IJPSR (2011), Vol. 2, Issue 7 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 05 April, 2011; received in revised form 16 May, 2011; accepted 26 June, 2011

ASSESSMENT OF INJECTION USE PRACTICES AND COMPLETENESS OF PRESCRIPTIONS: THE CASE OF AYDER REFERRAL HOSPITAL, MEKELLE, NORTHERN ETHIOPIA

Jemal Maeruf [1], Naod Gebresamuel [1], Gebremedhin Solomon [1], Hagos Abrha [2] and Girma Belachew*[1]

Department of Pharmacy, College of Health Sciences, Mekelle University [1], Mekelle, Ethiopia
Department of Medicine, College of Health Sciences, Mekelle University [2], Mekelle, Ethiopia

Keywords:

Injection, Prescription, Prevalence, Parenterals, Completeness

Correspondence to Author:

Girma Belachew

Department of Pharmacy, College of Health Sciences, Mekelle University, Mekelle, Ethiopia

ABSTRACT

Back Ground: Overuse of injections is considered as an important indicator of irrational prescribing pattern in a given health care setting owing to the invasive nature of such drug delivery system. Moreover, blood-borne diseases such as hepatitis B, hepatitis C and HIV/AIDS can be transmitted through unsafe injections due to poor injection practices and injection overuse. If the use of injections exceeds the availability of injection accessories, reuse of syringes and needles is likely. Therefore, the greater the use, the higher is the risk.

Objectives: The objective of this study was to assess injection use prevalence and completeness of information on prescriptions in Ayder Referral Hospital (ARH).

Methodology: A population based descriptive (ecological) study was conducted on prescriptions of both in- and out-patients at ARH. Of the total of 11,980, some 2880 prescriptions containing injectable drugs prescribed during the months of February and March, 2010 were reviewed.

Results: During the study period, 24% (2880) of all the prescriptions ordered were found to have consisted at least one injectable. A total of 232 different types of drugs were dispensed of which around 19% (44) were drugs administered parentally. Grossly, 4348 drugs were prescribed with in 2880 prescriptions consisting of injectables indicating the amount of drugs administered per prescription to be 1.5. It was found that 53% (1526) females and 47% (1354) males have used injectable drugs. In the prescriptions, children <15 years 25.7% (740), adults 16-39 years 50.3% (1449) and 24% (691) of users were age 40 and above. Overall, 18.2% (8) of all the prescribed parenteral drugs were antibiotics, 27.3% (12) hormones and vitamins, 18.2% (8) infusions and the rest 36.4% (16) were other drugs with different therapeutic effects.

Conclusion: With regard to the WHO limit of injection use, ARH fails to maintain the limit. The average number of drugs per prescription and the number of different types of injectables that were prescribed from National Drug List of Ethiopia were within the range of the WHO standard. Generally, there was over use of injections and incompleteness of information on some prescriptions.

INTRODUCTION: Although there are various methods of taking drugs, injection will be favored by some prescribers and users as the full effects of the drug are experienced very quickly [1]. It also bypasses first-pass metabolism in the liver, resulting in a higher bioavailability for many drugs than oral ingestion would [2]. Because of the irreversibility of the parentral route of administration and the immediate effect and contact of the drug product with the blood stream and systemic circulation, any substance that has potential toxic properties, either related to the type of substance or its dose, will be unsuitable for parentral administration or will have restrictions for the maximum amount to be in the formulation. For example, the choice of antimicrobial preservative agents for parentral administration are very limited, and even those agents that are acceptable have limits on how much of the agent can be contained in marketed dosage form. Similar restrictions exist for antioxidants, surface active agents, solubilizers, cosolvents, and other drug stabilizers [1].

Unsafe injection practices in developing countries have been reported to occur in between 15 and 50% of cases [2-8]. Injection overuse is indicated by a high proportion of prescriptions detailing at least one injection [3, 4]. In India, it has been reported that more than 93% of injections are unsafe and nearly 60% of cases of HBV infection are caused by such practices [8]. Throughout the world, diseases most frequently transmitted through unsafe injection practice are hepatitis B (estimated 21 million cases per year), hepatitis C (estimated 2 million cases per year) and HIV/AIDS (estimated 260 000 cases per year) [3, 9].

