

A retrospective study of NSAIDs containing medication orders for evaluating prescribing errors in outpatient clinical settings of a metropolitan city

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Abstract: Prescription is an order for medications issued by a physician, veterinarian, dentist or other properly licensed medical practitioner to pharmacist. Incorrect prescription writing habits may lead to substandard therapeutic goals and even can cause drug induced injuries. Non-steroidal anti-inflammatory (NSAIDs) drugs are used in various inflammatory diseases such as arthritis. The missed or wrong information regarding NSAIDs in prescription may lead to irrational drug use and can cause gastrointestinal, cardiovascular and other problems. The present study was carried out to evaluate the prescribing errors in NSAIDs containing prescriptions. We collected a total of 2712 prescriptions by randomly visiting the pharmacies located beside outpatient clinical settings in various towns of Karachi city, Pakistan. Among the omission errors, the absence of prescriber's registration number (94.5%), prescriber's qualification (93.7%), drug's generic name (86.5%), patient's diagnosis (86%) and patient's weight (83.90%) were the most frequent errors. Regarding the commission errors the error of writing an ambiguous order (77.7%) was the most common followed by the use of non-standard or abbreviated drug names (37.6%), wrong dose (26.9%) and wrong dosage form (23.2%). Overall a low compliance to the standards of prescription writing was observed which may cause serious or fatal NSAIDs induced injuries. Implementation of electronic prescribing systems, educational programs on prescription writing and proper reviewing of the orders by pharmacists may be valuable to reduce the errors.

I. Introduction

Prescription is an order for medications issued by a physician, veterinarian, dentist or other properly licensed medical practitioner to pharmacist[1]. The legal requirements for prescription writing differ from region to region. Typically a prescription needs to have (a) Name, address, contact number, registration number and signature of the prescriber (b) Name, age, gender, weight and diagnosis of the patient (c) Brand and generic names, dosage form, strength, frequency, dose, duration of therapy, quantity of drug to be dispensed (d) Date, Directions, instructions and warnings for patient[2, 3].

Prescribers must obey the legal requirements and standards of prescription writing to diminish the errors, as outcomes of therapy are largely dependent on accuracy and authenticity of prescription. However, prescription errors can cause drug induced injuries. A prescribing error can be defined as "A clinically meaningful prescribing error occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional significant (1)reduction in the probability of treatment being timely and effective or (2) increase in the risk of harm when compared with generally accepted practice" [4]. Prescribing Errors can be divided into two main classes, a) omission error, are those in which there is incomplete information in prescription, as well as prescriptions that are illegible and prescriptions that violates legal requirements while b) commission error contains incorrect written information in the prescription [5-7].

Prescription errors may lead to serious morbidities and mortalities. In a study of teaching hospital 23.7% of the patients were affected due to prescribing contraindicated and adversely interacting drugs and 1.9% of the total prescriptions were potentially hazardous[8].Further prescription errors may also lead to increment in cost of the therapy. In February 2000, Dr. Patricia M.L.A et.al analyzed 3,540 orders out of which 351(9.9%) contained prescribing errors, and as a result during one week period the interventions made by pharmacy staff aid in the investment of EUR 9867[9].Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most commonly prescribed drugs and its misuse due to prescription errors may lead to serious injuries specifically gastro intestinal and cardiovascular problems. In a study, researchers compared the risk of cardiovascular diseases that occur in between users and non-users of NSAIDs, focusing on 03 commonly used drugs, i.e.,

Diclofenac, Naproxen and Piroxicam, they found consistent increase of cardiovascular risks in users than non-users of NSAIDs, moreover all three had a higher relative risk of cardiovascular events[10]. A study published in September 2001 has revealed 4.1 times increase in the risk of developing upper gastrointestinal complications by the improper use of NSAIDs[11]. Joseph Thomas and his colleagues presented that patients utilizing NSAIDs developed gastrointestinal side effects twice (19.6%) as compared to control group (9.5%) [12].

