



Research Article

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Antibiotics prescribing pattern in pediatric unit of Ayder referral hospital, Tigray region, Northern Ethiopia

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Abstract

Introduction: Antibiotics are among the most commonly prescribed drugs in pediatrics. Because of the emergence of antibiotic resistance, overall increase in health care cost and lack of uniformity in drug prescribing, monitoring as well as control of antibiotic use is important. **Methodology:** A retrospective cross-sectional study was conducted to assess the prescribing patterns of antibiotics in the Pediatrics ward of the Ayder Referral Hospital from March until May 2013 based on patient medical records. A total of 190 patient medical records were taken in this study. Data was entered into the computer and analyzed by using Microsoft Excel 2007 and SPSS version 16.0. **Results:** The average number of drugs per patient was four and the average number of antibiotics per patient was two. More than 95% of the patients were exposed to at least two drugs. The maximum number of drugs per patient was ten while the maximum number of antibiotic per patient was five. The most common diseases were pneumonia 51 (16.3%), sever acute malnutrition 39(12.5%) and Acute gastroenteritis 21(6.7%). The most commonly prescribed antibiotics were ceftriaxone 76(19.6%), Gentamicin 59(15.8%) and Ampicillin 57(14.7%). Most of (71.8%) of the drugs were administered parentally. Pediatrics of age 1-5 years received more antibiotics than < 1 and 5-14 years with proportion of 37.8%, 36.6% and 25.5% respectively. About 649 (94.9%) of all the drugs were prescribed by their generic name. About 651 (95.2%) of drugs were prescribed from Essential Drug List but 33(4.8%) were not. **Conclusion:** Children of age 1-5 years receive more antibiotic than other age group. Therefore, strategies that promote rational use of antibiotic should focus on these patients' populations.

Keywords: Antibiotic, Pediatric, Drug, Drug prescribing.

Introduction

The pediatric population comprises of 20-25 percent of the total world population, and numerous acute and chronic diseases can affect this sub population. Premature neonates have poorly developed organ functions and are at highest risk of eliciting unexpected toxicity or poor clinical response from sub optimal dosage regimens of drug usage. This alters the pharmacokinetics or dosage requirements in this population.¹

Antibiotics are chemotherapeutic agents that have transformed the treatment of infectious diseases by turning life threatening diseases into more manageable and treatable conditions. The combination of global immunization programs; sanitation, housing and nutrition; and the use of such antimicrobial agents led to a significant fall in mortality of the pediatric population from infectious diseases during the 20th century.^{2,3}

The use of antimicrobial agents has become a routine practice for the treatment of pediatric illnesses and antibiotics are among the most commonly prescribed drugs in pediatrics. They are commonly prescribed for children with conditions for which they provide no benefit, including viral respiratory infections such as the common cold. Broad-spectrum antibiotic use is increasing, which adds unnecessary cost and promotes the development of antibiotic resistance.^{4,5}

Pediatricians and other medical personnel who provide health care for infants and children in developing countries are faced with numerous challenges due to the shortage of appropriate drugs, costs and lack of infrastructure. The rising incidence of bacterial resistance to commonly used antibiotics, particularly the

emergence of multi-drug resistant organisms has made it mandatory that antibiotics are used astutely in pediatrics practice.⁶

Antibiotics receive the special attention of the various classes of drugs as more money is spent on them than many other drugs. The worldwide emergence of antimicrobial resistance is a major public health problem that significantly impacts patient treatment and outcomes. The relationship between antimicrobial use and antimicrobial resistance is complex, with a growing body of data strongly suggesting that higher levels of antimicrobial usage are associated with increased levels of antimicrobial resistance. Today the situation is that many of the second and third line agents are turning to be ineffective in clinical settings. The slow pace with which new molecules of antimicrobials are introduced into the market is inadequate to meet the needs of this global threat.⁷⁻¹⁰

Several professional societies have issued guidelines designed to reduce the use of antibiotics worldwide by means of various control strategies. Detailed knowledge of antibiotic prescription pattern is important before policies and measures can be implemented.¹⁰

Drug prescribing is a skill that needs to be refined on a continuing basis. It reflects that professional's skills and attitude toward diagnosis of an ailment and selection of appropriate treatment. In view of this, it is important to do study the pattern of prescribing in pediatrics patients on continuous bases.¹¹

Most of the drugs prescribed for children have not been tested in the pediatric population. Some of the reasons for this lack of testing are small financial benefits to the pharmaceutical companies, difficulties in carrying out clinical studies in children, and ethical issues due to children not being able to make their own decisions to participate in a clinical trial.¹²

In a Kentucky study, 60% of patients were prescribed antibiotics for the common cold. In a Canadian study of Saskatchewan, 85% of antibiotics prescribed for respiratory tract infection in children less than 5 years of age were considered inappropriate.⁴

Objectives

General Objective

To assess the prescribing patterns of antibiotics in the Pediatric unit of Ayder Referral Hospital

Specific objectives

To evaluate the average number of drugs prescribed per prescription.

