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Evaluation of Antibiotics Use and Prescribing Error among Hospitalized Pediatric Patients in Nekemte Referral Hospital, Ethiopia

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ABSTRACT

Pediatrics population is the most vulnerable groups to irrational use of antibiotics and prescribing error. Inappropriate use of antibiotics is global problems which curtail health care costs, potential adverse effects, increased resistance and poor health outcomes. Evaluation of antibiotic use and presrcribing error is critical approach to improve antibiotics use and prescribing in pediatrics. The study was aimed to evaluate the use and prescribing error of antibiotics among hospitalized pediatrics in Nekemte Referral Hospital. The prospective cross- sectional study was conducted on 124 patients admitted to pediatric ward of Nekemte Referral Hospital; from March to April 2013.The antibiotic use and prescribing error were done according to Ethiopian pediatric drug formulary and WHO antibiotics pediatrics dosing guideline. The finding showed that 225(85%), 23(7.67%) and 22(7.33%) of antibiotics were prescribed empirically, kinetically and prophylactically respectively. Gentamycin was the widely, 76 (25.33%), prescribed antibiotics. Penicillins, 103(34.33%), were the most extensively prescribed classes of antibiotics. The study found average number of antibiotic per patient2.48 and duration of treatment 5.77 days. Majority, 72(58.1%), of patients were stayed in hospital for 4-7 days. Only 262(56.34%) of the prescribed antibiotics were prescribed with indication and appropriate dosage regimen while slightly less than half of them were not. The use of antibiotics on empirical basis was routine prescribing practices are- far greater number of antibiotics per patient and parenteral administration of antibiotics. Overwhelmingly, antibiotics are prescribed with no indication and inappropriate dosage regimen. Significant death and referral were occurred due to treatment failure.

Keywords: Antibiotics, Pediatrics, Use, Evaluation, prescribing error.

INTRODUCTION

Antibiotics are one of the pillars of modern medical care and play a major role in prophylaxis and treatment of infectious disease [1, 2] and are the most commonly used of all drugs [3]. They represent approximately 30% of acute care hospitals' drug expenditure and they are prescribed for 20-50% of

inpatients [4, 5]. Antimicrobial drugs have helped dramatically in curing patients suffering from bacterial infections [6] and the use of antibiotics has become a routine practice for treatment of pediatric illness [7]. WHO estimates that more than half of all medicine are prescribed, dispensed or sold inappropriate, and that half of all patients fail to take their medication correctly, more than one third of world population lacks access to essential medicines [8-10]. Antimicrobial agents are among the commonly misused of all drugs [3], which is common in all countries [11]. Studies have shown that 22-65% of antibiotic prescriptions are inappropriate [4-5]. It is particularly troublesome in developing countries where there is a heavy burden of infectious diseases [11]. Overwhelmingly, the prescribed antibiotics are based on common signs and symptoms without considering the specific strain responsible [12]. Inappropriate treatment of antibiotics in developing countries with poor capabilities of monitoring of therapies and adverse effect yields devastating results [7].

Misuse of antibiotics therapy has ramifications on health care costs, antibiotic resistance, treatment failure, hospitalization time, wasted medication and increased return visits to the physician [6]. Irrational use of antibiotics may even lead to infections that are worse than the originally diagnosed ones [13, 14]. Antibiotics can cause serious toxicity and injudicious uses of antimicrobials agents promote selection of resistant microorganisms [15, 16]. Growing misuse of antibiotics has been reported in hospitals, causing untoward toxic effects and various infections due to resistant microorganisms that increase the cost and duration of hospitalization and considerable influence on further drug use outside the hospitals [17].

Infants and children are the most vulnerable population groups to counteract illness [3]. The pediatric medication use process is complex and error prone because of multiple steps requires in calculating, verifying, preparing and administering doses [18, 19]. Children are at the three fold greater risk for medication errors than adults and up to 19% of these errors are deemed to be preventable [20, 21]. In developing countries, children and infants are among the most susceptible to infectious disease and quite vulnerable to the harmful effects of drugs [22].

