

Pattern of Logical Drug Prescription Among Iranian General Dental Practitioners

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Abstract

Objective: To determine the prescribing patterns of the general dental practitioners in Kerman province in Iran. **Material and Methods:** In this cross sectional study 1200 prescriptions, which were prescribed by general dentists in Kerman province during one-year period, were evaluated. Each prescription was assessed for the number of drugs per prescription, drug (category, name, route of administration, frequency) and duration of treatment. Descriptive statistics were used to calculate the absolute and relative frequencies, mean and standard deviation. The Chi-square test, analysis of variance (ANOVA) and t-test were used. The statistical tests were performed at the significance level of 0.05. **Results:** The mean number of drugs per prescription was 2.59. Antibiotics, Analgesics, corticosteroids and antiseptics were the most common drug category prescribed drugs by general dentists. Oral route was the commonest route of drug prescription (84.1%). Amoxicillin capsule (60.5%) was the commonest drug prescribed by general practitioners followed by ibuprofen derivatives (55.4%). Spelling errors was found in 62.7% of prescriptions. The mean score of prescriptions for logical prescription pattern was 7.36 ± 1.32 out of 9. **Conclusion:** Dental prescribing patterns should be considered as a potential area for improvement in the treatment process and patient safety. It is suggested to emphasis more on principles of prescription at university and retraining courses for dentists.

Keywords: Prescriptions; Drug Prescriptions; Dentists; Toothache.

Introduction

Drugs are known as strategic commodities directly related with public health; so the quality of drug prescription and drug use is of utmost importance in medical drug treatment [1]. Many drugs are potentially capable of causing adverse side effects whose magnitude varies depending on patient conditions as well as types of drugs [2].

A prescription is an instruction written by a clinician with legal authorization to order medicines for a specific disease and also use for diagnosis, prevention, or treatment. In fact a prescription is a legal document that makes a clinician as well as a pharmacist responsible for the maintenance of patient health and it is also considered as the first step of treatment. As well, prescriptions can significantly help in strengthening clinician-patient professional relationships. Therefore, the reasons behind prescriptions should be logical and standardized and the necessity for drugs and medications included in prescriptions should be transparent and justified [3].

Inappropriate and excessive drug prescription not only leads to financial loss for a patient but also causes adverse effects [1]. Various studies have likewise suggested that average prescribed pharmaceuticals in each prescription in many countries is higher than the standards developed by the World Health Organization [4].

Dentistry is distinguished as one of the applied medical sciences encompassing its own techniques and treatments. Numerous diseases with oral manifestations necessitate drug prescriptions by dentists as one of the common and important therapeutical measures taken in dental offices; thus, dental practitioners should be endowed with enough knowledge in terms of prescriptions and prohibited prescribing cases as well as contraindications and side effects associated with drugs [5].

Failure to notice the details during drug prescription may lead to non-ideal treatments. Such prescribing errors can at best bring about inconveniences for patients and may even lead to mortality of patients at their worst states. Furthermore, incidence of such problems can damage professional relationships between patients and dental practitioners and even result in legal disputes and proceedings [2].

One of the procedures to reduce errors caused by drug prescriptions is the evaluation of the related prescriptions. Such an evaluation by clinicians can provide valuable information in order to fix and reduce errors associated with drug prescriptions [2]. Common mistakes in the writing of prescriptions include errors in writing the names, forms, and doses of drugs and their frequency of use; mismatch between prescribed drugs and clinical diagnoses as well as drug contraindications. Moreover, the prescriptions may contain drugs whose prescriptions are not logically justified. The illegibility of prescriptions and presence of cross-outs can be also cited as prescription faults in this respect [3].

Thus far, numerous studies have been conducted in terms of the evaluation of drug prescriptions written by dental practitioners in Iran and other countries [1,5,6-30]. Given the importance of correct and rational drug prescription, the present study was to evaluate drug

prescription patterns in the prescriptions written by general dental practitioners in Kerman Province (as the largest province in Iran). The former similar study in this respect was conducted approximately 15 years ago; therefore, it seems that the present study was of great importance to know whether there have been changes in drug prescription patterns at the present time or not.

Material and Methods

Study Design and Sample

The present study was of cross-sectional research type. The study examined total existing prescriptions written by general dental practitioners in Kerman Province in 2018 from Prescriptions Departments in the Office of Health Insurance Organization and Social Security Organization in Kerman Province.

Due to changes in drug prescriptions based on patient age, prescriptions for patients aged below 12 years and over 70 years were excluded from the present study. Moreover, only the prescriptions written by general dental practitioners were included in the present study.

