



A Study to Assess the Drug Consumption and Rationality in the Prescription of Outpatients Undergoing Periodontal Treatment

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Abstract: Drug utilisation research is essential in clinical practice because it serves as the foundation for implementing changes to drug dispensing rules at the local and national levels. The ultimate goal of such a study is to make drug usage more reasonable. This prospective cross-sectional study aimed to collect data on drug utilisation among dental patients from Himachal Pradesh's Department of Periodontics to identify possible targets for improving drug prescribing habits. After applying inclusion and exclusion criteria, data were collected prospectively from a total of 849 medical records of patients. The patient's information included their OPD number, age, sex, health problem description, and prescription parameters, including medicine name, route, strength, dose form, quantity, duration, investigations, provisional diagnosis, and therapy. Prescriptions were analysed using WHO core drug indicators and WHO ATC/DDD approach to calculate drug consumption. The most prescribed antibiotic was amoxicillin, separately or in combination. The number of DDD consumed and the DDD/1000 population/day was the maximum for vitamins, followed by antibacterial and non-steroidal anti-inflammatory drugs. The average number of drugs per encounter was 2.2. The percentage of encounters with an antibiotic in prescription was very high i.e., 72.3%. Only 37.6% of medications were prescribed, from NLEM 2015, and 14.60% generic names were prescribed. The dental practitioners did not adhere to WHO prescribing guidelines. The lowered number of prescriptions for generic names was a subject of worry.

Keywords: Drug Utilisation, Prescription, ATC/DDD, Essential Drugs, Generic Name.

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1. INTRODUCTION

A drug utilisation study is a valuable tool for evaluating drugs used in clinical practice to make medical treatment more rational and cost-efficient.^{1,2} WHO defines it as in a technical report 1977, "the marketing, distribution, prescription and use of drugs in a society with special emphasis on the resulting medical, social and economic consequences".^{2,3} The rational use of medicine for a patient involves prescribing a well-documented drug at an appropriate dose, with adequate information and at a reasonable cost.² On average, more than half of medicines are given or prescribed incorrectly, and half of the people who take them cannot use them correctly.^{4,1} Irregular drug use has made people less confident in healthcare systems.⁵ A prescription order is a critical interaction between a physician and a patient. Providing instructions for palliation or restoration of health and highlights the physician's diagnostic ability and therapeutic expertise.² The Prescription Indicators, created by WHO, enable variable comparisons, measuring the population's medical needs and finding the most frequently prescribed medicines in a specific location. The prescription indicators are the average number of prescribed drugs in prescriptions, the proportion of prescribed drugs in generic names, the percentage of medications prescribed from an Essential Drug List or a formulary, and the percentage of encounters with antibiotics prescribed.⁶ According to published studies, irrational drug use is caused by polypharmacy, incorrect antibiotic use, abuse of injectable medications, prescription drug use that deviates from clinical standards, and inadequate self-medication.⁵ The EDL facilitates efficient and effective drug use, but the selection of the EDL is a complicated procedure. Therefore, the community's requirements must be considered part of the decision-making process, especially concerning diagnosis, prevention, and treatment using metrics such as the risk-benefit ratio, qualitative and practicable management cost-effectiveness and patient compliance. One-third of the world's population lacks access to necessary medications due to availability or inclusion in the EDL.⁵ The WHO recommends the Anatomical Therapeutic Chemical Classification (ATC) and Defined Daily Dose (DDD) for drug utilisation studies. This approach helps to improve health care and compares drug usage information at various levels.⁷ The DDD is a measuring unit. It represents the average daily maintenance dose of a drug for an adult. Each ATC code has a single DDD. Population size does not affect the drug use statistics in DDD. The Prescribed Daily Dose (PDD) is the average dose prescribed in the prescription. It might be different from the DDD.⁸ In India, there is a lack of data on drug utilisation in dentistry, which is a unique profession with diverse patients. In dental Pharmacotherapy, many drugs are prescribed, including antibiotics, analgesics, vitamins, other supplements, and other pharmaceuticals.² Among dental diseases, periodontal diseases affect over half of the Indian population.⁹ It is one of the most prevalent microbial diseases in adults, accounting for approximately one-third of all cases, an inflammatory condition of bacterial origin damages the tissues that support the teeth and causes them to bleed.¹⁰ This cross-sectional study was done with the aim of evaluating the rationality of prescription patterns and drug consumption in outpatients undergoing periodontal treatment. In addition, this research would help health care officials, decide how to use medicines in the best way possible and recommend the exclusion and inclusion of drugs to EDL to treat periodontal diseases.