Antibacterial therapy in infants and children represents many challenges [23]. In Sub-Saharan, studies on antimicrobial resistance have been done, but, by large, the issue has received far too little attention [24]. In several situations, the rational use of antibiotics has been reported to reduce the emergence of resistant strains. Antibiotic use evaluation is one of the increasingly used methods in combating the development of bacterial resistance to antimicrobial agents [4, 5]. Antibiotic use evaluation can identify problems in drugs use, reduce adverse drugs reactions, optimize drugs therapy and minimize drug related expense correct prescribing and interventions to ensure appropriate drug use [25-28].

Ethiopian hospitals consume about 50% of the national drug budget. However, very little is known how drugs particularly antibiotics are used in hospitals like in other health facilities [29]. One mechanism to ensure correct prescribing and use is antibiotic use evaluation [30]. Therefore promising method should be developed to assure appropriate antimicrobial drugs use [12]. Thus, this study was aimed to evaluate antibiotic use pattern, prescribing error and hospital course of the hospitalized pediatrics in Nekemte referral hospital, Ethiopia.

MATERIALS AND METHODS

Study Setup description: The study was conducted in pediatric ward of Nekemte Referral Hospital. The hospital is found in Oromia National Region State, Western Ethiopia, which is located at 331 km from Addis Ababa, the capital of the country. The hospital serves 2,028,680 populations.

Patient selection: Prospective cross- sectional study was conducted on 124 hospitalized pediatric patients from March 18 to April 18, 2013.The sample size was determined by using Joint Commission Accreditation of Health Care Organization (JCAHO) criteria [31]. The patients were selected by using systematic random sampling. All hospitalized pediatric patients with at least one antibiotic with or without

other concurrent medications were included as study participants. Patients receiving only anti TB, anti-Leprosy and patients hospitalized with surgical cases were excluded. The antibiotic use pattern including commonly prescribed antibiotics, combined antibiotics, route of administration, use of antibiotics on the basis diagnosis type, duration of antibiotic treatment, antibiotics use on the basis of disease type, average number of antibiotics per patient; antibiotic prescribing error: dosage regimen, contraindication, drug-drug interaction and the patients' hospital course, duration of hospital stay and reason for discharge were evaluated. The data collection tool was based on the prospective chart review with follow-up of the patients throughout their hospital stay. The information extracted comprises of the patients' baseline demographics, clinical parameters and antibiotic use related characteristics. The data was collected by two clinical pharmacists after proper training on the data collection process and tools. The antibiotic use evaluation was done against Ethiopian pediatric drug formulary and WHO antibiotics pediatrics dosing guideline, WHO antibiotic prescribing indicators and Nelson text book of pediatrics.

Statistical Analysis: The data was entered into Microsoft excel and exported to SPSS 20 for analysis.

RESULTS AND DISCUSSION

A total 151 patients have hospitalized during the study period. Of 151 pediatric patients hospitalized, 124 met the inclusion criteria. The baseline demographic characteristics of pediatric patients are provided in Table1

Table 1: Baseline demographic characteristics of hospitalized pediatric patients in pediatric ward of Nekemte Referal Hospital, Ethiopia

Variable	Frequency (Percentage), N (%)
Sex	
Male	72 (58.1%)
Female	52(41.9%)
Total	124(100)
Age group	
<1month	36(29.1)
1-12 month	39(31.45)
1-2 years	18(14.52)
2-5 years	12(9.68)
5-12 years	16(12.9)
12-15 years	3(2.43)
Body Weight(kg)	
<2.5	6(4.84)
2.5-3.99	27(21.77)
4-9.99	46(37.1)
10-14.99	21(16.9)
15-19.99	9(7.26)
20-24.99	5(4.03)
>25	6(4.84)
Unspecified	4(3.3)
Total	124(1000