Data Collection

The research instrument was a researcher-designed checklist developed based on the related literature [1,28]. The first part of the given checklist was comprised of information about dentist's gender, number of items prescribed, drug forms, and names of drugs; and in the second part, rational drug prescription patterns based on 9 criteria (legible and non-scribbled prescriptions, correct spelling for the name of prescribed drugs, correct drug dose, appropriateness of the amount of drugs prescribed, correct insertion of frequency of use for drugs, clearly explained administration of drug, illustrated manner of drug use, and consistency between prescribed drugs and dental treatments as well as rational clinical connections between drugs were evaluated [1,6,28].

Error in writing the form of a drug means that the pharmaceutical form is not written or it is written in a wrong manner. Similarly, error in writing the name of a drug suggests that the name of a drug is misspelled or the name of a drug is not generally written or it is illegible. Error in writing the drug dose means that the dosage does not comply with what is listed in pharmaceutical reference books or the dose is not mentioned. Moreover, error in writing the frequency of use for a drug refers to lack of consistency between the frequency of drug use and the guides in pharmaceutical reference books, or when the frequency of drug use is not mentioned, or the phrase (as prescribed) is written. Error in writing the manner of administration means that the manner of drug administration is not written, or it is not correct, or even the phrase (as prescribed) is written. Likewise, errors in writing the items associated with the route of medication use, consistency between prescribed drugs and dental treatments, and logical-clinical connection between prescribed drugs were also evaluated on the basis of Dental Pharmacology as a reference book [3,30].

Moreover, possible contraindications among the prescribed drugs were evaluated based on the same reference book. The related checklist was completed for each prescription by a senior dental

student who had already fulfilled the required training in this field under the supervision of an oral pathologist. Responses for the 9 items of rational drug prescription patterns were recorded in the form of Yes and No and the scoring range of 0 to 9 was considered for the accuracy of the responses in this part.

Data Analysis

Data were analyzed using IBM SPSS Statistics for Windows Software, version 23 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to calculate the absolute and relative frequencies, mean and standard deviation. The Chi-square test, analysis of variance (ANOVA) and t-test were used. The statistical tests were performed at the significance level of 0.05.

Ethical Aspects

This study received ethical code: Ir.Kmu.rec.1394.164 from the ethics committee of the Office of Vice-Chancellor for Research and Technology in Kerman University of Medical Sciences.

Results

A total number of 1200 prescriptions written by general dental practitioners in Kerman Province were investigated in the present study (30 prescriptions were not included in this study due to their flaws). The mean number of medications per prescription was 2.59 (ranged from 1 to 5 drugs). Table 1 illustrated the frequency distribution of dentists' gender, number of medications prescribed in a prescription, and the most prescribed forms of drugs.

Table 1. Frequency distribution of gender, numbering and the most drug forms.

Variables	N	%
Gender		
Male	1042	86.8
Female	158	13.2
Number of Drugs per Prescription		
1	114	9.5
2	444	37.0
3	480	40.0
4	138	11.5
5	24	2.0
Pharmaceutical Form		
Tablet and Capsule	781	65.1
Capsule	108	9.0
Tablet	98	8.2
Tablet, Capsule and Ampule	62	5.2
Tablet, Capsule and Mouthwash	54	4.5
Capsule and Ampule	28	2.3
Syrup, Elixir	22	1.8
Capsule and Mouthwash	20	1.7

Table 2 showed the prescription pattern of most frequently prescribed drug category. Our results showed that antibiotics (n = 960; 80%), analgesics and anti-inflammatory drugs (n = 912; 76%), mouthwashes (n = 130; 10.8%) and corticosteroids (n = 72; 6%) were the most top four often prescribed classes of medications.

Table 2. Frequency distribution of prescriptions by the drug groups.

Drug Groups	Prescriptions	N	%
Antibiotics	Amoxicillin, Metronidazole	396	33.0
	Amoxicillin	330	27.5
	Penicillin V	98	8.1
	Penicillin V, Metronidazole	64	5.3
	Metronidazole	50	4.1
	Cefixime	16	1.3
	Penicillin G	4	0.3
	Azithromycin	2	0.1
Analgesics and NSAIDs	Ibuprofen	304	25.3
	Gelofen	248	20.6
	Novafen	114	9.5
	Mefenamic Acid	106	8.8
	Acetaminophen	70	5.8
	Gelofen, Acetaminophen	42	3.5
	Ibuprofen, Acetaminophen	18	1.5
	Diclofenac	8	0.6
Mouthwash	Celexib	2	0.1
	Chlorhexidine	106	8.8
Corticosteroids	Persica Mouthwash	24	2.0
	Dexamethasone	62	5.1
	Betamethasone	10	0.8

Frequency distribution of items related to the accuracy of prescriptions was delineated in Table 3.

Table 3. Frequency distribution of drug prescription patterns.