In addition, unsafe injections can cause abscesses and lead to septicaemia. Less frequently, hemorrhagic fevers and malaria can also be transmitted [2, 9]. About 16 billion preventive and curative injections are given each year in developing and transitional countries. Over 95% of all injections given are curative (therapeutic): for every vaccination given, 20 therapeutic injections are administered [8, 9]. The more injections are given, the more people are exposed to needles and syringes. In addition, if the use of injections exceeds the availability of injection equipment allows, reuse of syringes and needles is likely to occur. Therefore, the greater the use, the higher is the risk [3, 8, 9].

Patients and health care workers often believe that injections are more effective and act faster than oral medication [2, 9]. In addition, health care workers can charge an increased fee for injections. In many cases trained health care workers such as physicians, nurses and paramedical staff have not been trained in safe injection practices. Often, they lack the awareness of the risks associated with unsafe practices. In addition, in some communities, untrained lay persons administer injections outside the formal health care sector [3, 9].

The World Health Organization (WHO) defines 'a safe injection ' as one that does not harm the recipient, does not expose the provider to any avoidable risk, and does not result in any waste that is dangerous to the community [4, 8]. One of the major problems facing the health services in developing countries is how to limit the number of irrationally prescribed injections while retaining a positive attitude towards vaccination. Even if one considers that all the injections are administered for a good reason, one cannot unequivocally ensure their safety.

According to the WHO, the major cause of widespread unsterile injection practices is an insufficient supply of syringes and needles [4]. Unsafe injections can result in the transmission of blood-borne pathogens to patients and health care workers. Directly or indirectly, the community is also at risk of these transmissible infections as, in many instances, the used equipment is reused, sold, or recycled because of its commercial value as well as being subject to unsafe health care waste management [4, 7, 10].

The issue of disease transmission due to multiple uses of a single needle and syringe might definitely be factored out, at least in ARH where this study was conducted, as the general operating policy is use-and-throw. But yet, higher prevalence of injection as a drug delivery system cannot be accepted owing to such important implications of injections as invasiveness, toxicity and the need for skilled personnel as well as being subject to unsafe health care waste management.

The preference of the general public when it comes to drug delivery in Ethiopia is injectables as most experienced clinicians indicate. Nevertheless, no study has so far been conducted with this regard on the ARH in particular and other zonal or district hospitals in the Tigray region in general. The WHO considers the extent of injections delivered to patients as one indicator and hence measure of rational prescribing in a given health care setting. The present study, therefore, assessed the prevalence of injection use in Ayder Referral Hospital, a teaching hospital under the College of Health Sciences, Mekelle University. In addition, prescriptions consisting of injectables were reviewed for incorporation of relevant information by the prescribers.

Methods:

Study design and area: A population based descriptive study (ecological study) was conducted. Some 2880 prescriptions consisting of injectables out of the 11,980 prescriptions ordered during the months of February and March 2010 at ARH were systematically reviewed for relevant information. ARH is the only University Hospital in the Tigray Region with some 500 beds and is situated in Mekelle; the political and commercial capital of the region which is located at 783km North of Addis Ababa.

Source population: All the prescriptions written and dispensed to in-and outpatients at ARH from Feb. 1 to March 31, 2010.

Study population: All the prescription consisting of injectables dispensed from Feb. 1 to March 31, 2010 at the Pharmacy section of ARH were assessed for the basic prescription information including the dosage form, dose, route and frequency of administration, patient and prescriber details and polypharmacy.

Ethical considerations: Ethical clearance was obtained from the Ethics Review Committee of the College of Health Sciences, Mekelle University. Permission to access patients' prescriptions catalogue was formally secured from the Medical director's office via a letter of cooperation written by the Department of Pharmacy, College of Health Sciences, Mekelle University.

Data interpretation and Analysis: All the basic information obtained were recorded on a recording format. These records were used for data analysis and interpretation. All the prescriptions were assessed for completeness of basic information that are supposed to be incorporated on the standard prescription paper. All the prescriptions containing one or more injectable drugs were counted. Similarly, total number of drugs in these prescriptions were also determined and used in computing the average number of drugs per prescription. SPSS version 16 was employed for statistical analysis.