Only few reports have been published regarding prescription errors in Pakistan. A study was conducted by collecting prescriptions from medical stores in various towns of Karachi city. They observed that 27% of the prescriptions did not fulfill the standard requirements for prescriptions and the error of illegible hand writing was the most common error [10]. In our previous study conducted in a teaching hospital of Hyderabad city, Pakistan we found that only 3% of prescriptions followed the proper prescription guidelines. Missing of patient's weight, prescriber's contact, drug generic name and duration of therapy were the most frequent errors[13]. In another study we found that around 90% of antibiotic containing prescriptions were failed to contain patient's weight[14].

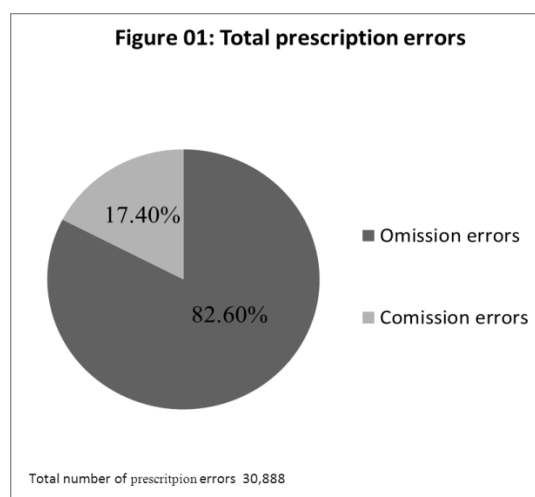
The current study was conducted to focus on the prescription errors in NSAIDs containing prescriptions, as these are the most commonly prescribed drugs and associated with a variety of drug induced problems. This study will help to promote the proper prescribing practice and to avoid omission and commission errors related to NSAIDs prescriptions and ultimate reduction in NSAIDs induced injuries.

II. Methodology

A retrospective study was conducted by collecting NSAIDs containing prescriptions by randomly visiting the pharmacies located beside out-patient clinical settings in 23 towns of Karachi city, Pakistan. All the prescriptions containing NSAIDs were separated from prescription records of Nov, 2012 to April, 2013 available at pharmacies. A total of 2712 prescriptions were randomly collected in the form of photo copy at an average of around 30 to 40 prescriptions per pharmacy. The collected prescriptions were reviewed by registered pharmacists by using authenticated drug references including Drug Information Handbook[15] and British National Formulary[16] for identification of drug related errors, and World Health Organization [3] prescription writing guidelines for reviewing prescription parameters related errors. In our study reviewing of drug related information such as, brand/generic name or both, dosage form, strength, dose, frequency, duration of therapy or quantity of drug and drug interactions were limited to only NSAIDs. Moreover, important elements of prescription such as, prescriber's information (Name, telephone number/ address and signature), patient's information (name, age, gender, weight, diagnosis) and miscellaneous information (directions for patients, legible hand writing and date on prescription) were also reviewed. The identified errors were noted on a predesigned pro-forma and divided into 1) Omission errors 2) Commission errors. Finally, percentages of the errors were calculated by using Microsoft excel program and the data was tabulated. The graphs were also drawn by using Microsoft excel program.

III. Results

We randomly collected a total of 2,712 prescriptions, having at least one NSAID from the pharmacies located beside outpatient clinical settings in various towns of Karachi, Pakistan, out of which a huge number of errors 30,888 were observed. Among them 25,504 (82.6%) errors were categorized as omission and 5,384 (17.4%) errors as commission (Fig. 01)



Out of 25,504 omission errors, 6,836 (26.8%) errors were related to patient’s information “Fig.02”. Among these, the most frequent identified errors were the absence of diagnosis (86%) and weight (83.90%) followed by gender (75.4%) and age (5.9%). Only a marginal number of prescriptions (0.89%) were missed the patient’s name “Table 01 (a)”.

Among 25,504 omission errors, 9,347 (36.6%) errors were pertained to prescriber’s information “Fig.02”. Prescribers were found to be the laziest in writing their registration number and qualification, more than 90% of prescriptions were found to miss them. 76.5% and 68.7% of prescriptions were failed to possess address/telephone number and prescriber’s name respectively. However, in around 90% of prescriptions signature was mentioned by prescriber “Table 01 (b)”.

