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ANTIBIOTIC USE AND PRESCRIPTION PRACTICE IN A RURAL REFERRAL HOSPITAL IN NORTHERN TANZANIA: A SURVEY

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ABSTRACT

Aim: To assess antibiotic use, prescription practice and prescriber's knowledge of rational antibiotic use. **Methods**: A survey was conducted in a rural hospital in Northern Tanzania by reviewing patient notes and interviewing prescribers using a questionnaire. A total of 503 patient notes were assessed and 37 prescribers answered the questionnaire. **Results**: The penicillin class of antibiotics was the most (49.9%) prescribed antibiotic compared with other antibiotic groups. Registrars (MD) comprised the majority (80.8%) of the prescribers. Blood/pus cultures were performed in only 3.6% (18/503) of patients for whom antibiotics were prescribed. Approximately one-third (164/503) of the antibiotics prescribed did not match the written diagnosis. More than 75% of the prescribers were aware of the threat of antibiotic resistance, though less than one quarter were able to correctly define the term "rational antibiotic use". Approximately 25% of bacterial growth was resistant to two or more antibiotics. **Conclusion**: There is a high proportion of inappropriate antibiotic prescription in this hospital. Though most prescribers were aware of the threat of antibiotic resistance, very few were able to correctly define rational antibiotic use. There is a need for regular antibiotic surveillance and education concerning the rational use of antibiotics among prescribers.

KEYWORDS: Antimicrobial, knowledge, practice, resistance.

BACKGROUND

Antibiotic resistance is the greatest threat to global health, primarily caused by human antibiotic misuse. Inappropriate antibiotic use is associated with antibiotic resistance, a high

risk of mortality and greater economic costs.[1,2] The global problem of antibiotic resistance is more pressing in developing countries, which have a huge burden of infectious disease.[3]

The class of penicillin antibiotics are the most used antibiotics globally and have saved millions of lives over the past 100 years since their discovery.[4] It is estimated that globally, more than 60 percent of the total antibiotics prescribed are either not indicated, are prescribed in an incorrect dosage, or are inappropriately prescribed.[5,6] The risk of colonization or infection with a multi-drug resistant organism is significantly higher when longer antibiotic courses are prescribed.[7] The prevailing theory is that the longer a patient's normal flora is exposed to antibiotics, the higher the proportion of their flora remains resistant. Prior antibiotic exposure promotes colonization and subsequent infection with antibiotic-resistant pathogens, complicating initial choices of antibiotic therapy, thereby increasing the likelihood that delayed administration of appropriate antibiotic therapy will occur. Moreover, the prolonged duration of exposure to antibiotics seems to be most important in promoting the emergence of antibiotic resistant pathogens in critically ill patients.

Rational drug use means prescribing the right drug to the right patient at the right dose and interval and for the right duration.[8] This concept of rational drug use is not well known in developing countries.[9] Therefore, there is a need for baseline assessment of antibiotic usage in clinical settings, the prescriber's knowledge of the antibiotic prescription and the antibiotic resistance pattern. The objectives of this study were to assess the type and appropriateness of antibiotics prescribed, the prescriber's knowledge and practice of prescribing antibiotics, and utilization of culture and sensitivity laboratory services.

METHODS

The study was conducted at Haydom Lutheran Hospital, which is a referral hospital located in rural Northern Tanzania, 300 kilometers from the nearest urban center, with a well-established infrastructure for collaborative research and data collection. Haydom Lutheran Hospital is the referral hospital for approximately 500,000 people, while the greater reference area covers approximately two million people. The hospital has a total of 420 beds, an average of 100,000 annual outpatient cases, and 16,000 patient admissions. The hospital has a total of approximately 4,500 deliveries per year, with a cesarean section rate of 21%. The hospital offers specialized care i.e., surgical, pediatric, orthopedic, urology, obstetrics and gynecology, and medical. Almost 65% of the hospital's annual medicine budget is spent on

antibiotics. Despite spending a large proportion of the hospital medicine budget on antibiotics, the hospital has no formal program to foster antibiotic stewardship.

Study design and data collection

This is a cross-sectional survey conducted at Haydom Lutheran Hospital in November 2017. The prepared form was used to collect data from the files of patients discharged from the hospital within the last five months prior to the study period. A representative sample was randomly selected from five inpatient wards, including the pediatric, medical, surgical, ICU and maternity wards.

The structured questionnaires were used to assess prescriber's antibiotic prescription practice and knowledge. Additionally, the available culture and sensitivity laboratory results from the past three years were reviewed.

The information reviewed from patient files included: the diagnosis/diagnoses, names of antibiotics prescribed (trade/generic name as written), dosage, route, duration of use and the prescribers' qualifications.