RESULTS:

Patients' information: According to the information obtained from the 2880 prescriptions containing one or more injectables, 53% (1526) females and 47% (1354) males were prescribed injectable drugs over the two months of this study period. In these prescriptions, children, <15 years, 25.7% (740), adults, 16-39, years 50.3 % (1449) and 24% (691) of the patients were aged 40 years and above. Moreover, 74% (2131) and 26% (749), respectively, of the patients were inpatients and outpatients in the 2880 prescriptions assessed in the present study.

Prescription information: A total of 11,980 prescriptions were ordered during the study period. Of all these prescriptions, 24% (2880) of them were found to contain one or more injectable drugs. The Pharmacy section of ARH dispensed a total of 232 different types of drugs on prescriptions containing injectables of which around 19% (44) were drugs administered parentally. A total of 4348 drugs, of which 66.2% (2877) injectables, were prescribed on these 2880 prescriptions showing that the amount of drugs per prescription containing injectables to be 1.5. Regarding to the prescription pattern; almost all, 99.7% (2873) prescriptions were found to contain dosage form and all contained dose and frequency of administration written properly.

Similarly 99.6% (2869) and 97% (2793), respectively, of all prescriptions had properly written patient information, age and sex. In addition to these, all the prescriptions had a legibly written signature of the prescriber and also the name of the patient, but only 98% (2822) and 89% (2563) of them contained the

name and qualification of the prescriber, respectively. While all the prescriptions were found to have incorporated the frequency at which the specific drug is to be administered, none had the diagnostic information that is crucial for dispensers (**Table 1**).

TABLE 1: SUMMARY OF THE INFORMATION ON THE PRESCRIPTIONS CONSISTING OF INJECTABLES ORDERED AT ARH FROM FEB. 1 TO MARCH 31, 2010

	Patient information			Drug information				Prescriber information		
	Name	Age	Sex	Diagnosis	Dosage form	Dose	Frequency	Name	Qualification	Signature
Total	2880	2869	2793	0	2873	2880	2880	2822	2563	2880
Percent	100%	99.6%	97%	0	99.8%	100%	100%	98%	89%	100%

It was also found that 18.2% (8) of all the prescribed parentral drugs were antibiotics, 27.3% (12) hormones and vitamins, 18.2% (8) infusions and the rest 36.4% (16) were other drugs with different therapeutic effects. **Table 2** below shows the list of all the individual drugs with the frequency at which they were ordered to be administered parenterally during the study period.

TABLE 2: MEDICINES PRESCRIBED TO BE ADMINISTERED BY INJECTIONS AT ARH FROM FEB. 1 TO MARCH 31, 2010

Medicine	Total number prescribed	Percentage of all injectables
Ceftriaxone	431	14.98
Dextrose 40%	397	13.80
0.9% normal saline	268	9.32
Water for injection	268	9.32
HCT	187	6.50
Cloxacillin	170	5.91
Diclofenac	151	5.25
DNS 1000ml	112	3.89
Ringer lactate 1000ml	108	3.75
Dexamethasone	105	3.65
Gentamycine	95	3.30
Ampicilline	92	3.20
Distilled water 5% 1000ml	67	2.33
TAT	45	1.56
Pethidine	43	1.49
Metoclorpramide	38	1.32
Oxytosin	32	1.11
Atropine	26	0.90
CAF	22	0.76
Vit.B-complex	20	0.70
Pyridoxine	18	0.63
Insulin	17	0.59
Hydrocortisone	16	0.56
Diazepam	11	0.38
Vit.K	10	0.35
Adrenaline	10	0.35
Lidocaine	8	0.28
Benzathine Penicilline	7	0.24
KCL 150mg/ml in 10ml	7	0.24
Aminophylline	7	0.24
Morphine	7	0.24
Ergometrine (methyl)	4	0.14
Hyosine	6	0.21
Sodium stibogluconate	7	0.24
Triamcinolone	6	0.21
Heparin	5	0.17
Vit. B-12	5	0.17
Promethazine	9	0.31
Regular insulin	9	0.31
Cimetidine	5	0.17
Dopamine	8	0.28
Calcium gluconate	8	0.28
Hydralazine	5	0.17
Mannitol	5	0.17