A significant number of errors 8,706 (34.1%) were related to missing NSAIDs information in the category of omission errors “Fig.02”. In most of the prescriptions, prescribers only mentioned the brand name of NSAIDs, 86.5% of prescriptions were lacking in generic names. Likewise a marked number of prescriptions 74.1% were depleted in directions for NSAIDs use. Regarding strength and duration of treatment/quantity of drug to be dispensed the errors were noted as 67.3% and 61.2% respectively. The missing of dose was also a significant error among omission errors, 16.7% prescriptions were short in NSAIDs dose. Per contra in only few prescriptions dosage form (8%) and frequency (7.2%) were not mentioned “Table 01 (c)”

During analysis we also found some prescriptions in which the date and clinic name were not specified. 9.3% and 13.4% of the orders were found insufficient in stating date and clinic names respectively “Table 01 (d)”

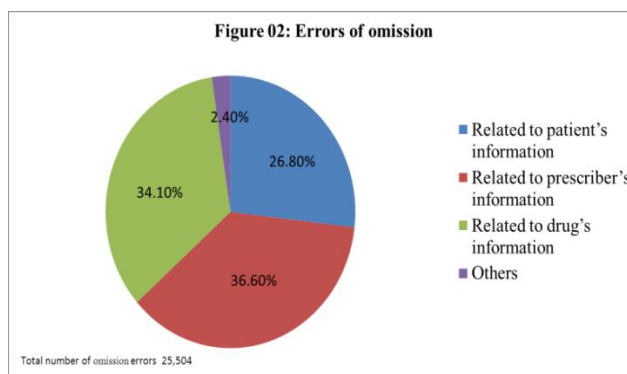


Table 01: Errors of Omission

Type of errors	Number of prescriptions containing errors (E)	Percentage = $\frac{E}{N} \times 100$
(a) Errors related to patient’s information		
Patient’s name not mentioned	24	0.89%
Age not mentioned	160	5.9%
Gender not mentioned	2,045	75.4%
Weight not mentioned	2,275	83.90%
Diagnosis not mentioned	2,332	86%
(b) Errors related to prescriber’s information		
Prescriber’s name not mentioned	1,863	68.7%
Address/telephone number not mentioned	2,074	76.5%
Qualification not mentioned	2,541	93.7%
Registration number not mentioned	2,563	94.5%
Signature not mentioned	306	11.3%
(c) Errors related to NSAIDs information		
Generic name not mentioned	2,346	86.5%
Strength not mentioned when drug is available in more than one strength	1,825	67.3%
Dosage form not mentioned	217	8%
Dose not mentioned	453	16.7%
Frequency not mentioned	195	7.2%
Duration of treatment or quantity to be dispensed not mentioned	1,660	61.2%
Directions for drug use not mentioned	2,010	74.1%
(d) Others		
Date not mentioned	252	9.3%
Clinic name not mentioned	363	13.4%

E= Number of prescriptions containing specific error

N= Total number of prescriptions (2,712)

Regarding the commission errors, writing an ambiguous order was the most frequently observed problem. Only a small number of prescriptions were written clearly otherwise a large number 77.7% of prescriptions were not easily readable. Use of nonstandard drug names or abbreviations, not mentioning the doses and dosage forms were also common, 37.6%, 26.9% and 23.2% of prescriptions respectively contained these types of commission errors. Further in 19.5% of the medication orders NSAIDs were found to interact with other prescribed drugs. However, the commission errors related to wrong strength, wrong duration of therapy and wrong frequency of drug were infrequent.

Table 02: Errors of commission

Type of errors	Number of prescriptions containing errors (E)	Percentage = $\frac{E}{N} \times 100$
Wrong dosage form	629	23.2%
Wrong strength	195	7.2%
Wrong dose	730	26.9%
Wrong duration of therapy	133	4.9%
Interaction of NSAIDs with other drugs in the order	529	19.5%
Ambiguous order	2,107	77.7%
Using nonstandard drug names or abbreviations	1,020	37.6%
Wrong frequency	41	1.5%

E= Number of prescriptions containing specific error

N= Total number of prescriptions (2,712)

IV. Discussion:

Our study revealed that most of the NSAIDs containing prescriptions did not follow the proper prescription guidelines. There were only 122 (4.5%) prescriptions which did not contain any error. These results are similar to our previous study which showed 3.5% of error free prescriptions[13]. Further the studies conducted by Kuan Mun et al. [17]and Al khaja et al. [18]revealed that 96.7% and 90.5% of prescriptions contained the errors respectively.

