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Antibiotics Use Evaluation for Pediatrics at Nekemte Referral Hospital, East Wollega Zone, Oromia Region, West Ethiopia

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Abstract: Information about drug utilization at the level of health institutions in Ethiopia is scanty although a large segment of the patients are being served at these health institutions. Drug use evaluation(DUE) is a performance improvement method that focuses on evaluation and improvement of drug use processes to achieve optimal patient outcomes. It is used to ensure that drugs-are used appropriately safely and effectively to improve patients' health status. The purpose of the study is to evaluate antibiotic use pattern for pediatrics at selected health institutions. Retrospective cross-sectional drug use evaluation was conducted at NRH, Nekemte, East Wollega Zone, Oromia region, Ethiopia. Pediatric patients with at least one antibiotic drug prescribed on their medical card at NRH were study population. A total of 341 patients' medical cards with at least one antibiotic were reviewed. The study reveal that most antibiotics were prescribed for empirical treatment and least as prophylactic treatment, 83.58% and 2.93%, respectively. Orally administered antibiotics contributed to the higher proportion 74%. An effort has been made to observe age and sex distribution of patients and the ratio of male to female were 1.11:1. The most age group treated by antibiotics was 1-5 year which accounts 43.11% of which 22.9% were males and 20.2% were females. While the least age group treated by antibiotics were those of less than six months. The maximum number of antibiotics concomitantly prescribed was two and the average number of antibiotics per patient was 1.09. The most leading class of antibiotics prescribed was penicillin 36.73%. There were inappropriate dose 16.62%, inappropriate frequency 7.51% and inappropriate duration 10.46%. More than seven concomitantly prescribed drugs have the potential drug-drug interaction. Also 11.80%, 2.95% and 23.06% were not indicated dose, frequency and duration; respectively. Less frequent combination of antibiotics was also prescribed. Prescribers should include all necessary information on patient card and the hospital should provide all necessary references including STG and antibiotic prescribing policy.

Key words: Antibiotics · Pediatrics · Dose · DUE · Patient card

INTRODUCTION

Back Ground: According to the original definition by Waksman, antibiotics substances which are produced by microorganisms and exhibit either an inhibitory or destructive effect on other microorganisms. In a wider, though not universally accepted definition; antibiotics are substances of biological origin, which without possessing enzyme character, in low concentrations inhibit cell growth processes [1].

Up to now, more than 4,000 antibiotics have been isolated from microbial sources and reported in the literature and more than 30000 semi-synthetic antibiotics have been prepared. Of these, only about 100 are used clinically as the therapeutic utility not only depends on a high antibiotic activity but also on other important properties; such as good tolerance, favorable pharmacokinetics etc. These antibiotics are today among the most efficient weapons in the armory/weapon store of the physician in his fight against infectious diseases. They are therefore used a large extent and constitute the largest class of medicaments with respect to turnover value. Today, antibiotics are also used in veterinary medicine and as additives to animal feed. In the past they were used addition, as plant protection agents and as food preservatives [1, 2].

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One of the most pressing problems facing public health providers and administrators in many countries is ensuring rational drug use. Rational drug use implies an individual approach to patient treatment. The presence of standard treatment guidelines and drug formularies for selected drugs in a health facility does not ensure that they are prescribed and used correctly. One mechanism to ensure correct prescribing and use is drug use evaluation (DUE) [2,3].

Antibiotics represent approximately 30% of acute care hospitals' drug expenditure and they are prescribed for 20-50% of inpatients. The development of bacterial resistance to antibiotics has become a major problem throughout the world. Resistant organisms may emerge as a result of many factors, including irrational use of drugs. Studies have shown that 22-65% of antibiotic prescriptions are inappropriate. In several situations, the rational use of antibiotics has been reported to reduce the emergence of resistant strains [4-6]. DUE is one of the increasingly used methods in combating the development of bacterial resistance to antimicrobial agents [5].

Infants and children are among the most vulnerable population groups to contract illnesses. The use of antimicrobial agents, especially antibiotics has become a routine practice for the treatment of pediatric illnesses [7-10].

