

*Full Length Research Paper*

# Assessment of the pattern of antibiotics use in pediatrics ward of Dessie Referral Hospital, North East Ethiopia

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The main purpose is to assess the prescribing practice of antibiotic in pediatrics ward of DRH, North East Ethiopia. **Methods:** A hospital-based retrospective cross sectional study was used to assess patient cards for the past 1 year (June 2012- May 2013). **Results:** About 98 % of pediatrics was prescribed with at least one antibiotic. The most common diagnoses were severe pneumonia (19.6%) and Acute Gastroenteritis (AGE) with some dehydration (10.3%). The most commonly prescribed single antibiotics was crystalline penicillin (33.3%) and multiple antibiotics were ampicillin and gentamicin (62.9%). Accordingly, parenteral route accounted for 377(76%) and with a practice of parenteral to oral shift upon discharge in only 7.9% of cases. The average number of drugs per patient was  $1.70\pm 0.93$  and antibiotics per patient were  $1.457\pm 0.599$ . More than 61.51% of the patients were exposed to at least two drugs. **Conclusion:** There is high percentage of antibiotics use in pediatrics ward of DRH and even some of them administered without proper indication. Proper treatment guidelines and policies should be practiced to promote judicious use of antibiotics.

**Key words:** Antibiotic, pattern, pediatrics, Dessie referral hospital.

## INTRODUCTION

Antibiotics are drugs taken to kill or inhibit the growth of microorganisms. Antibiotics are strong and effective medicines which are used to treat most different bacterial infections (Woldu et al., 2013). When antibiotics were first introduced, they were strong and efficient treatments for different bacterial infections. Antibiotics saved the lives of

numerous people. However, some bacteria change themselves and produce resistance to antibiotics. Consequently, the number of people dying from infectious diseases is mounting up from time to time due to absence of proper treatment. It is evident that the adverse effect of irrational use of antibiotics is more

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serious among children than adults (Abula and Desta, 1999). Misuse/overuse of antibiotics may cause increased adverse effects, resistance to antibiotics, making illnesses more serious, and increasing expenses of health services. In developing countries, antibiotics are prescribed for 44 to 97% of hospitalized patients often unnecessarily or inappropriately (Baktygul, 2011).

Ethiopian hospitals consume about 50% of the National drug budget, which are considered to have high drug budget compared to the population segment using these health facilities. However, very little is known how drugs (particularly antibiotics) are used in hospitals like in other health facilities (Abula and Kedir, 2004).

Information about the utilization of drugs particularly the prescribing pattern of drugs in pediatric wards in Ethiopia is scanty as yet (Abula and Desta, 1999). In developing countries, empirical use of antibiotics is a common practice including Dessie Referral Hospital (DRH). This situation could cause a serious resistance problem unless it is studied periodically in different parts of Ethiopia. Therefore, this situation calls for a need to investigate the pattern of antibiotics use so that we can be in a position to use it for the better. In this regard, infants and children are more exposed to become victims of these disastrous consequences of inappropriate use of antibiotics as these groups of people are frequently caught by various illnesses. Hence, health care professionals, parents and caregivers should know about the judicious use and the negative impact of antibiotics so that they can make informed decisions about it. The outcomes of this study help all concerned bodies to identify the pattern of antibiotic use in DRH Pediatric Ward. Therefore, the study is significant in portraying the actual practice of antibiotic use.

## METHODOLOGY

### Study area and period

DRH is located in the North East part of Ethiopia, in Dessie town. It is found 401 km away from Addis Ababa, the capital city of Ethiopia towards North East direction. The study was conducted from May to July, 2013.

### Study design

A hospital-based retrospective cross sectional study was used to assess patient cards. All patient records were assessed for the past 1 year (June, 2012 to May, 2013). A structured and pre-tested questionnaire was prepared to collect the information.

### Sampling technique and sample size determination

From a total of 2951 pediatric patients admitted from June 2012 to

May, 2013, the sample size was calculated as 296 by considering 74% proportion (2), confidence interval of 95%, margin of error 5% and adding 10% of samples for those with incomplete cards.

### Variables

Antibiotics use was the dependent variable while age, sex, weight, residence of patients, assessment (diagnosis) were the independent variables

### Data collection and instruments

In order to collect data, the researcher was used patients' medication records. The data was collected using structured data collection format. After that the collected data was analyzed using SPSS version 16. Interpretation, conclusion and recommendations were drawn afterwards.