While writing the prescriptions to mention all the parameters is important, otherwise it is considered as omission error. In our study we analyzed a large number of omission errors 25,504 (82.6%). A similar type of study conducted by Mugoyela V et al. revealed that all the prescriptions contained at least one or more omission errors[7]. However, a study by Al khaja et al. reported 54.1% of prescriptions with omission errors[18].

Specifying the complete patient's information on prescription is also essential, as it helps the dispensing pharmacist to properly analyze the prescribed drugs. In this study we noted 26.8% of total omission errors which were related to missing patient's information. To mention the patient's diagnosis, age, sex and weight on prescription are very important as they help the pharmacist to evaluate the prescriptions effectively for proper selection of drugs, doses, duration of therapy and dosage forms. In our study the absence of diagnosis in 86% of prescriptions corresponds to the study by Ghoto et al. where 70% of prescriptions failed to show the patient's diagnosis[14]. Pertaining to patient's weight our results are similar to a report by Mugoyela V et al. who detected 93.8% of prescriptions missed the patient's weight[7]. To mention the gender on prescription also plays an important role, as some of the medications may be contraindicated in either gender. In this regard we observed 1/3rd of prescriptions in which the gender was not mentioned. However, Irshaid et al. showed half of the prescriptions missed the patient's sex[19]. For proper selection of drugs the age also plays an important role as there are many drugs which may not be suitable for either pediatrics or geriatrics, therefore missing the patient's age on prescription may mislead the dispensing pharmacist during prescription evaluation. Our study reveals 5.9% of prescriptions deficient in patient's age, which is analogous to a report by Vaishali et al. they recognized 11% of prescriptions in which the age was not mentioned[20].

The rate of noncompliance to mention the prescriber's information in our study is quite high. However, complete prescriber's information aids the pharmacist and patient to easily communicate the prescriber as needed. Our study has revealed that in 76.5% and 68.7% of prescriptions the address/contact number and the name of prescriber were not mentioned respectively. With respect to missing prescriber's name our results are in contrast to Kuan Mun et al. who mentioned only 1.8% of related error[17]. On the other hand our results regarding the prescriber's contact are on par with Saleem et al. who reported 82.6% and 95% of prescriptions which failed to show address and telephone number of prescriber respectively[13]. The error of not mentioning the qualification and registration number was quite usual in our study, 93.7% and 94.5% of prescriptions were found with these errors respectively. Likewise, Vaishali et al. reported the half and 1/3rd of the prescriptions inadequately possessed prescriber's qualification and registration number respectively[20]. In our study we noted 11.3% of prescriptions deficient in prescriber's signature which is lower than a report by sapkota et al.[21] that identified 28% of the related error.

Our study has shown a high tendency of omitting the generic names of NSAIDs. In the case when drug contains more than one ingredients and only brand name was mentioned, it was not counted as error. However, if the drug contains only one active ingredient and the generic name was not mentioned it was considered as error. In our study we observed that just above 1/10th of prescriptions contained the generic name of NSAIDs, and the most commonly prescribed drug by generic name was diclofenac, even in some cases the generic name was not complete whether it is the sodium salt of diclofenac or potassium salt. Similar to our results the study conducted by Anuja A et al. (2010) in pediatric outpatient department reported only 7.4% of prescriptions contained the generic names[22]. In the prescriptions failure to mention the directions for drug administration may be harmful to patients, as most of the NSAIDs cause gastric irritation but it can be minimized by administering with food[16]. Therefore, to properly mention the directions for NSAIDs administration on prescriptions is far more important. In contrast our study showed 1/3rd of prescriptions missed the directions for NSAIDs use. Likewise, a study by Vaishali et al. demonstrated 45.9% of prescriptions in which instructions for patients were absent[20]. Administration of NSAIDs for longer duration may also lead to drug induced injuries. Banks et al. demonstrated that hepatotoxicity was apparent in 24% of patients by one month, in 63% of patients by 03 months and in 85% of patients by 06 months after starting diclofenac[23]. We observed that 61.2% of prescriptions did not consist of either duration of therapy or quantity of drug to be dispensed. Administration of the drugs in recommended doses is very crucial for optimal efficacy. Under dose of drug may have suboptimal effects while over dose may lead to drug toxicities. In our study we investigated 16.7% of prescriptions in which doses of NSAIDs were not mentioned. However, 8.7% of prescriptions did not retain doses in a study by sapkota et al. [21]. There are many NSAIDs which are available in more than one strengths such as naproxen available in 250 mg, 500 mg and 550 mg strengths. In these cases, missing of the strength may lead to hindrance in the dispensing and wrong dose administration. We found 67.3% of prescriptions without strengths which is in contrast to a study by Stubbs et al. which reported only 3.6% of prescriptions[24]. In the prescription failure to mention the dosage forms may create problems as various NSAIDs are available in more than one dosage forms such as diclofenac is available as tablet, modified release capsules and suppositories. Its absence on prescription may also affect the therapeutic outcomes, if the prescriber's intended dosage form is not dispensed by pharmacy. We figured out 8% of prescriptions without dosage forms which is similar to a report by Sapkota et al.[21] that revealed 2.6% of the related error. Concerning to the omission of date we found 9.3% of prescriptions which corresponds to a report by Balbaid OM et al.[25] that showed 8.7% of non-dated prescriptions.