As to the frequency of the individual brand or generic medicines prescribed to be administered parentrally over the study period, Ceftriaxone topped the list, being prescribed 431 times (15%) followed by Dextrose 40%, 397 times (13.8%) and Ergometrine (methyl) was the least frequently prescribed medicine for administration via this route accounting only for 4 (0.14%) of all cases. The Fig. below shows some of the most frequently prescribed antibiotics for administration via the parentral route at ARH during the study period.

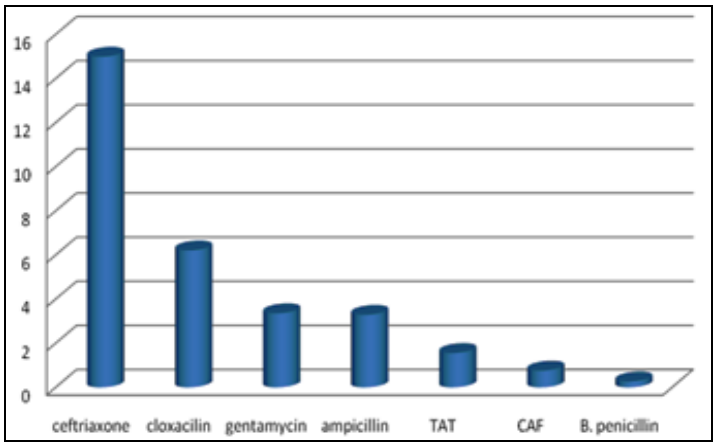

FIG. 1: INJECTABLE ANTIBIOTICS PRESCRIBED AT ARH FROM FEB. 1 TO MARCH 31, 2010

DISCUSSION: The patient information, the prescriber and the drug information found in the prescriptions are critically important and need to be written on the prescription legibly and properly. And also as much as possible, the core drug use indicator of the WHO standard should be followed and maintained [11]. In this study, it was found out that some prescriptions fail to have a properly written age of the patient. It is apparent that rational selection of drugs' dose and dosage forms would be highly determined by the age of the patient. The dose that should be administered to children would naturally be different from those given to adults, since age plays an important role in successful management of the therapy [12, 13].

Incase, if the pharmacist dispenses the drug without asking the age of the patient, he/she might wrongly dispense an adult dose to a child and vice versa, hence causing in either a therapeutic failure or over dosage causing toxicity. The fact that ages of the patients haven't been specified in 0.4% of the prescriptions assessed in the present study is an indication that some prescribers need to be reminded of the scientific rationale behind dose optimization versus patient age.

Besides, 97% of the prescriptions contain a clearly written sex of the patient, which is relatively higher than that of Dubai Arab Emirate (90%) [14]. Sex of patients will be recommended to be specified on standard prescriptions as some medicines could have sex dependent pharmacokinetic profiles [15] and also sex too determines the rational selection of dosage forms and delivery routes. Each prescription was found to contain name of the patient. In contrary to this, none of the prescriptions did contain a written diagnosis on it suggesting the prevailed tradition of ignoring this important information to be included on standard prescription. A standardized prescription paper to be used by prescribers in Ethiopia provides an exclusive part for diagnostic information.

Therefore, this misact of failing to include diagnosis on the patient's prescription, as found out by this study, should be curbed by the concerned enforcing authority. Prescriptions are sent to the pharmacist without diagnosis information means that the pharmacist can't be able to recommend the prescriber that possibly a better or a safer regimen can be considered for the given case. Regarding to the prescriber information; the name and qualification of the prescriber were not present on few prescriptions posing the issue of accountability in the medico-legal system. This information will be important for cross check evaluations in cases of prescription errors and help in easy identification of the liable prescriber.