The questionnaire was used to assess the prescriber's knowledge; several questions were included. The questions asked about the habit of the prescriber to consult the standard treatment guidelines, awareness of the essential drug list, and the utilization of culture and sensitivity laboratory services.

Research nurses reviewed the selected files using the pre-prepared form. Each completed form was then reviewed by two independent senior medical doctors (MD) who commented on whether the antibiotic was correctly prescribed and appropriate for the diagnosis. These doctors differed in a few cases, which were then reviewed by a senior physician who made the final decision.

Sample size estimations and data analysis

All of the files for patients discharged from the hospital from June to October 2017 were obtained. One in every ten files was selected and its documents were reviewed with regard to antibiotic prescriptions. In total, 503 files of in-patients with antibiotic prescription were reviewed. Additionally, a total of 38 prescribers completed and returned the questionnaires, which is 93.1% of all the registered hospital prescribers. When reviewing laboratory results

from the past three years, we only managed to obtain 80 cultures (including blood, pus, urine, pleural and ascetic fluid and stool) with bacterial growth, which were tested for sensitivity.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS Statistics 22) and excel; the frequency tables and bar graph were used to present the results.

Ethical considerations

Permission to conduct the study was granted by the hospital authorities and the Tanzania National Institute for Medical Research (NIMR) ethics committee. Researchers were trained on confidentiality and signed a confidentiality agreement to ensure confidentiality during data collection. Verbal consent was obtained from all prescribers before answering the questionnaires.

RESULTS

A total of 503 patient files from different wards were assessed. Penicillin was the most prescribed antibiotic group, and registrars (MD) formed the majority of prescribers. Nearly one-third of the cases had the option of using an alternative low-cost, relevant antibiotic to treat the underlying condition. In more than two-thirds of the cases, the prescribed antibiotics matched the written diagnosis, as per standard treatment guidelines. Only 3.6% of the reviewed files had documentation of culture and sensitivity laboratory results (Table 1).

More than half of respondents were below 30 years of age, only approximately 10% were above 45 years of age (Table 2). Two-thirds of the respondents were registrars (MD) and almost all have heard about rational antibiotic use. Only twenty-one percent of the respondents correctly defined the term “rational antibiotic use”. Over half of the respondents admitted frequent consultation of the standard treatment guidelines when prescribing antibiotics. More than three-quarters of the respondents acknowledged the existence of antibiotic resistance as a threat (Table 2).

Among the laboratory results of the cultures reviewed, 80 (1.6%) exhibited growth with antibiotic resistance (Figure 1). Both gram-positive (S. *aureus*, Group B streptococcus, and Enterococcus species) and gram-negative bacteria (*E. coli, K. pneumoniae, P. aeruginosa, and S. typhi*) (1/43 and 2/30, respectively) were least resistant to Ciprofloxacin (Table 3). The antibiotic resistance pattern seems to decrease when an increasing number of antibiotics are used in combination.

List of Tables and figures

Table 1.

	Number	Percentage
Antibiotic prescribed		
Penicillin	610	49.9
Cephalosporin	118	9.6
Aminoglycoside	111	9.1
Fluoroquinolones	91	7.4
Others	284	23.2
Correct antibiotic with diagnosis		
Yes	339	67.4
No	164	32.6
Culture and sensitivity done		
Yes	18	3.6
No	485	96.4
Possibility of using alternative antibiotic		
Yes	168	33.4
No	335	66.6

Table 2

	Number	Percentage
Prescribers age (years)		
<30	19	51.4
30-45	14	37.8
>45	4	10.8
Prescribers' cadre		
AMO & CO	6	16.2
MD	28	75.7
Medical specialist	3	8.1
Aware of rational antibiotic use		
Yes	36	97.3
No	1	2.7
Usual refer the Standard treatment guideline		
Yes	17	45.9
No	20	54.1
Aware of possible antibiotic resistance		
Yes	34	91.9
No	3	8.1

Table 3

	Gram positive bacteria		Gram negative bacteria	
	Resistant n (%)	**Total n**	**Resistant n (%)**	**Total n**
Amoxicillin	3 (100)	3	4 (80)	5
Ampicillin	2 (25)	8	11 (91.7)	12
Benzyl penicillin	2 (100)	2	1 (100)	1
Cloxacillin	9 (45)	20	3 (60)	5
Cotrimoxazole	10 (58.8)	17	12 (63.2)	19
Erythromycin	5 (35.7)	14	1 (100)	1
Ciprofloxacin	1 (2.3)	43	2 (6.7)	30
Chloramphenicol	3 (10.7)	28	3 (15.8	19
Gentamycin	3 (11.5)	26	1 (3.3)	30