Antibiotics are among the most frequently prescribed drugs for pediatric patients. They are mostly prescribed as empirical therapy, rather than prophylactic or definitive therapy. There have been fewer studies on antibiotics use in children than in adult patients. Inappropriate and unnecessary use of antibiotics can increases morbidity, mortality, medical expenses or patient cost and microbial antibiotic resistance. Inappropriate use of antibiotics is frequently seen in developed countries as well as developing countries [12].

Development of antibiotic resistance is also promoted by presenting antibiotics for viral infections use of broad spectrum antibiotics when a more selective and narrow spectrum agent would be more appropriate [13].

Physicians may also have an influence on proper drug utilization because of inappropriate prescribing [14].

It has been estimated by WHO that about half of all medicines are inappropriately prescribed, dispensed and sold and about half of all patients fail to take their medicines properly. The information of medicines available through promotional sources are primarily aimed at advertizing the reuse of specific products and not necessarily for the health benefit of the people providing the right information therefore should be an essential part of prescribing and dispensing of medicine [15].

Optimal and judicious/careful selection of antibiotics for therapy of infectious disease requires clinical judgment and knowledge of pharmacological and microbial factor. Antibiotics are used for the empirical, definitive and prophylactic therapy. When used as empirical or initial therapy the antibiotic should cover all the likely pathogen because the infecting organism has not yet been defined. Definitive antimicrobial therapy should be instituted with narrow spectrum and low toxicity agent to complete the course of treatment [16].

The pattern of antimicrobial resistance in the community & potential causative pathogen being empirically treated must be considered before choosing antibiotics [17]. The spread use of antibiotic therapy has led to the development of antimicrobial resistance. Bacterial resistance to antibiotics may be result of many factors, including irrational use of drugs. In children, lower than recommended dose of antibiotic therapy has been associated with increased pharyngeal carriage of penicillin resistant *Streptococcus pneumonae*. Resistance to penicillin and cephalosporin antibiotics is now common place among strains of *streptococcus pneumonae*, often necessitating the use of other class of antibiotics. Although there has been ever increasing emergence of resistance to penicillin, this agent remain valuable & are commonly used for management of many pediatric infectious disease [17, 18].

The two common ways in which antibiotics misused are: failure to document the bacterial etiology so that narrow spectrum agent can be used and failure to narrow the spectrum when an organism has been identified [16].Antibacterial therapy in infants & children presents many challenges. For some agents, there is a paucity/lack of pediatric data regarding pharmacokinetics and optimal dosage. Clinician must consider importance differences among varies age groups and the pathogenic species responsible for pediatric information. Appropriate antibiotic dosing and toxicities must also be considered [17, 19].

Use of a combination of antimicrobial agents may be justified for empirical therapy of an infection in which the cause is unknown, for treatment of polymicrobial infection, to enhance antimicrobial activity or to prevent emergence of resistance. However, it can be disadvantageous due to the risk of toxicity from two or more agents and the increased cost to the patient [16, 20]. Appropriate drug utilization studies have been found to be crucial to evaluate whether drugs are properly used and utilized in terms of medical, social and economic aspects [21]. Information about the utilization of drugs,

particularly the prescribing pattern of drugs in hospitals and other health institutions of Ethiopia are scanty as yet [22].

In this review we have confined ourselves to brief description clinically useful antibiotics. These belong to various classes of chemical compounds, differ in origin, mechanism of action and spectrum activity and are thus important and representative examples of known antibiotics.

Statement of the Problem: The emergence of antibiotic resistance is further complicated by the fact that bacteria and their resistant genes are traveling faster and further. Developing and developed countries are facing not only epidemics but also pandemic of antibiotic resistance. Data from low and middle income countries indicate that because of the development of resistance to first line using WHO recommended regimen [23, 24].One of the most pressing problems facing public health providers in many countries is ensuring rational drug use. One mechanism to ensure correct prescribing and use is (DUE) [18].

