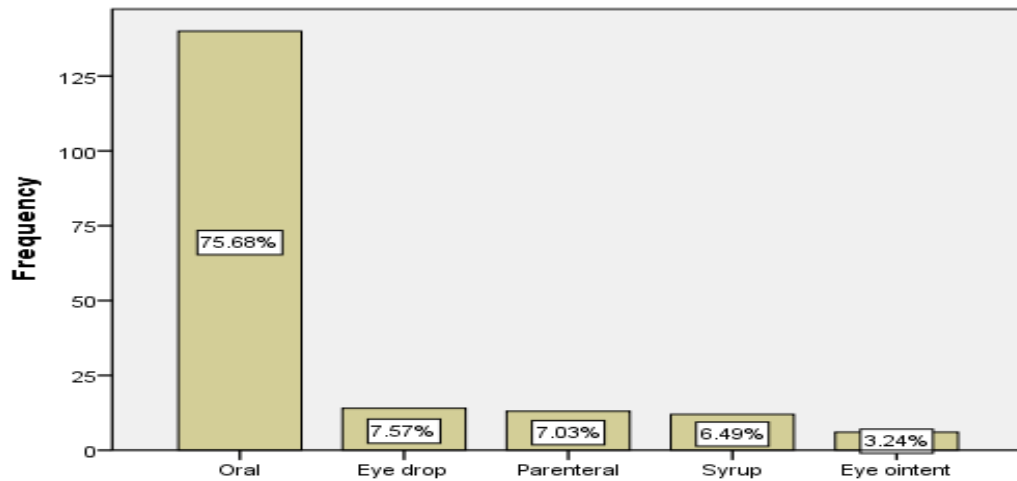


Figure 3: Common Route and dosage of Administration

Comparison with Guidelines and Drug therapy problems related with antibiotics 88.7% of the patient were treated irrespective of treatment guideline of Ethiopian standard treatment guideline 2021 (last

edition), and need additional drug therapy was the predominant DTP which accounts around 47% of DTP observed followed by patient compliance (22%) (Table 4).

Table 4: Comparison with Guidelines and Drug therapy problems related with antibiotics

Category		frequency	Percentage
Treatment According to Stg 2021	Yes	21	11.3%
	No	166	88.7%
	Total	187	100%
Drug Therapy Problem	Ineffective Drug	25	12.65%
	Need Additional Drug	78	46.98%
	Patient Compliance	37	22.3%
	Unnecessary Drug	10	6.02%
	Dose To Low	10	6.02%
	Dose To High	5	3.01%
	Adverse Drug Interaction	1	0.6%
Total	166	100%	

Discussion

Antibiotics are the key drugs for treatment of infections and are among the most commonly prescribed drugs in Mizan prison clinic. According to this study, the most frequently prescribed individual antimicrobial agents were amoxicillin, metronidazole, ciprofloxacin, B.penicillin, Tinidazole and doxycycline slight difference were observed compared to Study done on antibiotic utilization pattern in a Italy prison were the most frequently prescribed antimicrobial was amoxicillin and clavulanic acid, followed by amoxicillin, macrolides and third-generation cephalosporin's and this variation is possibly justified by being different setting and availability of potential alternative antibiotic in the

setting [18]. This was different from other study done in Nekemte showed that, From the total of antibiotics, cotrimoxazole was the most frequently prescribed followed by amoxicillin and also chloramphenicol, gentamicine, cephalexin, and crystalline penicillin. The study done in Nekemte showed that, the total of drugs including antibiotics were prescribed to the total of 341 patients; out of which 373 were antibiotics. From the total of antibiotics, cotrimoxazole was the most frequently prescribed followed by amoxicillin and also chloramphenicol, gentamicine, cephalexin, ceftriaxone, crystalline penicillin. Doxycycline and procaine Penicillin Fortified were prescribed for only two patients each and norfloxacin and azithromycin were prescribed for one patient each. In this study the

most commonly prescribed classes of antibiotics include penicillin followed by sulfonamides, cephalosporin and the least prescribed class was macrolides and tetracycline [23].

Concerning to the clinical indication, this study showed that the most common reason for which antibiotics prescribed was community acquired pneumonia followed by typhoid, urinary tract infection, Giardiasis, amobiasis, diarrhea, tonsillitis, eye infection and others. Similar study done in Saudi Arabia showed that the most prevalent indications for prescribing were respiratory tract infections. All antibiotics prescribed were broad-spectrum. Antibiotics were prescribed for patients with malaria and also in situations where diagnosis was uncertain [20].and also similar study in Italy prison showed that, URTI and dental infections. Among the URTI, pharyngitis, acute bronchitis, influenza, common cold, and were rhino-sinusitis, whereas among dental infections symptomatic irreversible pulpitis with or without symptomatic apical periodontitis, and pulp necrosis and symptomatic apical periodontitis/pulp necrosis and localized acute apical abscess [18]. Regarding to the route of administration, the majority 140(49.7%) of antimicrobial were prescribed by oral followed by parenteral 13(6.9%), syrup12 (6.4%), and eyedrop14 (7.4%). This was similar with study done in Italy prison the route of administration was oral in 84.8% and intramuscular. In this study, the empirical diagnosis is 129(68.9%) and laboratory diagnosis 58(31%) antimicrobial agents were amoxicillin, doxycycline, ciprofloxacin, Penicillin, Tinidazole, albendazole, gentamicin and metronidazole, this is because those drugs can be used in a wide variety of disease conditions in clinic patients, easily availability, available in different dosage forms, preferred in severe cases due to its fast onset of action.

Conclusion

This study gives an overview of antibiotic utilization in clinic of Mizan prison. Amoxicillin, metronidazole, ciprofloxacin were the most frequently prescribed individual drugs. community acquired pneumonia was most prevalent disease followed by, typhoid and typhus, urinary tract infection, was found to be primary case for clinic visit among prisoners.The percentage of oral drugs was very high compared to drugs administered through parenterally. Ineffective drug therapy, need additional drug therapy, unnecessary drug therapy most encountered drug

therapy problem followed by dose too high, dose too low, adverse drug reaction and patient compliance.

Recommendation

We would like to recommend...

The prescribers and pharmacist in prison clinic should prescribe and dispense antimicrobials according to the STG.

The prison should provide enough drugs.

The prison should increase human resource for clinic.

The pharmacists in prison clinic should encourage the prisoners to take drugs according to correct route, dose and frequency.

The pharmacist to counsel the patients accordingly and correctly.

Abbreviation

AR: antimicrobial resistance

DUE: drug use evaluation

DTC: drug therapeutic commute

DTC: drug therapy problem

EDL: essential drug list

WHO: world health organization

STG: standard treatment guideline

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the institutional review board of Mizan Tepi University, college of Medicine and Health. Letter of permission was presented to the managements of Mizan prison who allowed us to use patients' medical records. Patients' information such as name and address of the patients was not recorded. This study did not involve human experiments or human tissue. All findings in this paper were performed in accordance with relevant guidelines and regulations (such as the Declaration of Helsinki).

Consent for publication

Not applicable to this work.

Competing interests

The authors declared no potential competing of interest concerning the research, authorship, and/or publication of this article.

Data availability

All the datasets used/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest

All authors declare no conflict of interest.

Authors' Contributions

All authors contributed to data analysis, drafting, or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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