Pattern of Antibiotic Use: The study revealed more than three fourth, 255(85%) of the antibiotics were prescribed empirically. The pattern of antibiotic use is shown in Table 2. Gentamycin, 72 (24%), ceftriaxone, 43(14.33%), Ampicillin, 42(14%) and crystalline penicillin, 23(7.67%) were the top four prescribed empirically. Ceftriaxone,8(2.67%), cephalexin, 7(2.33%) and chloramphenicol, 5(1.67%) were the top three prescribed kinetically. The top three for prophylaxis include Ceftriaxone, 9(3%), cloxacillin, 4(1.33%) and amoxicillin, 3(1%).

Nearly nine tenth, 108(87.1%), of the patients used antibiotics for the treatment. The study determined the average number of antibiotics per patient for treatment, prophylaxis; both prophylaxis and treatment to be

2.45, 1.88, 2.63; respectively. More than half, 66(55.65%), of the patients had received at least two antibiotics.

Table 2: The pattern of antibiotic use among hospitalized pediatrics in Nekemte referral hospital, Ethiopia

Variable	Frequency (percentage), N (%)
Prescribed antibiotics on diagnosis basis	
Empric	225(85%)
Amoxicillin	15(5)
Amoxicillin-clavulinic acid	2(0.67)
Ampicillin	42(14)
Ceftriaxone	43(14.33)
Cephalexin	20(6.67)
Gentamycin	72(240
Chloramphenicol	15(5)
Cloxacillin	10(3.33
Cotrimoxazole	7(5.65)
Crystalline penicillin	23(7.67)
Metronidazole	1(0.33)
Fortified procaine penicillin	2(0.67)
Tetanus anti-toxoid	2(0.67)
Kinetic	23(7.67)
Ceftriaxone	8(2.67)
Cephalexin	7(2.33)
Gentamycin	1(0.33)
Chloramphenicol	5(1.67)
Cloxacillin	1(0.33)
Crystalline penicillin	1(0.33)
Prophylactic	22(7.33)
Amoxacillin	3(1)
Ceftriaxone	9(3)
Cephalexin	2(0.67)
Gentamycin	3(1)
Cloxacillin	4(1.033)
Cotrimoxazole	1(0.33)
Number of antibiotics per patient	
Prophylaxis	8(6.45)
One	3(2.42)
Two	3(2.42)
Three	2(1.61)
>four	0(0)
Treatment	108(87.1)
One	6(4.84)
Two	63(50.81)
Three	24(19.35)
>four	15(12.1)
Treatment and Prophylaxis	8(6.45)
One	0(0)
Two	3(2.4)
Three	5(4.03)
>four	0(0)
Average number of antibiotics per patient	1.88
Prophylaxis	2.45
Treatment	2.63
Treatment and prophylaxis	
Class of antibiotics	
Penicillins	300(100)
Cephalosporins	103(34.33)
Aminoglycosides	76(25.33)
Chlorampenicol	20(6.67)
Sulphonamides	8(2.67)