The inevitable consequences of the wide spread use of antibiotics has been the emergence of antibiotic resistant pathogens leading to an ever increasing need for new drugs and contributing to the rising cost of medical care inappropriate use and over use of medicines waste resources and result in significant patient harm in terms of poor patient outcomes and adverse drug reactions [2].

Growing misuse of antibiotics has been reported in hospitals causing unwanted toxic effects and various infections due to resistant microorganisms that increase the cost and duration of hospitalization. It is a worldwide problem with the problem being greater in developing countries through inappropriate prescribing habits an over-zealous desire to treat every infection infants and children are mostly suffering from. Such problems are important to primary health care [8, 13]. The fact that the fate of infants and children is decided by parents or any other third party can have a negative impact on the provision of health care for them. The increasing use of antibiotics empirically and the prescription of unnecessary antibiotics has already been reported. The roles of health workers in the selection of antibiotics for pediatric patients are crucial [13].

The rational use of drugs demands prescription of appropriate drugs, availability of drugs, right time, in right dose intervals for the duration of time for the right patient and at affordable price [26, 20]. A pattern of drug utilization study In Jimma teaching hospital in 2005, indicate that the practice of polypharmacy overuse of antibiotics and injections were wide spread. The survey reveals that acquired habits patients demand and lack of drug information were the major underlying factors for irrational prescribing [27]. This study mainly focused on identifying further problems on rational use of antibiotics for pediatrics at NRH.

Significance of the Study: DUE may be applied to a drug or therapeutic class, or diagnosis. Through its focus on the system of drug use, DUE helps to identify actual and potential drug-related problems, resolve actual drug-related problems and prevent potential drug-related problems that could interfere with achieving optimum outcomes from drug therapy [3].

The current study is aimed to assess the current proper use of antibiotics for pediatrics, correlate it with specific variable and provide the baseline data for further investigations or qualitative research in order to determine the main factors which contribute to inappropriate using/prescribing behavior and for targeting future interventions, i.e. this study would serve as the basis for follow up intervention. From the measurement of performance in antibiotics use practices by health providers in their treatment with antibiotics, this study in addition to other similar studies will help in developing strategies or essential drug list guideline for rational use of drugs at the level of hospital in terms of more appropriate prescribing and use of antibiotics by dissemination of the results to health authorities and policy makers. The result of this study is therefore useful to improve the rational use of antibiotics for pediatrics at selected health institutions by assessing prescribing pattern, most frequently prescribed antibiotics, extent of antibiotic combination used and by forwarding necessary recommendations to responsible body.

Objectives of the Study: As a general objective this study is to evaluate antibiotic use pattern in pediatrics at NRH and specifically to determine the type of antibiotics most commonly prescribed, conduct drug utilization review on the patient card specifically on antibiotics, assess the combination of antibiotic used, asses possible potential drug-drug interaction and assess factors that affect drug utilization pattern in pediatrics.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted from Feb.1 to May 30/ 2013 at NRH which found in Nekemte Town, East Wollege Zone, Oromia region, West

Ethiopia. Nekemte town is located 333 km far away from North of Addis Ababa. It has a population of 84,506 according to a census [28].

The area is well known by its coffee production. The climatic condition of the area is 'Woinadega' and it is found at 2080 m above sea level. According to the information from Nekemte health bureau shows that there are 99 health institutions in the town, of which 41 are private, 4 governmental (including one referral hospital) and the rest are health institutions that run by NGO's.

The selected health institution was assumed to be a representative to conduct the study. There are a number of cooperative health professional workers (Medical Doctors, Health Officer, Pharmacists, Druggist, Nurses, Laboratory Technician, etc) and administrative staffs. Those health facilities found in Nekemte Town (both governmental and private sectors) are burden in their service provision. There are currently around 414 health professionals working in the private and public sectors including,7 pharmacist, 23 GPs, 2 gynecologist, 4 surgeon, 156 nurse all types and 3 health officer specialists (Nekemte Town Health Bureau).

Methods: The prescribing pattern of antibiotic study was conducted at NRH which is found in Nekemte Town, East Wollega and West Ethiopia. The number of patients to be included in the study was determined based on number of population using sampling method of scientific statistical calculation.