### Inclusion and exclusion criteria

The inclusion criteria for the study population include all pediatric population admitted to DRH with in this period. The exclusion criteria include those who admitted to the HIV clinic and TB clinic are not included in the study.

### Operational definition

**Generic drug:** The Essential Drug List of Ethiopia is used as a basis to determine drugs as generic or brand name.

**Pediatrics:** Children having the age of 0 to 14.

## RESULTS

From a total of 296 patients whose records fulfilled the inclusion criteria, five medical records were excluded due to incomplete medical records; hence a total of 291 medical records were investigated. Of the total of (n = 291) pediatric patient medical records, almost half of the patients (54.3%) were male and the rest (45.7%) were females. More than half of the pediatric patients (65%) came from areas outside Dessie city and the remaining (35.1%) were within the city. The mean age of pediatric was  $3.32 \pm 3.876$  years and the majority of patients were neonates and infants (44.32%) followed by toddlers (24.47%) as shown in Table 1.

As shown in Table 2, the most common diagnoses were severe pneumonia (19.6%), acute gastroenteritis (AGE) with some dehydration (10.3%) and early onset neonatal sepsis (EONS) (6.2%). Among patients affected by severe pneumonia, the majority of them (57.89%) were infants and neonates followed by toddlers (36.84%) and no adolescent patient were affected by severe pneumonia. In cases of AGE, half of them (50%) were

**Table 1.** Socio demographic data of patients in pediatric ward of DRH during 2012/2013 Years, Dessie, Ethiopia.

Variable	Frequency (%)
<b>Sex</b>	
Male	158(54.3)
Female	133(45.7)
<b>Age</b>	
0-1	119 (40.89)
Toddlers (b/n 1 and 3)	83 (28.52)
Preschool age (3 and 5)	28(9.6)
School age (5 and 10)	36 (12.37)
Adolescents (10 to 14)	25(8.5)
<b>Residence</b>	
Dessie Ketema	102 ( 35.1)
Kombolcha	32 ( 35.1)
Dessie Zuria	11 ( 3.8)
Other places*	146 ( 50.2)

**Table 2.** The eleven top most diseases of pediatrics (n=291) Pediatric Ward of DRH, during 2012/2013 Years, Dessie, Ethiopia.

Assessment	Frequency (%)
Severe pneumonia	57(19.6)
AGE with some DHN	30(10.3)
EONS	18(6.2)
AGE with severe DHN	14(4.8)
Soft tissue infection	14(4.8)
GI onset sepsis	14(4.8)
URTI	11 (3.8)
AFI	11(3.8)
Pneumonia	10(3.4)
SCAP + HAAD	9(3.1)
Acute appendicitis	8(2.7)
Others*	95(32.64)

toddlers followed by infants and neonates (40%). There was no pediatric patient affected by AGE in school age. Soft tissue infection was the most common diagnosis in school age patients.

About 98% of pediatrics was prescribed with at least one antibiotic. The average number of drugs prescribed at a time was  $1.71 \pm 0.693$  whereas average number of antibiotics per patient was  $1.457 \pm 0.5995$ . Majority of the patients (58.1%) contain multiple drugs at a time. Among these, patients with one antibiotic (55.3 %) and two antibiotics (39.9%) are common (Figure 1). Accordingly, this study showed that out of the 521 total number of medication prescribed, parenteral route accounted for

**Table 3.** The Frequency and Percentage of single prescribed antibiotics in pediatric Ward of DRH during 2012/2013 Years, Dessie, Ethiopia.

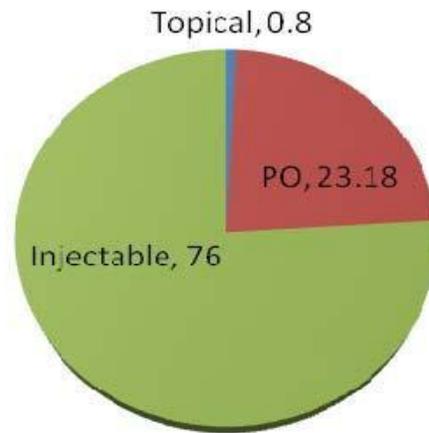
Individual antibiotic	Frequency (%)
Crystallin penicillin	55 (33.33)
Ceftriaxon	45 (27.27)
Amoxicillin	26 (15.75)
Cotrimoxazole	13 (7.8)
Ampicillin	8 (4.8)
Cloxacillin	6 (3.6)
Cefalexin	5 (3.03)
Augumentin	2 (1.21)
Enhensine	2 (1.21)
Erythromycin syrup	1 (0.60)
CAF	1 (0.60)
Myconazol	1 (0.60)
Total	165 (100)

**Table 4.** The frequency and percentage of multiple antibiotic prescriptions in pediatric Ward of DRH, during 2012/2013 year, Dessie, Ethiopia.