Tetracyclines	1(0.3)
Others	3(1)
Prescribed antibiotics	
Gentamycin	76(25.33)
Ceftriaxone	60(20)
Ampicillin	42(14)
Cephalexin	29(9.67)
Crystalline penicillin	24(8)
Chloramphenicol	20(6.67)
Amoxicillin	18(6)
Cloxacillin	15(5)
Cotrimoxazole	8(2.67)
Others	8(2.67)
Disease with commonly prescribed antibiotic	Frequency(percentage)
Severe pneumonia	Ceftriaxone 24(70.59)
Neonatal sepsis	Ampicillin+gentamycin 28(100)
Acute gastro enteritis	Ceftriaxone 12(50)
Typhoid fever	Ceftriaxone 8(80)
Meconium aspiration Syndrome	Ampicillin+gentamycin 9(90)
Severe acute malnutrition	Amoxacillin 4(57.14)
Skin infection	Cloxacillin 6(100)
Trauma	Gentamycin 3(75)
Pyrogenic meningitis	Chlorampenicol 3(100)
Tetanus	Tetanus anti-toxoid 2(100)
Route of antibiotic administration per patient	
Prophylaxis	8(100)
PO only	2(25)
IV only	1(12.5)
IV+PO	5(62.5)
Treatment	108(
PO only	1(0.93)
IV only	16(14.81)
IV+IM	4(3.70)
PO+IM	2(1.85)
PO+IV	46(42.59)
IM+IV+PO	38(35.19)
IV+PO+IO	1(0.93)
Treatment and prophylaxis	8(100)
IV only	1(12.5)
IV+PO	6(75)
IV+PO+IM	1(12.5)
Combined antibiotics	
Ampicillin+gentamycin	90(58.44)
Ceftriaxone+gentamycin	26(16.88)
Cephalexin+gentamycin	13(8.44)
Cloxacillin+chlorampenicol	9 (5.84)
Chloramphenicol+crystalline penicillin	5(3.25)
Cloxacillin+gentamycin	4(2.6)
Others	7(4.54)
Duration of antibiotic treatment	
1-3 days	88(29.3)
4-7 days	143(46.67)
8-10 days	40(13.3)
11-14 days	15(5)
>14 days	14(4.67)
Mean	5.77

Note! IV=intravenous, IM=intramuscular, PO=oral, IO=Intra ocular

The study depictedgentamycin, 76(25.33), ceftriaxone, 60(20%) and Ampicillin, 42(14%) were the top three prescribed. Penicillin, 103(34.33%), cephalosporins, 89(29.63%), aminoglycoside, 76(25.33%) were the extensively prescribed classes.

The study identified ceftriaxone was indicated for 24(70.59%) of severe pneumonia; and prominently acute gastroenteritis and typhoid fever. Pyogenic meningitis and tetanus prescribed exclusively chloramphenicol and TAT, respectively. Sepsis and meconium aspiration syndrome prescribed only Ampicillin and Gentamycin combination. Severe acute malnutrition was treated with amoxicillin infection in phase I of treatment.

The study assessed the combination of intravenous and oral route were the extensively administered while almost all, 121(97.58%), patients had received at least one antibiotic parenterally. The study identified Ampicillin and Gentamycin, 90(58.44%), ceftriaxone and Gentamycin, 26(16.88%), cephalexin and Gentamycin, 13 (8.44%) as the first top three combinations.

Evaluation of Antibiotic Use and Prescribing Error: The study showed the initial dosage regimen with the right dose 122(65.95%), frequency, 140(75.68%) and duration, 159(85.95%) respectively. However, the initial antibiotic regimen was identified with over dose, 13(7.03%), low dose, 50(27.1%) and less frequent, 38(20.54%), more frequent, 7(3.78) and short duration, 25(13.51%) and prolonged duration, 1(0.54%). In the subsequent dosage regimen 248(88.57%), 211(75.35%) and 259(92.5%) were prescribed with appropriate dose, frequency and duration respectively. The subsequent antibiotic regimen indicated with overdose, 13(7.03) and under dose, 50(27.1%). Antibiotic administration with less frequent, 38(20.54); and more frequent, 7(3.78%) were encountered. Short duration occurred in 25(13.51%) of indications, but it was prolonged in 1(0.54%) of subsequent regimens**.**

The study depicted, the antibiotics prescribed with appropriate dose, frequency and duration, 370(79.57%), 351(75.48%) and 418(89.89%), respectively. More of the inappropriate antibiotic regimen was under dose, less frequent and short duration. On average, 380 (81.72%) of the antibiotics were prescribed with correct dosage regimen without considering the indication. Less than one third, 139(29.89%), prescribed without indication. The rational dosage regimen was found to be 262 (80.37%).Only slightly over half, 262(56.34%), of antibiotics were prescribed with right indication and dosage regimen; however, nearly half were not. Evaluation of antibiotic use and prescribing error is depicted in Table 3.