A retrospective study on Medical records of pediatric patients of age falls between 1 month and 14 years were reviewed. Systematically the patient card was selected for the study. Patient characteristics such as age, sex, body weights, drugs taken/recommended and duration of treatment are noted. Moreover, drug data, including name of the drug, dosage regimen (form, route, frequency and duration) and the date on which the pharmacotherapy was instituted were recorded. Intravenous fluids, blood transfusion and nutritional preparations were not included in the study.

Study Design: Retrospective cross-sectional study design with systematic random sampling method on drug use evaluation was conducted using patient medical card, based on Ethiopian treatment guide line for general hospital.

Study Population: All pediatric patients' medical cards at NRH with prescribed drug(s) from October 01/2012 to December 30/2012 were used as the source of information. Those Pediatric patients with at least one antibiotic drug prescribed on their medical card at a selected health institution were included in this study.

Sampling Methods and Sample Size Determination: Systematic random sampling method was selected as an appropriate sampling method for patient card sampling. Sample size was determined after collecting all patient cards that at least contain one antibiotic within the study period from the selected health facility. The size of the sample can be determined as follows:

- If the number of population is greater than 10,000, it can be calculated as follows

$$n_i = \frac{z^2 p\,(1-p)}{W^2}$$

where:
Z=confidence level
P=estimate of the population
W=margin of error.

When: Z=1.96, P= 0.5,and W= 0.05!

$$n_i = \frac{(1.96)^2(0.5)(1-0.5)}{(0.05)^2}$$

$$= 384.16 \sim 384$$

- If the number of population is less than 10,000, it can be calculated by using adjustment formula $(\text{i.e.} = \frac{ni}{1+\frac{ni}{N}})$

But, since my study population was less than 10,000, which is about 3057 excluding repeated patients. So, I should use adjustment formula to calculate the sample size as follows:-

$$nf = \frac{ni}{1+\frac{ni}{N}}$$

where:
ni =initial sample size
nf = final sample size
N= number of population

So the sample size becomes:- $nf = \frac{384}{1+\frac{384}{3057}} = 341$

Accordingly, 341 were sampled as the target to get the required data on antibiotic evaluation.

Data Collection: After all preliminary preparations were completed orientation was given to three selected patient card room workers those that facilitate to collect data on the prepared format.

Data Processing and Analyzing: The data collected from the patient's medical card was coded, categorized, analyzed using scientific calculators, Excel spreadsheet and interpreted. Different variables like dosage regimen, drug-drug interaction, contra indication, inappropriate indication, age, weight, sex, co-administered drug, co-morbid disease. The result was presented using tables and figures. Finally, it was compared with/evaluated against standard treatment guideline of Ethiopia, for referral hospitals.

Data Quality Control: The data was collected by the principal investigator and its completeness was checked throughout the collection.

Problems Encounter: The workers were too busy to select cards and hence prolong data collection period and most of the information written on the patients' medical card was not completed.

Ethical Consideration: A formal letter was written by Wollega University to selected health institutions in order to get permission to conduct the study. Any staff, including those who work in record office will be respected and permission for any cooperation was politely asked. The confidentiality of the patients' medical card was secured by not using their name during data collection and hence I was using their card number.

Operational Definitions

Antibiotics: Are substances produced by micro organisms and used to treat bacterial infections by killing or inhibiting their growth. It includes penicillin (crystalline penicillin, amoxicillin, & others), topical anti infective and other antibiotics (cephalosporin, cotrimoxazole).

Dose: The amount of drug taken at a time.

Drug Use Evaluation: Is a performance improvement method that focuses on evaluating and improving drug use processes to achieve optimal patient outcomes.

Infants: Children of less than 12 months.

Rational Use of Drugs: Is the process of prescribing right drug for right patient at right time, frequency and for right duration of time as well as correct dispensing and correct use of the drug by the patient.

Empirical Treatment: is an administration of drugs without an identification of causative agent.

Kinetic Treatment: Treatment performed after definitive identification of the causative agent.