2. MATERIALS AND METHODS

A prospective cross-sectional study was conducted after institutional ethics committee approval (vide letter no. hdc/ethical/pharma/2019/28) in the Department of Periodontics of the tertiary care dental centre of Himachal Pradesh from August 2020 to July 2021.

1. Inclusion criteria

- Patients above 18 years.
- Patients willing to participate in the study were included in the study.

2. Exclusion criteria

- Patients referred to other faculties or hospitals
- Patients with incomplete prescription orders.
- Patients with chronic diseases i.e., cancer, were excluded from the study.

3. Participants

More than 600 sample was taken which is the minimum recommendation by WHO.⁸ During the research period, 1353 patients visited the Department of Periodontics' outpatient department. After following the eligibility criteria, 922 patients were asked for consent to participate in the study. Informed consent was obtained from 849 patients for enrolment in the study. The attrition rate was 7.9%.

4. Prescription

Patients were reassured that their information would be kept confidential, and they were informed of the research's goals and the various benefits to the community. The duration of the engagement with the patient ranged from 15 minutes to 45 minutes. The information acquired was the patient's identity, demographics, the name of the medication prescription, the dose form, strength, the dosage prescribed, dosing frequency, and the prescription purpose.

5. Self-reported practice

A predesigned, semi-structured data extraction form was prepared and translated into the local language (Hindi). Drugs were given ATC codes as per the 2021 version of the ATC/DDD (Anatomical Therapeutic Chemical/Defined Daily Dose) categorisation method. The DDD was calculated at DDD/1000 inhabitants per day to measure the overall volume of medicine utilised. DDD compared with the average prescribed daily dosage (PDD). WHO core drug prescribing indicators calculated. The results were compared with the ideal values recommended by WHO for each core indicator except the Essential Drug List, for which the reference document was the National List of Essential Medicines (NLEM) 2015 of India.

3. STATISTICAL ANALYSIS

Data was entered and coded in Excel 2010. The Excel file was cleaned up, and cases with missing data were deleted and eliminated. The data was then imported into SPSS (IBM SPSS Statistics for Windows, Version 23.0; IBM Corp., Armonk, NY, USA). The descriptive analysis method was used in this study since the study participants represented the whole

research population. In addition, because the data was both continuous and nominal, the variables were shown in frequency and percentage.

4. RESULTS

The study comprised of 849 participants with periodontal disorders, of which 481 were males (56.65%) and 368 were females (43.35%), with a mean age of 37.8 years (Sd = 13.05). The diagnoses were categorised into four categories as per the new classification of periodontal disease 2017.¹¹ Most prevalent were 'periodontitis' (40.5%) and 'other conditions

affecting periodontium' (38.2%). In disease category periodontitis, two diagnoses were periodontitis and necrotising periodontal diseases. Other conditions affecting periodontium constituted five diagnoses in which most patients were treated for tooth and prosthesis related factors. The frequencies of patients with different diagnoses are presented in table 1. Periodontitis was most prevalent, followed by tooth and prosthesis related factors. The diagnosis of gingivitis was most prevalent in the disease category 'periodontal health, gingival diseases and conditions' (Table 1)