The study identified contraindication to high chloramphenicol in five patients. The antibiotics interacted more with non-antibiotics, which was 23(60.53%). Chloramphenicol was the most interacted among antibiotic, 18(34.62%), while Ringer lactate, 9(39.13%) was from the non-antibiotic side. The majority of antibiotics were administered for 4-7 days, 143(47.67). The average duration of indication was 5.77 days. The finding of the study showed the main reasons for discontinuation of antibiotics were change to oral therapy accounting, 87(39.37%), and change from IV to IM, 42(19%).

Over half, 72(58.1%), of patients stayed in hospital for 4-7 days; while 41(33.1%) of patients had been in the hospital for less than four days. The patients were hospitalized on average for 4.6 days. Three fourth, 93(75%) of patients were discharged from the hospital on improvement while 14(11.29%) were self-discharge. The study found out ten death due to treatment failure; and 7(5.63) referrals due to deterioration of their conditions.

Table 3: Evaluation of antibiotic use and prescribing error and hospital course of patients in pediatric ward of Nekemte Referral Hospital, Ethiopia

Variable	Frequency(percentage), N (%)
Initial antibiotics Dose regimen	
Dose	
Appropriate	122(65.94)
Inappropriate	63(34.13)
Over dose	13(7.03)
Under dose	50(27.1)
Frequency	
Appropriate	140(75.68)
Inappropriate	45(24.32)
Less frequent	38(20.54)
More frequent	7(3.78)
Duration	
Appropriate	159(85.95)
Inappropriate	26(14.05)
Short	25(13.51)
Prolonged	1(0.54)
Maintenance antibiotics regimen	
Dose	
Appropriate	248(88.57)
Inappropriate	32(11.43)
Over dose	5(1.79)
Under dose	27(9.64)
Frequency	
Appropriate	211(75.35)
Inappropriate	69(24.64)
Less frequent	67(23.93)
More frequent	2(0.71)
Duration	
Appropriate	259(92.5)
Inappropriate	21(7.49)
Less frequent	6(2.14)
More frequent	15(5.35)
Antibiotic prescribed no Indication	139(29.89%)
Antibiotic prescribed in contraindication (High dose of chloramphenicol)	5
Drug-drug interaction	38(100)
Antibiotic –Antibiotic	15(39.47)
Antibiotic-Non-Antibiotic	23(60.53)
Medications involved in drug-drug interaction	
Chlorampenicol	18(34.62)
AntibioticsCeftriaxone	16(30.77)
Cloxacillin	8(15.38)
Crystalline penicillin	4(7.69)
Gentamycin	4(7.69)
Ampicillin	1(1.92)
Metronidazole	1(1.92)
Ringer lactate	
Non-antibiotics Quinine	9(39.13)
F-75	6(26.09)
Furosemide	4(17.39)
Phenytoin	2(8.7)
Phenobarbitone	1(4.35)
	1(4.35)

Reason for antibiotic discontinuation	
Changed to oral therapy	87(39.37)
Changed to intramuscular therapy	42(19)
Completed course	25(11.3)
Patient discharged	23(10.4)
Patient expired	18(8.4)
Changed from narrower to another narrower agent	11(4.98)
Changed from narrower to broader agent	6(2.7)
Changed from broader to narrower agent	3(1.36)
Patient referred	2(0.9)
Others*	4(1.8)
Duration of hospital stay	124(100)
<4 days	41(33.1)
4-7 days	72(58.1)
>2 weeks	1(0.08)
Reason for discharge	124(100)
Improvement	93(75%)
Died	14(11.29%)
Referal	7(5.63)
Self-discharge	10(8.06%)

Others*: Changed to IV, changed from broader to another broader agent

The study showed 4(3.3%) patients without measured body weight, which is less than study conducted by Mengistu et al in Jimma (Ethiopia), 48(%) [30]. Lower patient burden in the current setup could be the reason.

