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Full Length Research Paper

Identification of errors in antibiotics' prescriptions and prescription writing trends in areas of Hyderabad Sindh, Pakistan

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Prescribing errors are common in hospitals and outpatient clinical settings. A number of studies have been performed regarding antibiotic prescription errors throughout the world but it is not yet enough in Hyderabad, Pakistan. This study was performed to identify the errors in antibiotics' prescriptions and to propose the ways to minimize such errors. A total of 286 antibiotic containing prescriptions were randomly sampled from a government teaching hospital, three private hospitals and ten outpatient clinical settings. These prescriptions were categorized according to the antibiotic classes, and errors were identified according to various drug references and World Health Organization guidelines. The extent of errors was calculated; the highest proportion of the prescriptions (n = 257, 89.86%) failed to demonstrate the patient's weight and the least number of prescriptions (n = 07, 2.44%) contained the dosage form errors. The mean error per prescription was observed as 6.35 with standard deviation (SD) = 3.138 and 95% confidence interval for population mean is (5.98, 6.71). The major reasons of prescription errors were heavy patients' influx, insufficient knowledge regarding prescription writing guidelines to prescribers, and the lack of pharmacy services. Continuous educational training programs regarding prescription writing skills, introduction of computerized prescription order entry system and by recognizing and appreciating the role of pharmacist in evaluating the prescriptions, can substantially reduce these widespread errors.

Key words: Antibiotics, prescription, errors, Hyderabad.

INTRODUCTION

Prescription is an order written by a physician, dentist or any other registered medical practitioner to a pharmacist to compound and dispense a specific medication for the patient. A prescription order contains the directions for both the pharmacist and patient (Gupta and Basai 2007). Although different countries may have different standards for prescription writing but the prescription should contain the information such as; (a) Name, address, contact number and signature of the prescriber, (b) Name, address, contact number, age and gender of the patient, (c) Date of prescribing the medicine, name, quantity and dosage form of the drug, (d) Directions, instructions and warnings

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for patient (Gupta and Basai 2007; De varies et al., 1994). The prescriber should follow the proper guidelines for writing a prescription in order to minimize prescribing errors. Dean et al. (2000) describes prescribing error as error which occurs as a result of a prescribing decision or in prescription writing process. As a result, there is an unintentional significant reduction in the probability of treatment being timely and effective and increase in the risk of harm.

Several studies have been performed on the prescriptions containing antibiotics and others drugs for identification of the errors. Kaushal et al. (2001) stated that in hospitalized patients, medication errors are the most important problems. They performed a prospective cohort study in two academic institutions on 1120 pediatric inpatients. A total of 10,778 medication orders were analyzed and 5.7% (616) medication errors were identified. Out of these, 28% of errors were found in the prescriptions containing anti infective agents. Simultaneously, in another retrospective study of medication errors, it has been demonstrated that the most common type of serious error was found to be the wrong dose administration (Philips J et al., 2001).

Ridley et al. (2004) worked on prescription errors in 24 critical care units of United Kingdom. A total of 21,589 prescriptions were evaluated and errors were found in 3,141 (15%) of the prescriptions; out of 3,141 errors, 916 (19.6%) were reported as potentially life threatening errors. Another study was performed by Jayawardane et al. (2007) from January, 2004 to January, 2005 in a teaching hospital of South Brooklyn. This study reported 3,513 errors in 466,311 prescriptions, and it was noticed that 53.9% errors were in prescriptions containing antibiotic drugs.

As no study on antibiotic prescription errors has been carried out in Hyderabad, Pakistan, therefore, this study has been conducted to report the trend of prescription errors in antibiotic prescription, to find the extent of these errors and also to propose the ways to minimize such errors.

MATERIALS AND METHODS

This study was carried out after collecting the prescriptions from a government teaching hospital, three private hospitals and 10 outpatient clinical settings in various areas of Hyderabad, Sindh, Pakistan. A total of 286 prescriptions, containing at least one antibiotic, were randomly collected by simple random sampling technique over the period of 6 months, from February, 2011 to July, 2011. The prescriptions were grouped according to the particular class of antibiotics such as penicillin, cephalosporin, tetracycline, quinolone, macrolide and aminoglycoside class (Table 1). The prescriptions were then analyzed to identify prescription errors as per World Health Organization (De Vries et al., 1994) parameters for prescription writing, British National Formulary (2010) and Drug information hand book (Lacy et al., 2010) criteria.

Depending on the requirements for prescriber information, patient information and drug information in each prescription, 16 error categories were designed and then every prescription from each antibiotic class was evaluated by for the presence of errors. The identified errors were placed under specific error category and the extent of errors in percentage was calculated in a predesigned analysis sheet. Finally, as a whole, the total extent of error was calculated for all the 286 prescriptions and a separate sheet was made.