Prophylactic Treatment: Administration of drugs to prevent possible infection before its occurrence.

Neonate: New born especially less than one month of age.

Children: A young person between birth and puberty.

Pediatrics: The branch of medicine concerned with the care and development of children and with the prevention and treatment of children's diseases.

RESULTS

Out of the total 3,057 pediatric patients came to NRH between October 1 to December 30, 2012; 341 cases were selected as appropriate sample size which treated with at least one antibiotic, by scientific statistical sample size determination formula criteria to evaluate appropriate use of antibiotics. The ratio of male to female was 1.11:1. Table 1 shows age and sex distribution of patients; and the most age group treated by antibiotics were 1-5 year which accounts 147 (43.11%) where 78 (22.9%) were males and 69 (20.2%) were females. While the least age group treated by antibiotics were those of less than six months.

In this study, the total of 579 drugs including antibiotics were prescribed to the total of 341 patients; out of which 373 (64.42%) were antibiotics. From the total of antibiotics, Cotrimoxazole 88 (23.59%) was the most frequently prescribed followed by Amoxicillin 80 (21.45%). Doxycycline and Procaine Penicillin Fortified were prescribed for only two patients each and Norfloxacin and Azithromycin were prescribed for one patient each. The most commonly prescribed antibiotics and their classes are presented in Table 2 and 3 respectively.

Table 1: Pediatric patient characteristics /Age and Sex Distribution / at NRH, East Wollega, Oromia, Ethiopia, 2013

Parameters			
Sex	Age	Frequency	Percentage (%)
Male	4wks-23wks	15	4.4
	6months-47wks	30	8.8
	1year-5y & 11mon	78	22.9
	6year-14year	56	16.4
Sub total	179	52.5	
Female	4wks-23wks	15	4.4
	6months-47wks	14	4.1
	1year-5y & 11mon	69	20.2
	6year-14yea r	64	18.8
Subtotal	162	47.5	
Grand Total	341	100.0	

Table 2: Most commonly prescribed antibiotics for pediatrics at NRH, East Wollega, Oromia, Ethiopia, 2013

Antibiotics	Frequency	Percentage (%)
Cotrimoxazole	88	23.59
Amoxilline	80	21.45
Chloramphenicol	34	9.12
Gentamicine	33	8.85
Cephalexin	30	8.04
Ceftriaxone	27	7.24
Crystalline penicillin	22	5.90
Cloxacilline	21	5.63
Erythromycin	14	3.75
Ciprofloxacin	6	1.61
Augmentin	5	1.34
Ampicilline	4	1.07
Ben. Penicillin	3	0.80
Procaine penicillin Fortified.	2	0.54
Doxicycline	2	0.54
Norfloxacin	1	0.27
Azithromycin	1	0.27
Total	373	100.00

Table 3: Most commonly prescribed classes of antibiotics for pediatrics at NRH, East Wollega, Oromia, Ethiopia, 2013

Classes of antibiotics	Frequency	Percentage (%)
Penicillin	137	36.73
Sulfonamides	88	23.59
Cephalosporin	57	15.28
Aminoglycosides	40	10.72
Chloramphenicol	34	9.12
Macrolides	15	4.02
Tetracycline	2	0.54
Total	373	100.00

Table 4: Number of antibiotics prescribed per patient at NRH, East Wollega, Oromia, Ethiopia, 2013

Number of antibiotics per patients	Frequency	Percentage (%)
One	282	82.7
Two	59	17.3
Total	341	100.0

Table 5: Antibiotic treatment type for pediatrics at NRH, East Wollega, Oromia, Ethiopia, 2013

Treatment type	Frequency	Percentage (%)
Prophylactic treatment	10	2.93
Empirical treatment	285	83.58
Kinetic/definitive treatment	46	13.49

Combination of antibiotic therapy was not exaggerated practice in NRH when compared to other some studies. Out of the total prescription 59 (17.3%) contains two antibiotics. Mostly, 272(82.7%) patients were prescribed with one antibiotic. According to this study, the average number of antibiotics per patient was 1.09.