The study found out extensive, 225(85%), empirical antibiotic use. The result deviate from study conducted in Philippines in which 61% of antibiotics were given prophylactically [32]. However, the result was similar with the study conducted in Indonesia in which was 73.5% empirical [33]. The plausible justification will be the invariably empirical diagnosis, based on common signs and symptoms without considering the specific strain responsible for the infection [12]. This arises mostly due to lack of necessary laboratory facility including culture and sensitivity tests.

The study assessed more than half, 69(55.65%), patients had received at least two antibiotics. The finding was greater than finding of other studies. According to study of Shankar et al in Western Nepal, 75(36.95%) patients received two antibiotics [34]. This could indicate extensive empirical use of antibiotics and lack of effective antibiotics in the current study area. The study showed2.41 average number of antibiotics indicated per patient, which highly greater than WHO recommendation, 0.47; but lower than study in Jimmaby Mengistu et al, 2.9 [30]. However, the result was similar with the finding of research conducted in Nepal by Palikhe et al, 2.41[35]. The study depicted five as the maximum number of antibiotics per which was less than study by Mengistu et al at Jimma, seven [30].

The study evaluated Gentamycin 76(25.33%), ceftriaxone, 60(20%) and Ampicillin, 42(14%) as the first top three antibiotics prescribed. The finding deviated from study in Jimma by Mengistu et al, in which commonly prescribed antibiotics were crystalline penicillin, Gentamycin and Ampicillin, respectively [30]. On the other hand, study in Nepal by Rehana showed cloxacillin followed by Ampicillin as the widely used antibiotics [36]. Research conducted in Indonesia by Hindra et al showed cefotaxime followed by ceftazidime and cotrimoxazole as commonly prescribed [33]. The variation could be explained by difference in epidemiology of pathogens and susceptibility pattern and availability of antibiotics, physicians' preference and cost of antibiotics in different setups.

The study depicted penicillins as the top classes of antibiotics prescribed, 103(34.33%). The finding similar with the study conducted by Asefa et al in Gondar [37], Schollenberg et al in Manitopa [38] and Lauser et al in Taiwan[39]. However, the result was different with study conducted by Palikhe et al in

Nepal [35], and Orett et al in China [22]where cephalosporin's were the widely prescribed classes of antibiotics. The variance might be related due to availability, cost and physician preferences.

The study identified severe pneumonia and typhoid fever was treated mostly with ceftriaxone, while neonatal sepsis and meconium aspiration syndrome were exclusively managed with Ampicillin and Gentamycin combination. According to the study conducted by Palikhe et al in Nepal pneumonia was mostly treated by cefotaxin, however similar to current study typhoid fever was treated by ceftriaxone [35]. Study done by Burke et al, regarding treatment of sepsis revealed that empirical antibiotic combination of Ampicillin and Gentamycin was necessary, although the later can cause severe adverse events and has to be cautiously administered cautiously in the first months of life [40]. This may be due to the similarity of setups facility levels and treatment provision.

The current study showed nearly all, 121(97.58%), patients received at least one antibiotic parenterally. This by far exceeds the WHO recommendation of percentage of prescription with an injection, which is 22.63%. However, excessive use of injectables were common in many developing countries as shown by Tomson et al in Sirilanka [41] and Palikhe et al found 75% of antibiotics were given by injection [35]. This may be because of two reasons. The first major reason is that children especially neonates and infants cannot favorably take oral medications. Secondly, due to severity of infections and clinical conditions, such as unconsciousness IV or IM medications are preferable over oral medications.

The study evaluated that slightly over half, 262(56.35%), dosage regimens were appropriate while nearly half were not. The high prevalence of antibiotic prescription for off label antibiotics at unregistered dose in current study was in line with previously published data concerning pediatric use of antibiotics [42-46]. Study conducted by Mengistu et al in Jimma l [30] by WHO [8, 9] and by Chag in Taiwan [47] showed that more than half of antibiotics are inappropriately prescribed. The study was also similar with study conducted at Kathmandu University by Palikhe et al [35] and Hindra et al in Indonesia showing that 48.3% of antibiotics were inappropriate [33], but lower than study by Rehana et al in Nepal where 22-65% of antibiotics prescription were inappropriate [36]. Excessive irrational use of antibiotics may be due to poor understanding of the properties and characteristics of antibiotics, carelessness and availability of effective antibiotics.