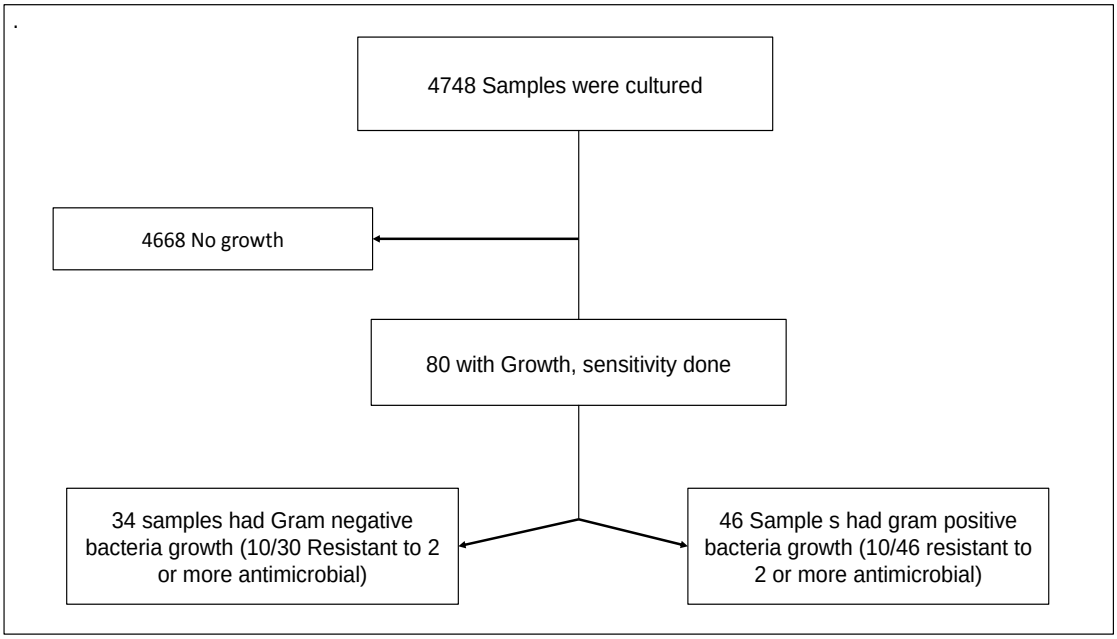

Figure 1

DISCUSSION

This study found that nearly half of the antibiotics prescribed in this hospital are members of the penicillin class, and two-thirds of the antibiotics prescribed correspond with the written diagnosis. Almost all prescribers have heard about rational antibiotic use, but less than a quarter correctly defined the term “rational antibiotic use”. A majority of prescriber’s report that they occasionally perform culture and sensitivity tests. Among the reviewed growth cultures, 25% were resistant to two or more antibiotics. More gram-negative bacteria (91.7%) were resistant to ampicillin compared to gram-positive bacteria (25%).

The penicillin class of antibiotics affects most of the infectious bacteria of the upper respiratory and urinary tracts. In addition to affecting a wide range of bacteria, this class is also relatively inexpensive compared with other classes of antibiotics. In our study, we found that penicillin is the most prescribed antibiotics; this finding concurs with that of Heta S. et al., 2018.[10,11] Unfortunately, resistance is reported to be high in this class of antibiotics, especially among gram-positive bacteria.

One-third of the prescribed antibiotics did not coincide with the written diagnoses. These findings concur with that of Remesh et al., 2013 and Ozkurt et al. 2005, that most of the prescribed antibiotics are inappropriately prescribed.[2,5] In one-third of the prescriptions, there was an option to prescribe an alternative, inexpensive antibiotic; this finding concurs with other studies that found that 20% to 50% of antibiotics were used unnecessarily or inappropriately.[7,12,13]

Prescribers' awareness of the possibility of antibiotic resistance is the first step toward addressing antibiotic resistance. In our study, more than 90% of the prescribers were aware of the possibility of antibiotic resistance, and these findings concur with that of Asante K, et al., 2017.[14] Despite being aware of the concept of rational antibiotic use, most prescribers were unable to define the concept correctly. These findings concur with the Amin et al., 2011 report, that the concept of rational antibiotic use is not well known in developing countries.[9] Most of the prescribers were entry-level and needed proper orientation on the rational use of antibiotics. However, the hospital has no program on antibiotic stewardship. All of these factors may have contributed to the irrational antibiotic use observed at this site.

There were inadequate culture and sensitivity laboratory results that showed resistance of up to 25% to two or more antibiotics. Though the samples were few, the findings are alarming, and call for more vigilant surveillance and broader studies that will address possible dangers.

Limitation of the survey: This was a retrospective observational survey with several limitations. Some of the limitations include selection bias in which only some selected patients' notes were reviewed, and the inability to confirm whether the prescribed antibiotic was actually given or not. Additionally, only a few culture and sensitivity laboratory results were reviewed, which does not give a clear picture regarding resistance patterns. The survey was conducted in one hospital, at one point in time, hence the usefulness of these findings is limited.