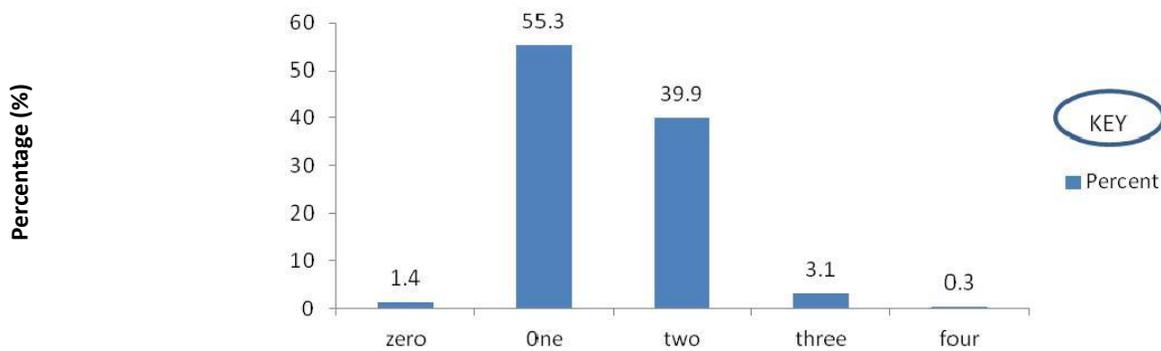
Combined antibiotics	Frequency (%)
Ampicillin + Gentamicin	78 (62.9)
Cloxacillin + Chloramphenicol	9 (7.2)
Ceftriaxon + Gentamicin	6 (4.8)
Ceftriaxon + Metronidazol	4
Ceftriaxon + Cry. penicillin	3
Ampicillin + Chloramphenicol	3
Cloxacillin+Nitrofurazone	2
Ceftriaxon+Doxycycline	2
Cloxacillin+Metronidazol	2
Ampicillin+Gentamicin+Metronidazol	2
Amoxicillin+Ampicillin+Gentamicin	2
Others*	9
Total	124

76% (Figure 2) and with a practice of parenteral to oral shift upon discharge in only 23 (7.9%) of cases. The most common discharged oral medications include amoxicillin (52%) and cotrimoxazole (26%). Among the total of 521 drugs, the proportion of drugs prescribed in generic name was 96.6%.

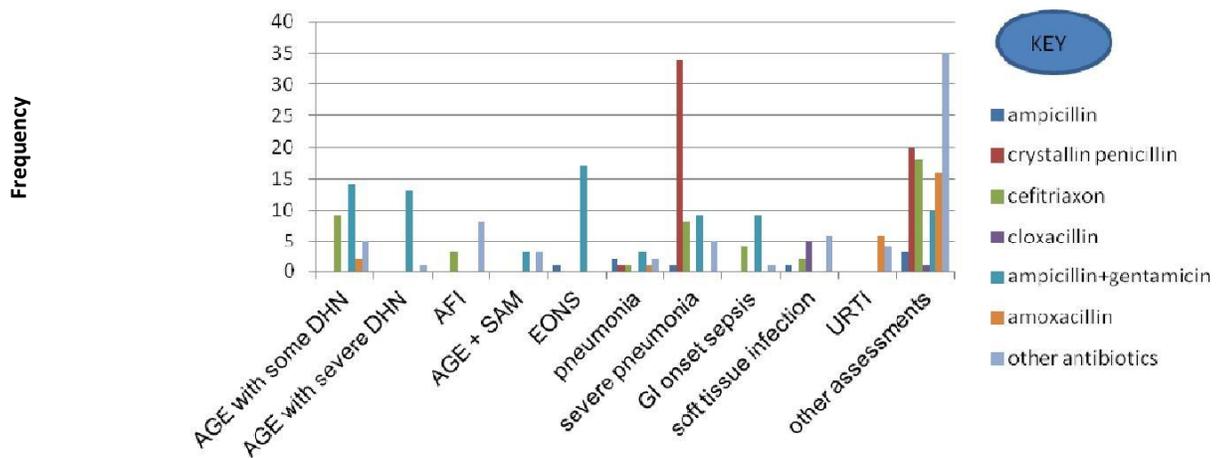
Of all prescribed drugs, the most commonly prescribed antibiotics were crystalline penicillin (33.3%), ceftriaxone (27.3%) and amoxicillin (15.8%). The most commonly prescribed multiple antibiotic regimens were ampicillin and gentamicin (62.9%), cloxacillin and chloramphenicol (7.2%), ceftriaxon and gantamicin (4.8%) (Tables 3 and 4). The injections were commonly co-administered with