Table 1 The various classes of disease and the number of patients in each class		
Category of Disease	Diagnosis	Frequency
Periodontal health, gingival diseases and conditions	Periodontal health and gingival health	54
	Gingivitis	68
	Gingival diseases	13
Periodontitis	Necrotising periodontal diseases	5
	Periodontitis	339
Other conditions affecting periodontium	Systemic diseases/conditions affecting periodontal supporting tissues	5
	Periodontal abscesses and endodontic periodontal lesions	16
	Traumatic occlusal forces	27
	Mucogingival deformities and conditions	62
	Tooth and prosthesis related factors	214
Peri-implant diseases and conditions	Peri-implant mucositis	28
	Peri-implantitis	18

A total of 1938 medicines were prescribed in 849 prescriptions. The most prescribed drug was the amoxicillin & clavulanic acid combination in 21.7% of prescriptions, followed by the B-complex with vitamin C 13.4%, aceclofenac, paracetamol & serratiopeptidase combination 12.0%, and

diclofenac sodium & serratiopeptidase combination 11.9%. (Table 2) Chlorhexidine was the most prescribed oral preparation, followed by the combination of chlorhexidine gluconate, lidocaine & metronidazole. Out of a total, 148 patients were smokers and were prescribed nicotine (7.6%).

Table 2. The various drugs and prescribing frequency		
Individual drugs	Frequency	%
Amoxicillin & clavulanic acid	422	21.78
B Complex with vitamin C	260	13.42
Aceclofenac, paracetamol & serratiopeptidase	233	12.02
Diclofenac sodium & serratiopeptidase	231	11.92
Chlorhexidine	200	10.32
Chlorhexidine gluconate, lidocaine & metronidazole	148	7.64
Nicotine	148	7.64
Toothpaste	64	3.3
Metronidazole	40	2.06
Multivitamins	32	1.65
Paracetamol & tramadol	27	1.39
Ofloxacin & ornidazole	26	1.34
Amoxicillin	18	0.93
Clindamycin	18	0.93
Ketorolac	18	0.93
Doxycycline	14	0.72
Lidocaine & tannic acid	12	0.62
Prednisolone	5	0.26
Hydrogen peroxide	5	0.26
Triamcinolone	5	0.26
Ibuprofen	4	0.21
Aceclofenac & tizanidine	3	0.15
Ofloxacin	2	0.1
Cefixime	1	0.05
Diclofenac	1	0.05
Povidone-iodine	1	0.05
Total	1938	

Drugs used for respective periodontal diseases categories are shown in Figure 1. A combination of amoxicillin & clavulanic acid was the most prescribed drug. It was prescribed to patients in the periodontal disease category 'Other combination affecting periodontium' (58.7%) followed by 'Periodontitis' (39.3%). B complex with vitamin C was the second most prescribed drug. It mainly was prescribed for the disease category 'other conditions affecting periodontium' (82.8%), followed by 'periodontitis' (15.7%).

Analgesics most prescribed were aceclofenac, paracetamol & serratiopeptidase and diclofenac sodium & serratiopeptidase Combination. The first combination mainly was prescribed for disease category 'other condition affecting periodontium' (93.1%), and the second combination mainly was prescribed for 'periodontitis' (68.8%). In local oral formulations, chlorhexidine mouthwash was mainly prescribed for disease category 'periodontitis' (48%) and 'periodontal health gingival diseases and conditions' (39.5%).