The study found Ampicillin and Gentamycin, 90 (58.44%) as a common combination and number of antibiotics combined to be three. The result was similar with the study by Tefera et al in Gondar (Ethiopia)[48]. But according to research conducted by Desta et al in three hospitals of northern Ethiopia, ampicillin was the widely combined with other antibiotics and the maximum number of antibiotics in the combination was four [49]. In this case high dose chloramphenicol was prescribed off label for five children's even though it is contraindicated according the guidelines. According to study conducted by Alexandro et al in three European countries off label was almost related to dose and indication. The only antibiotic used off label for age in pediatric ward was meropenem [50]. But in this study chlorampenicol was off label antibiotics regarding to age and dose. This may be due to carelessness and lack of other appropriate drugs to cover the infections/cases by high dose drugs. The study identified interaction of antibiotics was mostly with non-antibiotics. Thus, it is always important to note the possible drug interaction prior to concomitant drug administration.

The study showed the average duration of treatment for empiric, 5.7days; directed,6 days; and for both 5.6 days. The mean duration of treatment was 5.77 days. According study conducted by Tefera et al in Gondar teaching hospital showed the mean duration of therapy was 3.2 days for prophylaxis and 8.7 days for treatment [48]. The average duration for treatment in the current setup is lower but higher for prophylaxis than Gondar teaching hospital finding. This could increases the cost and adverse effect to the patient.

APPLICATIONS

This study is the first in its kind in the current set up, it suffers from its study design, cross-sectional, and being conducted on relatively small sample size. However, the results of Study provides paramount importance to use it as tool for prudent use and choice of antibiotics, especially in this resource limited setting where irrationality of antimicrobial use was high.

CONCLUSIONS

The antibiotics were prescribed overwhelmingly for empirical treatment. The mean number of antibiotics used per patient was by far greater than WHO guideline recommendation. Slightly over half the patients had received two antibiotics. Gentamycin was the widely prescribed antibiotic. Unprecedently, nearly all, patients received at least one antibiotic parenterally which is extremely greater than WHO guideline. Unlike many setups Gentamycin and Ampicillin were the most frequent combination. Over half of patients were hospitalized for 4-7 days. The mean duration hospitalization was 4.6 days.

Significant amount of antibiotics were prescribed without indication. Slightly over half, antibiotics were prescribed with right indication and dosage regimen, yet nearly half were not. More of the inappropriate antibiotic regimen was under dose, less frequent and short duration. Contraindication to high dose chloramphenicol was identified in five patients. Antibiotics were widely interacted with non-antibiotics. The main reason for discontinuation of antibiotic was due to change to oral therapy. Three fourth of patients were discharged on improvement, but ten patients were died, while seven patients referred due to lack of improvement

Finally, this study showed high empirical treatment. High number of antibiotics per patient and parenteral administration of antibiotics was routine practice. Overwhelmingly antibiotics are prescribed with no indication and inappropriate dosage regimen. Significant death of patients and lack of clinical improvement was observed. Even though this study is the first in its kind in the current setup, it suffers from its study design, cross-sectional, and being conducted on relatively small sample size. However, it provides paramount importance to use it as tool for prudent use and choice of antibiotics, especially in this resource limited setting where irrationality of antimicrobial use was high. To implement the finding of this study for judicious use of antibiotics, the prescribers have to adhere to WHO antibiotic use guideline for developing countries and Ethiopian pediatric handbook of pediatrics and focus to improve the dosage regimen of antibiotics and avoid use of antibiotics without indication. Further study which is longitudinal with prospective design on large sample size in scores of health facilities is encouraged.

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