**Figure 1.** The percent of injectables, POs and topical drugs used by patients in pediatric ward of DRH, during 2012/2013 years, Dessie, Ethiopia.



**Figure 2.** The percentage of antibiotics used by patients in pediatric ward of DRH during 2012/2013 years, Dessie, Ethiopia.



**Figure 3.** The frequency and percentage of antibiotics and assessments pediatric ward of DRH, during 2012/2013 years, Dessie, Ethiopia.

frequently used combination in DRH and it was used for the treatment of wide variety of diseases like EONS, AGE with dehydration, severe pneumonia and GI onset sepsis. In addition to the mentioned indications, ceftriaxone was recommended in acute febrile illness and soft tissue infection. Cloxacillin was mostly used for the treatment of soft tissue infection in DRH. Amoxicillin was mostly used for the treatment of upper respiratory tract infections (URTI) and in a lesser extent it was used for the treatment of diseases like AGE with some DHN and pneumonia (Figure 3).

## DISCUSSION

Antibiotics represent one of the most commonly used drugs in pediatrics ward. Their irrational use leads to a number of consequences in terms of cost, drug interactions, hospital stay, bacterial resistance and increased medication error (Woldu et al., 2013; Zeleke et al., 2014). According to this study, the most frequent clinical indication was severe pneumonia followed by acute gastroenteritis which is similar to the studies done in Bishoftu (Feleke et al., 2013), Jimma (Agalu and Mengistu, 2012) and Nepal (Palikh, 2004).

The major problematic area from this study was high use of antibiotics (98%) which is higher as compared to a report in Jimma hospital (44.9%) by Agalu and Mengistu (2012) and in Arulmoli et al. (2009) (54%). This high percentage was also reported by Palikh (2004) (93%). Similarly, study done by (Bosu and Afori-Adjei 1997) again showed the variation in average percentage of patients receiving at least one antibiotic, which was 41, 45, 79 and 98% in different health centers. It is not possible to draw any firm conclusion since the patients are not matched socio- economically. The morbidity pattern may also be different. Moreover, around half of patients that came from outside the Dessie city and even the patients living in Dessie need referral to get treatment in Dessie. But one of contributing factors for high use of antibiotics will be the empirical use of antibiotics and use of antibiotics without proper indication like congestive heart failure, uncomplicated measles, moderate croup which do not require antibiotic treatment.

In this study, most commonly prescribed antibiotics in DRH pediatrics ward are crystalline penicillin and ceftriaxone similar to reports in Gondar, Debretabor (Abula and Desta, 1999) and Nepal (Palikh, 2004). But in these hospitals the second most common drug was chloramphenicol and was the most common drug in Bahirdar hospital (Abula and Desta, 1999) which once a time was widely used. Chloramphenicol nowadays is replaced by other antibiotics like cotrimoxazole and

amoxacillin in Jimma (Agalu and Mekonnen, 2012) and third generation cephalosporins like ceftriaxone in Bishoftu (Feleke et al., 2013) and India (Kanish et al., 2014) and cefotaxime in Indonesia (Husni et al., 2004). Chloramphenicol use must be reserved in neonates as it can cause gray baby syndrome at toxic doses (Wardoyo and Tifoid, 2002).