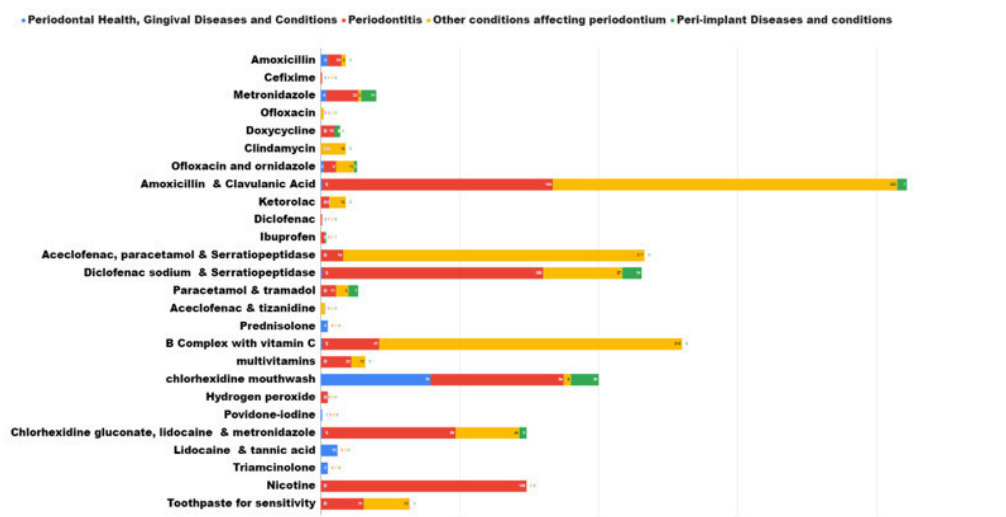


Fig 1: Distribution of individual drugs prescribed in four categories of periodontal diseases

Based on ATC codes, DDD was calculated. DDD was only given to systemic drugs. The number of DDD consumed and the DDD/1000 population/day was the maximum for vitamins (4380 and 14.12 respectively), followed by antibiotics (2625 and 8.43 respectively) and non-steroidal anti-inflammatory

drugs (1948.75 and 6.27 respectively). Most of the drugs had similar PDD and DDD. Only metronidazole, nicotine and a fixed-dose combination of paracetamol & tramadol had lower PDD than DDD. (Table 3)

Table 3. Comparison of the number of defined daily doses per 1000 population per day of prescribed drugs.

Individual drug	ATC Classification	no. of DDD	DDD/1000 population/day	PDD	WHO/DDD
Antibacterial					
Amoxicillin	J01CA04	90	0.29	1.5	1.5
Cefixime	J01DD08	5	0.01	0.4	0.4
Metronidazole	P01AB01	120	0.38	1.2	2
Ofloxacin	J01MA01	10	0.03	0.4	0.4
Doxycycline	J01AA02	70	0.22	0.1	0.1
Clindamycin	J01FF01	90	0.29	1.2	1.2
Ofloxacin & ornidazole	J01RA09	130	0.41	2 U	2U
Amoxicillin & clavulanic acid	J01CR02	2110	6.8	1.5	1.5
Total		2625	8.43		
Non-steroidal Anti-inflammatory Drugs					
Ketorolac	M01AB15	90	0.29	0.03	0.03
Diclofenac	M01AB05	5	0.01	0.1	0.1
Ibuprofen	M01AE01	20	0.06	1.2	1.2
Diclofenac sodium & serratiopeptidase	M01AB55	1732.5	5.59	0.1	0.1
Paracetamol & tramadol	N02AJ13	101.25	0.32	3U	4U
Total		1948.75	6.27		
Corticosteroids					
Prednisolone	H02AB06	70	0.22	0.01	0.01
Vitamins					
B Complex with vitamin C	A11EB	3900	12.58	1U	1U
Multivitamins	B03BA51	480	1.54	1U	1U
Total		4380	14.12		
Drugs used in Addictive Disorders					
Nicotine	N07BA01	0.888	0.002	0.012	0.03

ATC- Anatomical Therapeutic Chemical; DDD- Defined Daily Dose; PDD- Prescribed Daily Dose; WHO- World Health Organisation; U- Unit

To find out the rationality of the prescription, using WHO core indicators, the average number of drugs prescribed per prescription was 2.2. Out of 849 patients, 614 were prescribed antibiotics. The percentage of encounters with antibiotics was 72.3%, and the generic name of medicines prescribed were only 14.6%. Therefore, only 37.6% of drugs were from the NLEM 2015.