Obligatory Requirements		N	%
Legibility	Yes	1164	97.0
	No	36	3.0
Correct Spelling	Yes	448	37.3
	No	752	62.7
Correct Dosage	Yes	840	70.0
	No	360	30.0
Quantity Sufficient for Treatment	Yes	1138	94.8
	No	62	5.2
Correct Dosage Interval	Yes	844	70.3
	No	356	29.7
Correct Duration of Treatment	Yes	960	80.0
	No	240	20.0
Correct Administration Route	Yes	1054	87.8
	No	146	12.2
Orientation to Dental Treatment	Yes	1176	98.0
	No	24	2.0
The Existence of Logical Clinical	Yes	1184	98.6
	No	16	1.4

In terms of item 8 (consistency between medications prescribed and dental treatments) 4 prescriptions included medications such as Vitamins C, B Complex, and Multi-Vitamin which were omitted from the list of data analysis due to lack of evaluation for their uses in dental treatments. In

the case of item 9 (logical-clinical connection between prescribed drugs), 4 prescriptions included three different antibiotics together and three analgesics had been prescribed in 4 other prescriptions together.

According to the 9 constituent components of the checklist used for the evaluation of logical drug prescription patterns, a scoring range of 0 to 9 was considered for all and the results showed that the mean score for prescriptions was 7.36 ± 1.32 and the maximum and minimum scores for the given prescriptions were 3 and 9.

Male dental practitioners had significantly ($p=0.002$) committed lower percentage of errors than females. Moreover, dentists who had prescribed four pharmaceutical items obtained significantly ($p=0.000$) lowered scores compared to other dental practitioners. The analysis also indicated that the increase in a prescribed drug could reduce 0.3 of the total score for each prescription and this relationship was significant ($p=0.000$).

Discussion

The present study was to evaluate logical drug prescription patterns among prescriptions written by general dental practitioners in Kerman Province. In this respect, the most frequently prescribed pharmaceutical items in one script was equal to 2.59 ± 1.13 . This value was higher than the average number of prescribed items in others studies that found 2.03 [1] and 2.3 [25] but it was lower than the 2.64 obtained in Rasht, Iran [29]. Moreover, in most studies, the average number of drugs prescribed in the prescriptions written by dentists was estimated by 2 to 3 items and observations also showed that dental practitioners often prescribed one or two analgesic and anti-inflammatory items along with one or two antibiotic items to their patients although this prescription pattern demonstrated great diversity in their prescriptions.

In the present study, the most prescribed forms of medications were tablets and capsules together or separately, which included 82.3% of items in the prescriptions. In another studies, all the analgesics prescribed by the dentists were in oral form [17] and 81% of all medications had been prescribed in the oral form [1].

The most prescribed antibiotics was Amoxicillin whose prescription separately or in combination with Metronidazole composed 60.5% of antibiotic prescriptions in total. Some studies showed that the bulk of antibiotic items prescribed by dentists were Amoxicillin whose values in terms of their dose were in the range of 26% and 82% [1,13,20,21,23]. It should be noted that the figure in the present study was at the same range. In this respect, the results obtained previously were significantly inconsistent with the findings of other studies [22].

Today, some references have also highlighted Penicillin V as a first-line treatment for dental infections and there are in fact conflicts in terms of Penicillin V or Amoxicillin selection for this purpose. However, as can be seen, the prescription of Amoxicillin was clearly more common among dentists in the present study and the majority of similar studies compared to the prescription of Penicillin V. Moreover, reliable references have advocated the prescription of Metronidazole as the

second-line treatment and in cases where patient re-examinations have revealed no indications of improved infection following the first-line antibiotic prescription; in other words, when clinicians suspected the resistance of infection-generating microorganisms to the first-line antibiotics. However, there is currently an excessive prescription of Metronidazole by dental practitioners in a way that such a medication was prescribed in the present study in 42.5% of prescriptions (by itself or along with Amoxicillin) which is a very high value and there are concerns that patients are exposed to its potentially serious complications following excessive use including metallic taste in mouth, contraindications (such as interference with Warfarin), and harmful effects on fetus and infants [3,30]. The percentage of prescribed Metronidazole was equal to 21.5 as previously reported [10] and it was half of the values obtained in the present study. In this respect, it was observed that the prescription of Metronidazole by dentists was inappropriate in 36% of cases [19].

The most frequent analgesic drug prescribed in the present study was Ibuprofen or its derivatives, which had been used alone or in combination with Acetaminophen in 55.4% of the cases. Others authors also estimated the prescription of Ibuprofen by itself or along with Acetaminophen as the most frequent regimen of analgesics and anti-inflammation medications among dentists [1,17,24,25], but the prescription of this drug in the mentioned studies was 50%, lower than that in the present study. Among the NSAIDs, reference books considered Ibuprofen as an appropriate analgesics in this respect and also recommended Naproxen as a strong anti-inflammatory drug which was not prescribed in the prescriptions evaluated in the present study.