CONCLUSION

There is a high proportion of inappropriate antibiotic prescription in this hospital. Though most of the prescribers were aware of the threat of antibiotic resistance, very few were able to correctly define rational antibiotic use. There is a need for regular antibiotic surveillance and education concerning rational antibiotic use among prescribers.

Abbreviations

HLH	Haydom Lutheran Hospital
ICU	Intensive Care Unit
MD	Medical Doctor
OPD	Outpatient Department
SPSS	Statistical Package of Social Sciences

Declarations

Ethics Approval and consent to participants

The approval to conduct this survey was obtained from the hospital management and National institute for medical research ethical committee, all prescribers filled the questionnaires asked verbal consent.

Consent to publish

The permission to publish was granted by the hospital management.

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No funds received from any one to facilitate this survey.

Authors' contributions

The authors PFM and GG were involved in survey design, data collection, data analysis and manuscript writing. EM was involved in the survey design, data analysis and manuscript writing. BM, EQN, RFN, JH, JGG, YM, SK, MJ and TM were involved in manuscript writing. All authors revised this manuscript and approved it for submission.

Competing interests

All authors declare that there is no conflict of interest regarding the publication of this manuscript.

Availability of Data

Data collected are available upon request to the main author.

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REFERENCES

1. Founou RC, Founou LL, Essack SY. Clinical and economic impact of antibiotic resistance in developing countries: A systematic review and meta-analysis. PLoS ONE., 2017.
2. Ozkurt Z, Erol S, Kadanali A, Ertek M, Ozden K, Tasyaran MA. Changes in antibiotic use, cost and consumption after an antibiotic restriction policy applied by infectious disease specialists. Jpn J Infect Dis., 2005; 58(6): 338–43.
3. Okeke IN, Laxminarayan R, Bhutta ZA, Duse AG, Jenkins P, O'Brien TF, et al. Antimicrobial resistance in developing countries. Part I: recent trends and current status. Lancet Infect Dis., 2005.
4. Marston HD, Dixon DM, Knisely JM, Palmore TN, Fauci AS. Antimicrobial Resistance. JAMA, 2016.
5. Remesh A, Gayathri AM, Singh R, Retnavally KG. The Knowledge, Attitude and the Perception of Prescribers on the Rational Use of Antibiotics and the Need for an Antibiotic Policy–A Cross Sectional Survey in a Tertiary Care Hospital. J Clin Diagnostic Res., 2013; 7(4): 675–9.
6. Ozkurt Z, Erol S, Kadanali A, Ertek M, Ozden K, Tasyaran MA. Changes in Antibiotic Use, Cost and Consumption after an Antibiotic Restriction Policy Applied by Infectious Disease Specialists. Jpn J Infect Dis., 2005; 58: 338–43.
7. Crotty MP, Meyers S, Hampton N, Bledsoe S, Ritchie DJ, Buller RS, et al. Impact of antibacterials on subsequent resistance and clinical outcomes in adult patients with viral pneumonia: an opportunity for stewardship. Crit Care., 2015; 19(1): 404.
8. Kumar J, Shaik M, Kathi M, Deka A, Gambhir S. Prescribing indicators and pattern of use of antibiotics among medical outpatients in a teaching hospital of Central Nepal. J Coll Med Sci., 2010 Aug 24; 6(2): 7–13.
9. Amin A, Khan MA, Azam SMF, Haroon U. Review of prescriber approach towards rational drug practice in hospitalised patients. J Ayub Med Coll Abbottabad, 2011; 23(1):

19–22.

10. Heta S, Robo I. The Side Effects of the Most Commonly Used Group of Antibiotics in Periodontal Treatments. Med Sci., 2018; 6(6): 1–6.
11. Bayarski Y. Antibiotics and Their Types, Uses and Side Effects., 1928; 6.
12. Schultz L, Lowe TJ, Srinivasan A, Neilson D, Pugliese G. Economic Impact of Redundant Antimicrobial Therapy in US Hospitals. Infect Control Hosp Epidemiol., 2014; 35(10): 1229–35.
13. Shapiro DJ, Hicks LA, Pavia AT, Hersh AL. Antibiotic prescribing for adults in ambulatory care in the USA, 2007–09. J Antimicrob Chemother, 2014 Jan; 69(1): 234–40.
14. Asante KP, Boamah EA, Abdulai MA, Buabeng KO, Mahama E, Dzabeng F, et al. Knowledge of antibiotic resistance and antibiotic prescription practices among prescribers in the Brong Ahafo Region of Ghana; a cross-sectional study. BMC Health Serv Res., 2017; 17(1): 422.