5. DISCUSSION

In all nations, irrational drug use exists and is harmful to individuals.¹² This study presented the pattern of periodontal diseases, the types of drugs prescribed to treat them, and evaluated the rationality of prescriptions using WHO prescription indicators. The most prevalent disease category was periodontitis followed by other conditions affecting the periodontium. In the disease category other combinations affecting the periodontium most prescriptions were for partial edentulism for which the implant was placed. Several modifiable and non-modifiable risk factors increase the risk of periodontal diseases, as revealed by various studies.¹³⁻¹⁶ Antibiotics were the most frequently recommended class of medication, and amoxicillin was prescribed most often, either alone or in combination. The most common antibiotic for dental patients was found to be amoxicillin in some other Indian studies as well. Ravichandran *et al*¹⁷, Kaul *et al*¹⁸ and Suhaib *et al*.¹⁹ Agossa *et al*²⁰, Shrestha *et al*²¹, Hashemipour *et al*²², Baskaradoss *et al*²³, Fadare *et al*²⁴, Al-Johani *et al*²⁵ and Asmar *et al*²⁶ documented that the most commonly prescribed antibiotic was Amoxicillin. However, according to Aly *et al*²⁷ Deniz-Sungur *et al*²⁸ Javed *et al*²⁹ and Shrestha *et al*³⁰, the most often prescribed antibiotic was amoxicillin & clavulanic acid combination. Smith *et al*³¹ found that amoxicillin was among the top antibiotics administered by dentists in England and Scotland. Because of its microbial origin, antibiotics have been used to treat inflammatory periodontal disease. Antibiotics are often used to treat infections caused by the host's invasion by a harmful bacterium.¹⁰ After dental implant placement, antibiotics must be given to have a long-term survival rate and high success rate.³² The most prescribed analgesics were aceclofenac, paracetamol & serratiopeptidase and diclofenac sodium & serratiopeptidase combination. We have found similar findings in other studies by Nagarajan *et al*³³ the most prescribed periodontal pain medication was paracetamol & aceclofenac. Cinthura *et al*³⁴ documented paracetamol alone and paracetamol & aceclofenac most prescribed. Rajaraman *et al*³⁵ documented that dentist favoured combination of analgesics. Ramanath *et al*³⁶ found that diclofenac & paracetamol combination and Aceclofenac & paracetamol combination were commonly used analgesics like our findings in periodontitis. The reason attributed to this could be that analgesics are prescribed for pain, which is a symptom of infections and inflammatory oral disorders.³⁷ Most of the cases in our research were associated with inflammation and infection. Vitamins were prescribed mostly to disease category other condition affecting periodontium. Though periodontal disorders are not nutritional deficiency illnesses. However, deficiency can lead to the progression of underlying periodontal lesions and impact periodontal treatment results.³⁸ The most commonly prescribed oral formulations were chlorhexidine mouthwash which is similar with other studies by Nuroloyuni *et al*³⁹ and Shrestha *et al*³⁰. Mouth rinses containing chlorhexidine are used to treat gingivitis.⁴⁰ To achieve complete mouth cleaning, a combination of therapeutic measures, including mechanical treatment and