Data analysis

Microsoft office and descriptive statistics were used for analyzing the collected data. Tool of 95% confidence interval was used for population mean by computational software statistical package for social sciences (SPSS) 17.0 version.

RESULTS

In the present study, a total of 286 antibiotic containing prescriptions were collected. These prescriptions were grouped according to the specific classes of antibiotics such as: penicillin group, cephalosporin group, tetracycline group, quinolone group, macrolide group, and aminoglycoside group (Table 1), and then analyzed and evaluated for the presence of errors. Out of 286 collected prescriptions, 257 (89.86%) prescriptions were missing the weight of the patients, 72 (25.17%) prescriptions where no age was mentioned, and 199 (69.58%) prescriptions were missing the patient's diagnosis. We found 155 (54.19%) prescriptions without using metric system, 141 (49.30%) prescriptions having strength error, 126 (44.05%) with patient's gender missing, 124 (43.35%) had dose error, 107 (37.14%) were missing directions for use, 96 (33.56%) were lacking date and patient's name, 92 (32.16%) were with potential for drug interaction, 84 (29.37%) with incorrect frequency, and 82 (28.67%) with incorrect administration route (Table 2). It was further found that omission of prescriber's signature in 79 (27.62%), unclear writing in 77 (26.92%) prescriptions and the least number of errors were identified in case of missing or writing the wrong dosage form as 7 (2.44%) (Figure 1). A total of 1,815 errors were noticed in all antibiotics' prescription, with an average of 6.35 errors per prescription with standard deviation of 3.138. A 95% confidence interval computed for population mean was between 5.98 and 6.71.

DISCUSSION

In our present investigation, we identified the extent of errors in antibiotics containing prescriptions. A total of 286 prescriptions were collected and evaluated for the presence of errors. The error category of dose omission or wrong dose represented 43.35% of the prescriptions. This data is at par with the findings of Costa et al. (2008)

Table 1. Distribution of antibiotic prescriptions according to specific drug classes

Antibiotic class	Number of prescription	Percentage (%)
Penicillin	60	20.97
Cephalosporin	60	20.97
Tetracycline	52	18.18
Quinolone	60	20.97
Macrolide	18	6.29
Amino glycoside	36	12.58
Total Antibiotics	286	100

Table 2. Analysis error categories sheet as per WHO parameters for prescription writing, British national formulary and Drug information hand book parameters/standards (Total prescription = 286).

No.	Error categories/parameters/standards	Errors/not followed (%)	Not error/followed (%)	Total prescription
01	Date and patient's name not mentioned	96 (33.56)	190 (66.43)	286
02	Writing ambiguous medication order	77 (26.92)	209 (73.07)	286
03	Patient's age not mentioned	72 (25.17)	214 (74.82)	286
04	Patient's weight not mentioned	257 (89.86)	29 (10.13)	286
05	Patient's gender not mentioned	126 (44.05)	160 (55.94)	286
06	Patient's diagnosis not mentioned	199 (69.58)	87 (30.41)	286
07	Misspelling of medications	66 (23.07)	220 (76.920)	286
08	Missed directions of use	107 (37.14)	179 (62.58)	286
09	Dose omission or writing incorrect dose	124 (43.35)	162 (56.64)	286
10	Missed or incorrect dosage form	07 (2.44)	279 (97.55)	286
11	Missed or incorrect Strength of medicine	141 (49.30)	145 (50.69)	286
12	Missed or incorrect administration route	82 (28.67)	204 (71.32)	286
13	Missed or incorrect frequency	84 (29.37)	202 (70.62)	286
14	Prescribing without using metric system	155 (54.19)	131 (45.80)	286
15	Omission of prescriber's signature	79 (27.62)	207 (72.37)	286
16	Presence of potential drug interaction	92 (32.16)	194 (67.83)	286

$C = \frac{A}{AB} \times 100$ C = percentage of prescriptions containing errors, A = number of errors containing prescriptions, AB = total number of prescriptions.

who reported that 49.6 and 28.6% of the prescriptions had high dose (wrong dose) and missing dose errors, respectively. The study by Vaishali et al. (2011) revealed similar results, they identified that 54.3% of prescriptions did not have the correct and calculated doses and in 35.1% of prescriptions, the doses were not mentioned clearly.

In a study by Folli et al. (1987), in terms of wrong dose, they found that 55.1% of the medication orders contained the overdose and 26.9% contained the under dose errors. It also stated that most of the serious or potentially lethal errant medication orders include the antibiotics. In contrast to our results, Balbaid and Al-Dawood, (1998) revealed that 7.6% of prescriptions did not contain the dose at all. Another study by Irshaid et al. (2005) revealed that 19.4% of the prescriptions were deficient in dose units. A study by Gandhi et al. (2005) reported 54% of the dose errors, it also revealed that antibiotic was the most common class of medications and contained 25% of the prescribing errors.