As the above table shows, most antibiotics were prescribed for empirical treatment and least as prophylactic treatment, 285(83.58%) and 10(2.93%), respectively.

Table 6 indicates, 62(16.62%), 28(7.51%) and 39(10.46%) were corresponds to inappropriate dose, frequency and duration; respectively and 44(11.80%), 11(2.95%) and 86(23.06%) were not indicated dose, frequency and duration; respectively. The dosage regimen indicated and not indicated for antibiotics prescribed at NRH is presented by Table 6 below.

Based on dosage regimen the age and disease were considered as patient factors to say appropriate or inappropriate. According to Table7 record shows the same drug for the same disease prescribed for different age group and body weight either as over dose or under dose; and greater than or less than duration of therapy as compared to Ethiopian Treatment Guideline. Here, therefore comparatively the prescribing pattern was not equivalent to that of Ethiopian STGs for referral hospital.

Even if prescribing combination of antibiotics was less frequent and not more than two was found as per this study, it's not as easy as it seems. Here below according to Table 7 about 30(50.85%) have a potential drug-drug interaction among antibiotics.

DISCUSSION

The use of antibiotics in pediatric ward is justifiable practice even though it requires a regular review of the chosen regimen to maximize the benefit of the patient [18]. In this study, 2310(75.56%) of the total pediatric patients at NRH between Oct. 1 and Dec 30/ 2012, was treated with at least one antibiotic. This shows that there is high incidence of antibiotic prescribing in NRH as compared with WHO indicator which accounts 39.15% and study conducted at North West Ethiopia in three hospitals

Table 6: Appropriateness of antibiotics prescribed for pediatrics at NRH, East Wollega, Oromia, Ethiopia, 2013

	Dosage regimen								
	Dose			Frequency			Duration		
Antibiotics	AP	IA	NI	AP	IA	NI	AP	IA	NI
Cotrimoxazole	67	13	8	85	-	3	77	10	1
Amoxilline	58	17	5	78	-	2	75	5	
Chloramphenicol	25	6	3	34	-		16	13	5
Gentamycine	21	3	9	21	10	2	17	5	11
Cephalexin	23	-	7	16	14		22	-	8
Ceftriaxon	27	-		27	-	-	-	-	27
Cryst. Penicillin	13	7	2	22	-	-	-	-	22
Others	33	16	10	51	4	4	41	6	12
Total	267	62	44	334	28	11	248	39	86
Key	*:AP=Appropriate*			*IA=Inappropriate*			*NI=Not indicated*		

Table 7: Comparison of dosage regimens of two antibiotics prescribed at NRH East Wollega, Oromia, Ethiopia, 2013

				Dose		Frequency		Duration	
Antibiotics	Disease	Age of Patient	Weight of Patient	Recommended	As per STG	Recommended	As per STG	Recommended	As per STG
Cotrimoxazole	Gastroenteritis	1.5year	9.5kg	120mg	240mg	BID	BID	7days	5days
		2year	9kg	120mg	240mg	BID	BID	7days	5days
		5mon	7.5kg	240mg	120mg	BID	BID	7days	5days
		5year	17kg	240mg	408mg	BID	BID	7days	5days
		7year	22.5kg	720mg	540mg	BID	BID	7days	5days
	Typhoid fever	8mon	-	240mg	240mg	BID	BID	5days	14days
		2.5year	15.5kg	240mg	240mg	BID	BID	7days	14days
		3.5year	13kg	480mg	240mg	BID	BID	7days	14days
		4year	13kg	360mg	240mg	BID	BID	7days	14days
	URTI	2year	10kg	360mg	240mg	BID	BID	5days	5-7days
		3year	11kg	360mg	240mg	BID	BID	5days	5-7days
Amoxilline	pneumonia	2year	11.5kg	250mg	172.5mg	TID	TID	7days	5days
		2mon	3kg	250mg	45mg	TID	TID	7days	5days
		6year	10kg	250mg	150mg	TID	TID	7days	5days
	Tonsillitis	11mon	9kg	62.5mg	135mg	TID	TID	7days	5-7days
		1.5year	14kg	125mg	210mg	TID	TID	7days	5-7days
		10year	22kg	250mg	330mg	TID	TID	7days	5-7days
		10year	28kg	250mg	420mg	TID	TID	7days	5-7days