Unlike this study, the most common drugs in pediatrics ward of Iran are amikacin and vancomycin (Mohammadi et al., 2013). This wider variability in commonly prescribed antibiotics might be due to empiric therapy throughout developing countries. In this study, the common practice of crystalline penicillin might be due to high prevalence of severe pneumonia in pediatrics in the area which is best managed by crystalline penicillin as per Ethiopian treatment guideline. The most commonly prescribed combined antibiotic medications were ampicillin and gentamicin (62.9%), whereas in Indonesia, the most common combination of antibiotics are ampicillin and chloramphenicol (Husni et al., 2004). World Health Organization has recommended the use of this type of antibiotics combination in developing countries for empiric therapy and because of this, the ampicillin and gentamicin combination can be used in a wide variety of disease conditions in pediatrics due to the synergistic effect of the combination.

Another problematic area is the high use of injectables. A total of 377 pediatric patients (76%) received injectable antibiotics. One explanation of such high use of injectable antibiotics could be due to social acceptance that intravenous antibiotics are "stronger" than oral antibiotics in treating an infection during hospital stay. Some antibiotics (for example, crystalline penicillin, aminoglycosides) are not mostly available in oral form. Some infections (for example, central nervous system infections) or patients groups (for example, neonates and infants) require parenteral use. Feleke et al. (2013) reported higher administration of parenteral antibiotics (81.8%) in bishoftu, Woldu et al. in hawassa (93.6%), Kanish et al.(92%) and Sviestina and Mozgis in lativia (64-86%).The finding in this study though relatively good, still should be discouraged and switch to oral medications when there is indication must be practiced because can reduce stay at the hospital, decrease the risk of needle-borne infections like HIV/AIDS and hepatitis and can decrease administration and family-related costs(Rojas and Granados,2006; Lorgelly et al., 2010; Vouloumanou et al., 2008).

According to world health organization (WHO) recommendation, the percentage of drugs prescribed by generic name should be 100%. Prescribing and dispensing of drugs by its generic name avoids confusion between prescribers and dispensers (De Vires et al., 1994).

In our study, we found that the pattern of generic prescribing was 96.6% which is high as compared to other studies conducted in different parts of Ethiopia showed that the use of generic prescription as 70.5% in Bahirdar hospital; 72.6% in Gondar hospital; 84% in Debretabore hospital and 82% in jimma hospital (Abula and Desta, 1999; Agalu and Mekonnen, 2012).

The mean number of drugs prescribed at a time was lower compared to studies conducted in Nepal (Palikh, 2004) and in Hawassa (Woldu et al., 2013) and consistent with the WHO recommendations (WHO, 1993). The mean number of antibiotics prescribed per-prescription was low compared to similar studies conducted in other part of the world (Baktygul et al., 2011; Palikh, 2004) but higher than similar studies conducted in Hawassa (Woldu et al., 2013). The maximum number of antibiotics prescribed at a time was four in DRH, but studies in Nepal shows that 6 to 7 antibiotics prescribed at once. The percentage of multiple antibiotics used in the study area (44.7%) was consistent with other findings in Hawassa (45.3%) (Woldu et al., 2013), but lower than studies conducted in Nepal that is, 79% (Palikh, 2004). Infants less than one year received anti biotic more frequently was similar with that of the study done in Nepal (Palikh, 2004). This could be due to physician behavior in ordering medication in association with age.

### LIMITATION OF THE STUDY

The possible limitation of the study was incomplete patient charts as all necessary information were not recorded: weight, body mass index (BMI), mid upper arm circumference (MUAC), duration of therapy, frequency, etc. Hence the appropriateness of the antibiotics was difficult to determine.

### Conclusion

This study gives an overview of the pattern of antibiotic use in the study area. Generally, we can conclude that there was:

1. High percentage of antibiotics use in pediatrics ward of DRH and even some of them administered without proper indication.
2. Crystalline penicillin and ceftriaxone were the most frequently prescribed single antibiotics while ampicillin and gentamicin injection was the most frequently prescribed combined antibiotics.
3. There was good generic prescription but there is still high percentage of injectables.

### RECOMMENDATIONS

The high percentage of patients charts involving injectable antibiotics observed in DRH requires rational use of antibiotics and judicious prescribing. We recommend proper interventions that could lead to the reduction in antibiotics overuse which may include:

1. Health education campaigns and professional education for parents and health professionals.
2. The establishment of antibiotic policy with periodic assessment of the sensitivity pattern of pathogenic organisms is recommended.
3. The adoption of an international standard and locally conformable guideline of antibiotic use can help to resolve such problems.
4. The government should recruit clinical pharmacists in the study area which is very important in order to monitor the clinical use of these medications and to tackle associated factors.