In our finding in most of the prescriptions (89.86%), the weight of the patient was not mentioned and also corresponded to the findings of Vaishali et al. (2011) and Irshaid et al. (2005), who found that none of the prescriptions contained the patient's weight. In case of patient's diagnosis, our data revealed that 69.58% of the prescriptions were missing the diagnosis. This is in contrast to the studies of Irshaid et al. (2005) who identified this error only in 15.1% prescriptions, whereas Bawazir (1993) had reported in 9.8% prescriptions and Balbaid and Al-Dawood, (1998) had found in only 6.8% of the prescriptions. This shows that as patient diagnosis factor

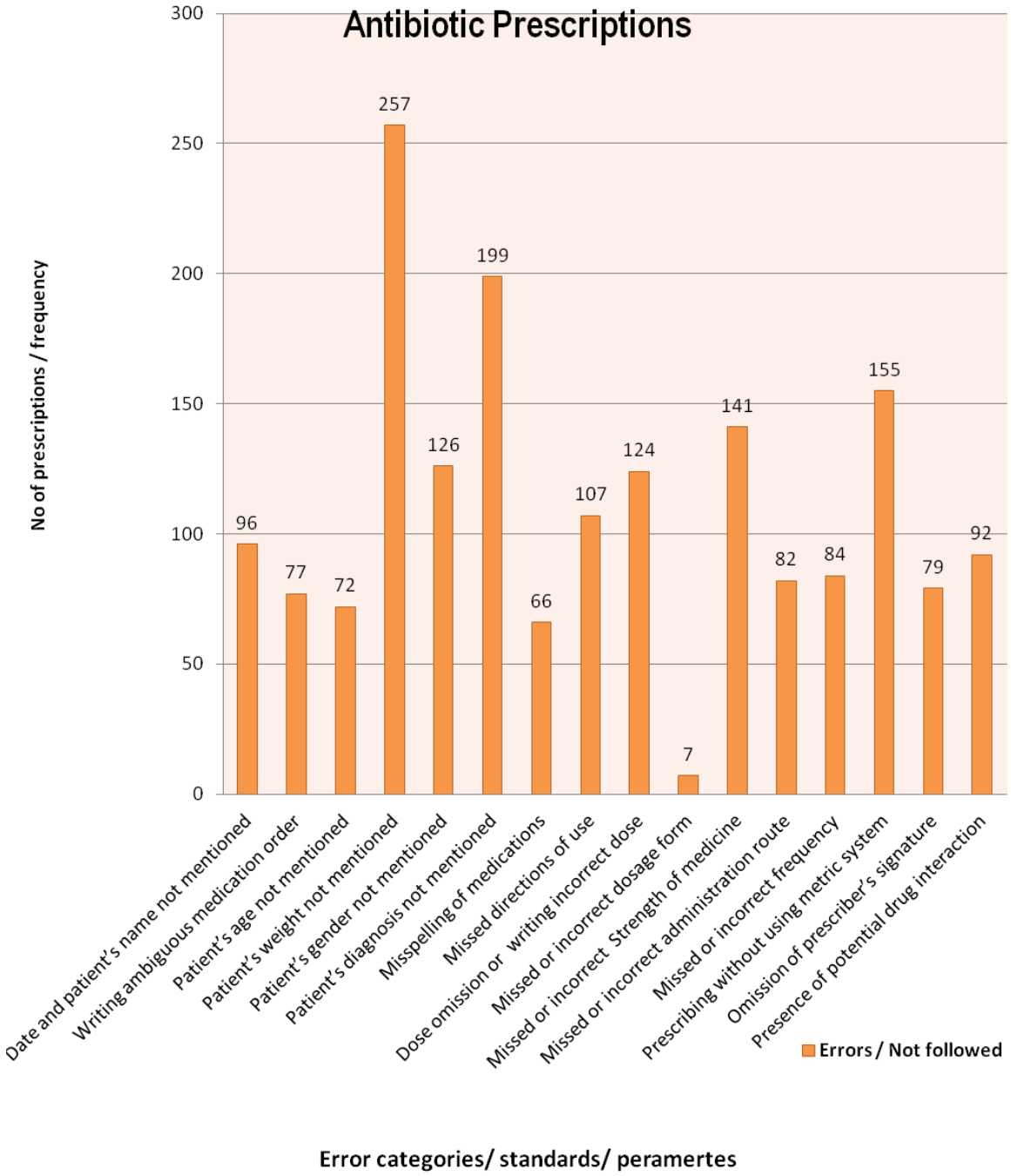

Figure 1. Errors (total prescription = 286)

factor is considered, the conditions of prescription writing in Hyderabad, Pakistan are worse.