Grossly, a total of 232 different types of drugs were dispensed with prescriptions consisting of injectables in ARH during the indicated study period of which 44 of them were parentral drugs. During the specified study period, some 11,980 prescriptions were prescribed, out of which 24% (2880) contained one or more injectables to be administered to the patients. Compared to the WHO standard limit for injection use (i.e. 20%), ARH is using injectable drugs more frequently than what is recommended if the prescribing pattern is to be considered as rational. Within the 2880 prescriptions, a total of 4348 different drugs were prescribed, showing that the mean number of drugs that were prescribed on a prescription containing at least one injectable was 1.5.

This is within the WHO limit (1.4-2.4), and is relatively higher than that of Tamil Nadu, India which was found to be 0.81 5. But compared to other studies done in Nigeria [15], Morocco [16], and Pakistan [17] whose drug per encounter is in the range of 2.2 to 2.4, it is appreciably lower. Prescribing multiple drugs to patients at once (technically called polypharmacy) is not generally recommended as problems like dose missing, over dosing and drug-drug or drug-food interactions may occur. The frequently organized workshops for prescribers on prescribing multiple regimens, especially those of ARTs, by both regional and federal health bureau in Ethiopia could have contributed to the low level of polypharmacy in the present study.

Regarding the type of parentral drugs administered, 18.2% were antibiotics, 27.3% hormones and vitamins, 18.2% infusions and the remaining 36.3% were other drugs with variety of therapeutic effects. The results showed that, these varieties of parenterally administered drugs are somewhat similar to those administered in Indonesia [10]. But the most commonly used injectables in Uganda include, chloroquine, Penicillin Procaine Fortified (PPF) and Crystalline

Penicillin [12], which is not encountered in the present study. This might be due to the fact the chloroquine has already became an obsolete drug and the other two are not the drugs of choice in the ARH.

Regarding to individual drugs, the most commonly administered drugs through parentral routes were Ceftriaxone14.98% (431), Dextrose-(40%) 13.80% (397), 0.9% Normal Saline 9.32% (268), Water for injection 9.32% (268), HCT 6.50% (187), Cloxacillin 5.91% (170) and Diclofenac 5.25% (151) comprising a total of 65.08% of all prescribed injectables. This shows that antibiotics are frequently administered in need of immediate effect and relief to the patients indicating the claim of some clinicians that most patients start seeking medical treatments only after their cases are complicated. On the contrary, the least frequently administered drug, by injection, was Ergometrine accounting only for a total of 0.14% of all prescriptions reviewed in the present study.

The study showed that, injection use is relatively high with inpatients compared to that in outpatients. This could be because of the higher consumption of life-lines like normal saline, dextrose 40% and other injectables owing to the progression of disease conditions in inpatients as compared to that of outpatients; and all the drugs dispensed in the pharmacy section of ARH were from the National Drug List for Ethiopia. This may be due to the government's policy to restrict drugs available in public health care facilities to be those that are listed in the national drug list only.

Impact making interventions need to be implemented to reduce the higher rates of injection use in developing countries to prevent health care associated infections with HIV and other blood borne pathogens as well as tackle the logistical chain challenges associated with injectables. In this study, injection use was significantly high 24%, ($P<0.05$) as compared to WHO standard which is 20%. This high injection use at ARH may be due to; most of the time, patients admitted to the hospital were in a serious disease condition requiring an urgent and quick acting medications and also simply because of the belief of patients and health care professionals alike that injections are more efficacious.

CONCLUSION: From the results of the study, it can be concluded that not all prescriptions were complete as few of them lack the necessary information such as sex, age, diagnostic results of the patient, the name and qualification of the prescriber. With regard to the WHO limit of injection use, ARH fails to maintain the limit. Moreover, the average number of drugs per prescription and the number of different types of injectables that were prescribed from National Drug List of Ethiopia were within the range of the WHO standard.

RECOMMENDATIONS: Appropriate interventional strategies like educational, managerial or regulatory interventions should be made to decrease injection overuse, cultivate the culture of providing all the important information on prescriptions and foster rational prescribing patterns. In addition, availability of necessary and of good quality injection devices and supplies with proper sharps waste management schemes should be put in place at ARH.

ACKNOWLEDGEMENTS: The authors would acknowledge Department of Pharmacy, College of Health Sciences, Mekelle University and all the staffs of the Pharmacy Service of ARH for their unreserved support and cooperation throughout the study.

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