Nevertheless, Naproxen along with Paracetamol was reported as a common analgesics and anti-inflammatory drug chosen by dental practitioners [22]. Among other NSAIDs, Diclofenac (35%) [23] and Piroxicam (31%) [25] accounted for the highest prescription rates. It is noteworthy that in the reference books, Diclofenac and Piroxicam have not been suggested as the first choices of analgesics and anti-inflammatory drugs in dentistry [3,30]. In the present study, 10.6% of prescriptions included the prescription of Mefenamic acid as an analgesic medication although it was not a good choice due to the risk of serious complications such as diarrhea and chronic blood dyscrasia in 25% of users; it is also deprived of pain-killing and anti-inflammatory properties suitable as indications in the field of dentistry.

The results of the present study revealed a decline in the prescription of Mefenamic acid by dentists compared to the same study conducted in Kerman Province 15 years ago [1], which was equal to 26.5% due to the introduction of newer and more effective analgesic drugs. However, the 10.6% figure obtained in this study was not a correct dose [1]. The study developed in Nepal in terms of the prescription of analgesic drugs by dental practitioners was the only study indicating the rate of prescription for Nimesulide equal to 22% [17]. The given drug is an inhibitor for some Cyclooxygenase enzyme II, which is prescribed in cases when patients with asthma are sensitive to Aspirin [3].

The remarkable thing was that, dentists did not consider the prescription of drugs for the protective lining of the digestive tract along with NSAIDs [18]. This is despite the fact that the

occurrence of health problems such as exacerbated gastritis and peptic ulcers are taken into account as the biggest concerns when NSAIDs are prescribed. In the present study, an anti-inflammatory medication from the group of the inhibitors for Cyclooxygenase enzyme II had been prescribed only in one of the prescriptions.

Apart from antibiotics as well as analgesics and anti-inflammatory drugs, corticosteroids and mouthwashes were also observed among the top given prescriptions. In this respect, a previous study revealed extensive range of drugs comprised of 13 pharmaceutical groups prescribed by dental practitioners that included pharmaceutical groups such as benzodiazepines, anti-histamine, and fluoride compounds in addition to the four groups prescribed in the present study [8]. In this study, nearly half of all prescriptions included Chlorhexidine mouthwash, which had not been reported in any similar studies. Such a prescription may be due to the topical impact of mouthwashes; however, it should be noted that excessive prescription of Chlorhexidine mouthwashes can bring about its own special side effects such as creation of tints on surface of teeth, changes in sense of taste, and burns in mouth [3,30]. Moreover, the high levels of prescribed Dexamethasone in the present study seemed worrying due to seriously adverse side effects of corticosteroids.

In terms of the evaluation of the logical prescription patterns of medications, the most frequent errors in the given prescriptions in the present study were associated with misspellings, wrong dose, and incorrect frequency of use for prescribed drugs. The figure for the misspelled drug prescription in this study was higher than those in all similar studies in this respect, but wrong dose and incorrect frequency of use as the common prescription errors in dentistry had been already mentioned [19,22,27].

The present study was a follow-up research conducted according to the similar study conducted in Kerman Province about 15 years ago [1] because such investigations in terms of drug prescription patterns in a region assessing changes over time are of utmost importance. In this respect, Palmer and others evaluated changes in the prescription patterns of antibiotics among dentists at the intervals of 1998-2004 in England [10-15]. In Norway, two similar evaluations in the field of antibiotics prescribed by dental practitioners with a 14-year interval were also conducted [9,21].

Since prescribing accurately is extremely important, it is necessary to develop therapeutic guidelines, and to provide pharmacological therapy courses. The implementation of educational programs, including the WHO Guide to Good Prescribing and Patient Safety Curriculum Guide, would be beneficial in helping students develop prescribing skills.

Conclusion

Drug prescription patterns among general dental practitioners in Kerman Province on the basis of prescription of 2 to 3 items in each script included administration of oral forms of drugs, prescription of Amoxicillin as an antibiotics and Ibuprofen as an analgesic and anti-inflammatory medication, and considerable interest to the prescription of Metronidazole, Dexamethasone, and

Chlorhexidine. Moreover, the given dentists had little interest in prescribing Penicillin and the rate of Mefenamic acid prescribed by them was reduced. In terms of the accuracy of prescribed prescriptions, the performance of dental practitioners in Kerman Province was generally at an acceptable level although spelling, dose, and frequency of use for the prescribed drugs and medications were required to be improved.

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