Concerning the strength of medications, it is the most important factor especially when a drug is available in market, in more than one strength. We found that 49.30% of the prescriptions are with wrong strength of medication or the strength has not been mentioned. This result is similar to the report of Irshaid et al. (2005) who stated that 52.8% of prescriptions were missing the strength of medications. On the other hand, our results are dissimilar to those reported by Vaishali et al. (2011) who identified that 26.8% of prescriptions did not contain the strength.

A large number of deficiencies also have been found regarding the gender and age of the patient. Our study

investigated that in 44.05 and 25.17% of the prescriptions, the prescriber had not mentioned the gender and age, respectively, of the patients. However, a study by Vaishali et al. (2011) found 10 and 11% of prescriptions in which the gender and age, respectively, of the patient were not written. Balbaid and Al-Dawood, (1998) identified that only 10 and 4.1% of prescriptions were missing the patients age and sex, respectively. Furthermore, Irshaid et al. (2005) found that 22.7 and 48.7% of prescriptions did not contain the age and gender of the patient. We identified a significant number of prescriptions, 37.14%, which did not contain the directions for patients. Our result is comparable to the findings of Vaishali et al. (2011) who recognized that 45.9% of prescriptions were missing the patient's instructions. Irshaid et al. (2005) revealed that 7.1% of the prescriptions were missing the patient's instructions and majority of the prescriptions, 90.7%, had only partial patient's instructions. On the other hand, Bawazir (1993) noticed that only 4% of the prescriptions were lacking in instructions for use to patient.

Our findings revealed that in 33.56% prescription, the name of the patient was not mentioned. It was further found that the same percentage (33.56) of the prescriptions were without the date of generation of the prescription. This number is much higher than the findings by Balbaid and Al-Dawood, (1998), who reported that in only 8.7% of prescriptions, the dates were not mentioned. Francois et al. (1997) reviewed 866 prescriptions and found only 4.5% of prescriptions with missing dates. In case of the drugs which can be administered by more than one route, it is necessary to mention their routes. We evaluated that 28.67% of prescriptions were deficient in mentioning routes of drug administration. These results are somewhat similar to the findings of Phalke et al. (2011), who reported 24.7% prescriptions that did not contain the routes of drug administration. But our results are in conflict with those reported by Gandhi et al. (2005) and Bawazir (1993), where only 13% and 0.1%, respectively cases were found with this deficiency.

Regarding the error category of writing an ambiguous medication order, we explored that 26.92% of prescriptions were not written clearly. Our result is dissimilar to the other findings reported, as Balbaid and Al-Dawood, (1998), Irshaid et al. (2005), Meyer (2000) and Makonnen et al (2002) reported that 7.2%, 64.3%, 15% and 15% of prescriptions, respectively, had poor and incomprehensible hand writing.

There are a number of studies which suggested implementing computer based system for prescribing the drugs (Javier Rodrı´guez-Vera et al., 2002; Ruud et al., 1991). Nightingale et al. (2000) and Meyer (2000) suggested that electronic prescription system can be used to improve the prescription writing by removing the illegible prescriptions. The studies by Bates et al. (1998) and Anton et al. (2004) have shown that it is possible to reduce the medication and prescribing errors by using computer based system of prescribing medications. De Vries et al. (1995) reported that educational training programs can also lead to improve the prescription writing. Obehi et al. (2008) studied the effect of educational intervention on prescription writing and reported the improvement. These data clearly show that there is a need for introducing computerized physician order entry system (CPOE) to improve the prescription writing and reduce the errors. There have been many studies conducted on drug-drug interaction, which is a critical issue in health care system. In our study, potential drug interactions were observed in 32.16% of the prescriptions. In a study carried by Lars et al. (2003), it is reported that 62% persons were exposed to potential drug interaction with single drug, and 38% with two or more different drugs.

Conclusion

It is concluded from this study and literature, that there is high percentage of prescription errors in practice. It was found that majority of the prescription errors are related to the incomplete or wrong information of prescriber, patient and drugs on the prescriptions, and poor or incomprehensible hand writing. This leads to various problems of dispensing, incorrect doses and administration of medicines, drug misuse, and drug interactions. The physicians should pay proper attention to the prescription writing and patient's counseling. The physicians should be provided with the educational training to improve their prescription writing skills according to World Health Organization Guidelines for Prescription Writing or other recognized and published standards. The computerized physician order entry system should be introduced. Pharmacist can also play an important role in preventing the errors by reviewing the prescriptions.

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