Table 8: Potential drug-drug interaction between some concomitantly prescribed drugs at NRH, East Wollega, Oromia, Ethiopia, 2013

Drug combined	Frequency	Potential Interaction
Ceftriaxone + Furosemide	2	Increase nephrotoxicity of cephalosporin
Furosemide + Digoxine	3	Increase risk of cardiac arrhythmias with digitalis(due to electrolyte imbalance)
Furosemide + Diclofenac	1	Decrease natriuretic and antihypertensive effects with NSAIDs
Ceftriaxone + Ringer lactate	2	Formation of ceftriaxone-calcium precipitate
Cephalexin + Gentamicin	9	Increased nephrotoxicity with aminoglycosides
Ciprofloxacine + antacids	1	Decreased absorption with antacids
Genta. + CAF, Cipro. + Doxy., cloxa. + CAF, CAF + Genta, CAF + Cry. Pen., Amoxi. + CAF	12	Bacteriostatic decrease the effect of bactericidal activity.

Key: Genta = gentamicine,Cloxa = cloxacilline, Cipro =cipirofloxacine, Cry. Pen = crystalline penicillin, Doxy = doxycycline, Amoxi = amoxilline

39.9%, 41.9% and 64.1% were received antibiotics; respectively [14]. According to this study the most commonly prescribed antibiotics were Cotrimoxazole, Amoxilline and Chloramphenicol and Crystallin Penicillin, Gentamicine and Ampicilline at Jimma Specialized Hospital [27].

One of the factors that should be considered in antibiotic selection is the cost of antibiotics. In this study, amongantibiotics, orally administered drugs contributed to the higher proportion 276(74%), of which Cotrimoxazole was the most leading one 88(31.88%) and followed by amoxicillin 80(28.99%). 97(26%) were parent-rally

administered and Gentamicin was the most leading parent-rally administered antibiotic 34 (35.05%), it was mostly indicated for the treatment of severe pneumonia. The study result was almost near to the WHO indicator of percentage of prescription with an injection which accounts 22.63%. It only violates and exceed by 3.37%. This may be because of awareness of physicians concerning ADR and cost effectiveness of the drug.

Despite the ability of antimicrobial therapy to prevent or control, drug interaction, side effects and contra indications limit the effectiveness of antimicrobial therapy. Although the simultaneous use of two or more antibiotics has a certain rational indiscriminate or routine use of antibiotic combination may have several negative consequences primarily the patient. Risk of toxicity from two or more antibiotics, increased cost and the emergence of drug resistance are some appropriate combination of the antibiotics. The uses of combination antibiotics were commonly observed in this study that the maximum number of antibiotics prescribed simultaneously per patient was found. Here 59(17.3%) antibiotics were prescribed in combination and 43% in Jimma Specialized Hospital [27]. According to this study the maximum number of antibiotics per patient was two. From other studies report four and seven at North-West of three hospitals [14] and Jimma Specialized Hospital [27]. The most commonly combined antibiotics were Ceftriaxone + Gentamicin 16(27.12%), followed by Cephalexin + Gentamicin 12(20.34%) and Cloxacillin +CAF 10(16.95%). Here Gentamicine was widely used combined with other antibiotics but Ampicilline according to study conducted at North-West of three hospitals [14]. The average number of drugs per encounter was 1.7 which isless than that of WHO indicator 2.04 and that of antibiotics was 1.09 which is higher than that of WHO indicator 0.47 for average number of drugs and average number of antibiotics per patient respectively but less than according to the study conducted in South West Ethiopia Jimma Specialized hospital in 2005,in which the average number of drugs used per patient was 2.9 and during the study no weight record data was found for 48% of pediatric patients [27].