To assess Percentage of drugs prescribed from the essential drug list.

To identify Percentage of prescriptions with injection(s) prescribed.

Methodology

Retrospective study using Institution based cross-sectional study design was conducted from March to May, 2013 in Ayder Referral hospital, Mekelle city, Tigray region, north Ethiopia which is found at 783 km from Addis Ababa. Ayder Referral Hospital is the only referral hospitals in the Tigray region. The region has an estimated total population of 4,314,456 in 2007.

All pediatrics patients' medical records in which antibiotics are prescribed from May 2004 to May 2005 were included in the study. The

required sample size was calculated using single population proportion formula and a total of 220 patient's medication record was included.

Data from patient medical records was reviewed and analyzed to answer the objectives of this research. Data was analyzed using descriptive analysis and results were presented using tables, figures and charts.

Approval to conduct this research was obtained from Mekelle University, College of Health Science. Then officials at different levels in the study area was communicated through letters from Mekelle University, College of Health Science departments of pharmacy. Confidentiality of the information was assured in such a way that no disclosure of any name of the patient or the health care provider in relation to the finding was made.

Result

Socio demographic characteristics of the participants

Out of the 220 Pediatric patient medical records 190 was eligible in which antibiotics were prescribed. According to our study 63(33.1%) patients were ≤ 1 years old, 69 (36.3%) of them were 1-5 years old and 58(30.5%) of them were > 5 years old. The finding also showed that 90(47.4%) of the patients were female patients (table 1).

Table 1: Socio-demographic characteristics of pediatric patients at Ayder referral hospital, 2013

Parameters	Frequency, n (%)
Age	
≤ 1 year	63(33.1)
1-5 years	69(36.3)
> 5 years	58(30.5)
Sex	
Female	90(47.3)
Male	100(52.6)

The most common diseases were pneumonia, sever acute malnutrition and Acute gastroenteritis each accounting for 51(16.3%), 39(12.5%) and 21(6.7%) respectively (Table 2).

Table 2: Disease pattern of pediatric patients at Ayder referral hospital, 2013

Diagnosis	Frequency, n (%)
Pneumonia	51(16.3)
SAM	39(12.5)
AGE	21(6.7)
CHF	14(4.5)
LONS	11(3.5)
Bacterial conjunctivitis	11(3.5)
Fracture	9(2.9)
Acute appendicitis	7(2.2)
UTI	6(1.9)
Meningitis	6(1.9)

Prescribing indicators

The most commonly prescribed antibiotics prescribed were Ceftriaxone, Gentamicin and Ampicillin each accounting for 76(19.6%), 59(15.8%) and 57(14.7%) respectively (Table 3).

Table 3: Frequency of individual antibiotic of pediatric patients at Ayder referral hospital, 2013

Drug name	Frequency, n (%)
Ceftriaxone	76(19.6)
Gentamicin	59(15.8)
Ampicillin	57(14.7)
Cloxacillin	51(13.1)
Amoxicillin	42(10.8)
Crystalline penicillin	41(10.5)
Cotrimoxazole	10(2.5)
Cephalexin	9(2.3)
Augmentin	8(2.1)
CAF	6(1.5)
Others	(7.1)

Others: Erythromycin, Vancomycin, Ciprofloxacin, Streptomycin, Ceftazidime and *B. penicillin*

The average number of drugs per patient was four and more than 95% of the patients were exposed to at least two drugs. The maximum number of drugs per patient was 10 (0.52%) while the maximum number of antibiotic per patient was 5(0.75%) (Table 4).

Table 4: Number of drugs per patient in pediatric patients at Ayder referral hospital, 2013

Number of drugs per patient	Frequency n, (%)
1	10(5.2)
2	30(15.8)
3	47(24.7)
4	38(20)
5	28(14.7)
6	14(7.4)
7	14(7.4)
8	5(2.6)
9	3(1.6)
10	1(0.6)

The common route for drug administration was parental (71.8%). The age wise distribution of antibiotics were 143(37.9%) in patients 1-5 years old, 138(36.6%) in patients ≤ 1 years old and 96(25.5%) in patients > 5 years old. The most commonly prescribed antibiotics were Ampicillin 25.4% in patients ≤ 1 years of age, Ceftriaxone 16.8% in patients 1-5 years of age and Ceftriaxone (37.5%) in patients > 5 years of age (Table 5).

Table 5: Age wise distribution of antibiotics in pediatric patients at Ayder referral hospital, 2013

Age category	Most commonly prescribed antibiotics	Frequency, n (%)
≤ 1 year	Ampicillin	35(25.4)
	Gentamicin	34(24.6)
	Ceftriaxone	15(10.8)
1-5 years	Ceftriaxone	24(16.8)
	Gentamicin	22(15.4)
	Amoxicillin	21(14.8)
> 5 years	Ceftriaxon	36(37.5)
	Cloxacillin	20(20.9)
	C.penicillin	8(8.4)

About 649 (94.9%) of drugs were prescribed by generic name and 35(5.1%) were prescribed by Brand name. About 651 (95.2%) of drugs were prescribed from Essential Drug List (EDL) and about 33(4.8%) of the drugs prescribed were not in the Essential Drug List of Ethiopia.