Generally, commission errors may be more threatening to the patient's health than the omission errors, if it is overlooked. For example; if a patient on warfarin therapy has been prescribed aspirin for some type of inflammation without monitoring INR, it may lead to hemorrhage. In the current study we identified writing an ambiguous order is the most common commission error, although the prescriptions which are ambiguously written may result in fatal injuries[26]and this is one of the leading cause of death[27].Our study showed 77.7% of the orders were ambiguously written, it is in contrast to Meyer TA[28] and Makonnen E et al. [29] observed only 15% of ambiguous orders. According to our findings the use of nonstandard drug names or abbreviations for NSAIDs was a common trend in some clinical settings, although those abbreviations were known to pharmacy staff beside those clinical settings but may not be understandable to the others. The drug names should be written in full so the prescriptions can be filled by any other pharmacy as well. The use of Dicl. instead of diclofenac, Nim. instead of nimesulide and Ibu. for ibuprofen were common. We found just above 1/3rd of such prescriptions which is worse than a study by sapkota et al.[21] revealed only 11.76% of related error. Wrong doses of NSAIDs may lead to either sub therapeutic effects or toxic effects such as gastrointestinal disturbances; in our study we observed 26.9% of prescriptions with wrong doses of NSAIDs. Pertaining to the dosage forms writing tablet dosage form to the children of small age like 1 or 2 year was seen. Further, prescribing a dosage form, syp. Diclofenac instead of tablet, which is not available in market, was also observed in some prescriptions. In our study we observed 23.2% of prescriptions in which either non available or unsuitable dosage forms were mentioned. On the other hand Kuan et al.[17] found quite smaller number (3.1%) of wrong dosage form errors. Proper frequency of drug administration is important to keep the drug plasma levels within therapeutic range and to get desired effects. In our study only few of the prescriptions (1.5%) contained wrong frequency. When two or more drugs given concomitantly, they may interact and produce adverse effects. We observed 19.5% of prescriptions in which NSAIDs were interacting with other drugs. Most common drug interactions were in between high dose aspirin or diclofenac with warfarin.

In our study a large number of omission and commission errors were observed in NSAIDs containing prescriptions. To improve this prescription writing trend various strategies can be adopted. Various researchers have shown that implementation of computerized drug order entry system has been proved to reduce the prescription errors[30, 31]. Further educational training programs on prescription writing for the prescribers can also help to reduce these errors[20].

V. Conclusion

The results of our study show a low compliance to the standards of prescription writing. A large number of omission and commission errors in NSAIDs containing prescriptions were observed which may affect the therapeutic outcomes and even may cause serious or fatal NSAIDs induced injuries. This shows that there is a clear need of implementing such strategies which can reduce these errors. We propose that implementation of electronic prescribing systems and conducting educational programs for prescribers to improve the prescription writing skills may reduce the chances of omission errors. Further, proper reviewing of each drug in the order and interventions by pharmacists may also be valuable to eradicate the commission errors.

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