### Conflict of Interest

The authors report no conflicts of interest.

### REFERENCES

- Abula T, Desta Z (1999). Prescribing pattern of drugs in pediatric wards of three Ethiopian hospitals. *Ethiop. J. Health Dev.* 13(2):135-140.
- Abula T, Kedir M (2004). The pattern of antibiotic usage in surgical in-patients of a teaching hospital, Northwest Ethiopia. *Ethiop. J. Heal Dev.* 18(1):35-38.
- Agalu A, Mekonnen H (2012). Drug prescribing practice in a pediatric ward in Ethiopia. *Int. Res. J. Pharm. Pharmacol.* 2(6):132-138.
- Arulmoli SK, Sivachandiran S, Perera BJ (2009). Prescribing patterns of antibiotics for children before admission to a paediatric ward in Jaffna Teaching Hospital Sri Lanka. *J. Child Health* 38:121-123.
- Baktygul K, Marat B, Ashirali Z, Harun-Or-rashid M, Sakamoto J (2011). An assessment of antibiotics prescribed at the secondary health-care level in the Kyrgyz Republic. *Nagoya J. Med. Sci.* 73(3-4):157-68.
- Bosu WK, Afori-Adjei D (1997). Survey of antibiotics prescribing patterns in government health facilities of the Wassa West District of Ghana. *E. Afr. Med. J.* 74(3):138-142
- De Vires GM, Henning RH, Hogortziel HV, Fresle DF (1994). Guide to good prescribing. Geneva, WHO WHO/DAP/94:11.
- Feleke M, Yenet W, Likisa JL (2013). Prescribing pattern of antibiotics in pediatric wards of Bishoftu Hospital, East Ethiopia *Int. J. Basic Clin. Pharmacol.* 2(6):718-722.
- Husni A, Abdoerrachman H, Akib A (2004). Antibiotic profile in Pediatric Wards, Cipto Mangunkusumo Hospital. *Paediatrica Indonesia* 44:3-4.
- Kanish R, Gupta K, Juneja S, Bains HS, Kaushal S (2014). Prescribing pattern of antibiotics in the department of pediatrics in a tertiary care medical college hospital in Northern India. *Asian J. Med. Sci.* 5(4).
- Lorgelly PK, Atkinson M, Lakhanpaul M, Smyth AR, Vyas H, Weston V, Stephenson T (2010). Oral versus i.v. antibiotics for community-acquired pneumonia in children: a cost-minimisation analysis. *Eur. Respir. J.* 35(4): 858-64.

- Mohammadi M, Mirrahimi B, Mousavi S, Moradi M (2013). Drug Use Evaluation of Three Widely Prescribed Antibiotics in a Teaching Hospital in East of Iran. *J. Pharm. Care* 1(3):100-103.
- Palikh N (2004). Prescribing pattern of antibiotics in pediatric hospital of Kathmandu Valley. *Kathmandu Univ. Med. J. (KUMJ)*. 2(1):6-12.
- Rojas MX, Granados C (2006). Oral antibiotics versus parenteral antibiotics for severe pneumonia in children. *Cochrane Database Syst. Rev.* 2.
- Vouloumanou EK, Rafailidis PI, Kazantzi MS, Athanasiou S, Falagas ME (2008). Early switch to oral versus intravenous antimicrobial treatment for hospitalized patients with acute pyelonephritis: a systematic review of randomized controlled trials. *Curr. Med. Res. Opin.* 24(12):3423-34.
- Wardoyo D, Tifoid D (2002). *Infeksi dan penyakit tropis*. Buku ajar IKA FKUI RSCM. Jakarta: Balai Penerbit FKUI pp. 367-75.
- WHO (1993). *How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators*. World Health Organization. Available at <http://apps.who.int/medicinedocs>. Accessed on 10 May 2013.
- Woldu MA, Suleman S, Workneh N, Berhane H (2013). Retrospective Study of Pattern of Antibiotic Use in Hawssa University Referral Hospital Pediatric Ward, Southern Ethiopia. *J. App. Pharm Sci.* 3(02):093-098.
- Zelege A, Chanie T, Woldie M (2014). Medication prescribing errors and associated factors at the pediatric wards of Dessie Referral Hospital, Northeast Ethiopia. *Int. Arch. Med.* 7(18):1-6.