Discussion

Antibiotics represent one of the most commonly used drugs.¹³ The majority of common childhood illnesses are caused by viruses which do not require antibiotics so excessive and inappropriate use leads to a number of consequences in term of cost, drug interactions, hospital stay and bacterial resistance.¹⁴

A total number of 1200 patients were admitted to the pediatrics ward of the Ayder referral hospital during May 2004-May2005. The number of male patients was comparatively higher than the number of female patients, which is similar to the research conducted in Kathmandu valley Jimma and Hawassa.^{4,15,16} In the current study average number of drugs per patient was four which was lower than a study conducted in Kathmandu valley which was 5.01 \pm 1.36(4) but higher than the study conducted in Jimma which was 1.33.¹⁵ This discrepancy could be due to inappropriate diagnosis, patient compliance or sometimes some drugs could be out of stock after the patient started taking them, which will push the prescriber to shift to other alternatives. The proportion of antibiotic prescription was 48.3% in our study, which was higher than the WHO recommendation of 20% antibiotic use for these common childhood illnesses.³

The current study showed that the maximum number of drugs per patient was 10 while the maximum number of antibiotics was 5 which was greater than the study conducted in Hawassa.¹⁶ This discrepancy could be due to diagnostic uncertainty which could lead to empirical treatment and the high prevalence of antibiotic use could be due to nosocomial infections which commonly develop after a prolonged hospital stay.

In our study the most commonly prescribed antibiotics in all age groups were penicillins, Cephalosporins and Macrolides not in line with a the study conducted in northern Tanzania where the most commonly prescribed antibiotics were penicillins, sulphonamides, aminoglycosides and macrolides.⁵ The difference in the trend of prescribing practice may be due to the difference in the prevalence of disease and availability of the drugs.

The higher number of antibiotics were prescribed for children whose age ranges from one up to five years, which was similar to the study

conducted in Hawassa¹⁶, which indicates this age group of pediatrics is highly susceptible to different adverse effect of drugs and also could be at higher risk of irrational drug prescribing compared to other group of pediatrics population which indicates this group needs a great attention in order to promote rational prescribing pattern of antibiotics

The most common disease in our study was Pneumonia which was similar to the studies conducted in Kathmandu and in Jimma.^{4,15} Only one antibiotic was prescribed in 31.3%, two antibiotics in 43.3%, three antibiotics in 14.5%, four antibiotics in 9.4% and five antibiotics in 1.5%. This finding was not similar to the study conducted in Kathmandu where one antibiotic was prescribed in 21 %, two antibiotics in 37 % (highest), three antibiotics in 28 %, four antibiotics in 10 % of and five or even more than five antibiotics were prescribed in about 4 % of all cases. In our study the most common route of administration (71.8%) was parenteral route, 24.1% was oral and other routes account for 4.1%. This result was not in line with the study conducted in Jimma where the common route was oral routes (52.94%) and parental route was (13.14%) followed by the topical route (10.39%).¹⁵ The excessive use of injectable is common in many developing countries.¹⁷ In our study, 71.8 % of antibiotics were given by injection.

In our study about 649 (94.9%) of drugs were prescribed by their generic names while 35(5.1%) were prescribed by their Brand names. This finding is higher when compared to a study conducted in Kathmandu 41%⁴ and in Jimma 82%¹⁵ but it's not sufficient according to an Ethiopian health policy which promotes 100% generic prescription. About 651 (95.2%) of drugs were prescribed from Essential Drug List (EDL) and about 33(4.8%) of the drugs prescribed were not in the Essential Drug List of Ethiopia. This figure is higher than the study in Hawassa Jimma^{15,16} but according to the Ethiopian health policy which expects 100 % of the prescribed drugs to be included in the Essential Drug List it is not satisfactory.

Conclusion

From the results of this study it can be concluded that, there was the high percentage of antibiotic and injectable use. Pediatrics, whose age ranges from one up to five years was given the higher percentage of antibiotics than other age groups and hence strategies to control antibiotic use should focus on these patients' populations. Ceftriaxone was the most commonly prescribed antibiotic in all age groups for different indications. Generally there was good generic prescription as well as outstanding antibiotic prescription from EDL of Ethiopia but there was a poor trend of writing full information of the drug regimen on the patient medical history.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

HB participated in the design of the study, collecting data, analyzing and preparing the manuscript. BT participated in the design of the study, collecting data and analyzing data. BL participated in analyzing data and preparing the manuscript. All authors read and approved the final manuscript.

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