Drug interactions are some of the most common causes of adverse drug reactions it may be additive, synergism, potentiating, or antagonism. It is always important to note the possible drug interaction prior to concomitant drug administration. In addition, more than three concomitantly prescribed drugs were expected to cause drug-drug interaction. There was less incidence of use antibiotic combination in NRH (17.3%) as compared to the study done in Ethiopia, Jimma specialized hospital (43%).

According to this study out of the total prescription 59 (17.3%) contains two antibiotics. Mostly, 272(82.7%) patients were prescribed with one antibiotic. The most commonly prescribed classes of antibiotics here identified were Penicillin's, Sulfonamides and Cephalosporin's. This result is in line with study conducted at primary care unit in Taiwan, the highest group of patients used antibiotics in three study periods were pediatrics, among which 82.4% received one, 15% received two antibiotics. The most commonly prescribed antibiotics were Penicillin's, Macrolides and Cephalosporin [24].

The optimal plasma concentration and course of treatment of antibiotics is crucial to maintain its effectiveness and safety. Frequency and duration by which antibiotics prescribed is therefore very important to pay attention most antibiotics were prescribed in the frequency of twice per day (BID) and few antibiotic were prescribed in the frequency of once per day (QD) for five, seven, or more days.

Although age is commonly used to compute dose of drugs in children, weight is frequently used to calculate pediatric dose of antibiotics. Failure to take weight may lead to incorrect dose calculation as weight is difficult to estimate from age of patient [29]. In this study, 99(29.03%) of the patients medical card has no body weight recorded.

Antibiotics are not effective if not used on the basis of specific type of infection in proper dose, frequency and duration. Antibiotic may be harmful and there is merely waste of money if not used properly. Inappropriate prescribing involves over prescribing & under prescribing including dose, frequency and duration. In this study, inappropriate dose, frequency and duration was commonly observed and 101(28.42%) dose related of which 62(16.67) was inappropriate dose; 28(7.53) frequency related of which 17(4.56%) was inappropriate frequency and 125(33.51%) duration related of which 86(23.06%) was not indicated duration in most medical cards reviewed and according to the study conducted at Jimma Specialized Hospital 59(24%) of prescription were inappropriate. Such inappropriate prescribing may be because of lack of materials (E.g. STGs, antibiotic prescribing guideline and policy) and overlooking the side effect of drug on the patient, community and economy. Almost 50% of all antibiotics prescriptions are inappropriate for infant and children admitted to hospital [30].

Antibiotics are used for empirical, Kinetic and prophylactic therapy. When used as empirical therapy, antibiotic should cover all the likely pathogen, because the infecting organism has not yet been identified. As this study indicate and other studies also show [31] most antibiotics were prescribed for empirical treatment. Table 5 above shows more than 83% of recommended antibiotics were empirically used.

CONCLUSION AND RECOMMANDATION

The final study result shows from the total of 579 drugs prescribed for the total of 341 pediatric patients 64.4%. Were antibiotics and when looking toward the specific antibiotic Cotrimoxazole 88(23.59%) was the most prescribed one & followed by Amoxicillin 21.45%. Whereas considering class of antibiotics, the most leading class prescribed was penicillin 36.73%. There were also inappropriate dose 16.62%, frequency 7.51% and duration 10.46% identified on the patient medical card. The study also identified that 17.3% patients were prescribed with two (combination of) antibiotic and 82.7% patients were prescribed with only one antibiotic's. From these two concomitantly prescribed drugs were identified, more than seven possesses potential drug-drug interaction. Out of the total prescribed antibiotics 97 (26%) were parent rally administered and Gentamicin was the most leading 34 (35.05%) one. From the obtained result of the study, the following recommendations like prescribers have to always note possible drug-drug interactions prior to concomitant drug administration, prescribers have to document all necessary information on patient's medical card, prescribers have to minimize empirical antibiotic prescribing as much as possible, the hospital should provide all necessary references including STG and antibiotic prescribing policy for prescribers, to reduce or limit inappropriate drug prescribing; professional group work are important. E.g. physicians/pediatrician, clinical pharmacist, etc.

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