antimicrobial therapy, must be done.⁴¹ The number of DDDs consumed and the DDD/1000 population/day was the maximum for vitamins, followed by antibacterial and non-steroidal anti-inflammatory drugs. Most of the drugs have similar PDD and DDD. Only metronidazole, nicotine, and a fixed-dose combination of paracetamol and tramadol have lower PDD than DDD (Table 3). Again, most drugs have similar PDD and DDD. The DDD is an approximation of how many patients in a community are treated for drugs. It may or may not correspond to the recommended or actual dose.⁴² Different drugs are given in different doses for different reasons, which must be considered. In our findings vitamins were prescribed in fewer prescriptions than antibiotics but for a longer duration. The WHO core prescribing indicators were used to analyse the current drug utilisation pattern. It was found that the average number of drugs per encounter was 2.2, which is greater than the average, i.e., 1.6-1.8 drugs per encounter as suggested by WHO.⁴³ Our finding is similar to the results found in the studies conducted by Kia SJ *et al*⁴⁴ (2.6), Rehan *et al*⁴⁵ (2.4) and Aparna *et al*⁴⁶ (2.8). This demonstrates the presence of over-prescription by dental practitioners that indicates considerable diversity in their prescriptions, such as how they frequently prescribe more than one analgesic, anti-inflammatory, and antibiotic medication to their patients. Counting systemic and non-systemic medications in a prescription may lead to over-prescription in dentistry. The other reasons could be physician incompetence, a lack of evidence-based standards and incentives for prescribers, a lack of ongoing medical education, and a lack of therapeutically appropriate medications.⁴⁷ In contrast to our findings, various studies conducted in different parts of India revealed a lower average number of drugs per encounter, i.e., 1.8 by Patel *et al*⁴⁸ and 0.9 by Pratiti *et al*.⁴⁹ The percentage of encounters with an antibiotic in prescription was very high i.e., 72.3% from the optimum value recommended by WHO 20.0-26.8%.⁴³ A study by Atif M *et al* documented it 52.2%.⁴⁷ However, this contrasts with the studies done by Guyon *et al* 25%.⁵⁰ Antibiotics should be used rationally, but if patients are identified with conditions that require antibiotics, this percentage could rise. In this study, most of the patients were treated for inflammatory conditions due to bacteria and for partial edentulism for which an implant was placed. Only 37.6% of medications were prescribed, according to NLEM 2015. This value is much lower than the studies conducted by Patel *et al*⁴⁸ 85.03% and Guyon *et al*⁵⁰ 85%. This proportion should have been higher because the medicines on this list are chosen based on public health importance, proof of efficacy and safety, and comparative cost-effectiveness.³⁰ According to the recommendation of WHO, it should be 100%.⁴³ However, this could be due to doctors' and policymakers' ignorance. So, they must be educated on the significance of essential medicines, the scope of new drugs on the list, and the efforts to make them available. In our finding most of the drugs prescribed for local oral treatment were not in the EDL. Another issue of worry was the reduced proportion of prescriptions for generic names. Only 14.60% of drugs were prescribed in generic names. Patel *et al* found it 1.58%⁴⁸, Pratiti *et al* 10.97%⁴⁹, and Sarkar *et al* 21%.⁵¹ A study by Shrestha *et al* found it very high compared to our finding, i.e., 63.26%.³⁰ When generic or preferred drugs are used in a therapeutic class, adherence to treatment improves.⁵² and the financial burden on patients may be reduced.⁵³ WHO strongly advises drug prescription by generic name since it clearly identifies the drug provides for improved information sharing and communication between healthcare

professionals and is also appropriate for patients. The lack of faith by physicians and patients in the quality of unbranded generic medicines may be a reason for their not being prescribed by doctors.⁵²

6. CONCLUSION

Before this research, there was no data on the pattern of periodontal diseases and prescriptions for patients having periodontal treatment in Himachal Pradesh, so it was deemed a pioneering initiative. However, the dental practitioners did not adhere to WHO prescribing guidelines. The lowered number of prescriptions for generic names was a subject of worry. We reviewed prescriptions only by periodontal specialists. They prescribed various drugs, single or in combinations, for local and systemic use. Most of them were not on the essential drug list. Because the needs for dental therapy are different from those for other systemic diseases, drugs should not be generalised. This study recommends a separate list of essential drugs for dentistry. These findings

will help policymakers establish policies that promote the most efficient use of resources in treating periodontal diseases. So, the clinical pharmacist's position and importance in hospitals may grow. In addition, it might be used to improve prescribing processes at other dental hospitals.

7. AUTHORS CONTRIBUTION STATEMENT

Dr. Amit Chaudhary contributed to designing the study; Dharmesh Sharma's contribution was in the literature review, designing the study, data analysis, writing up and editing, collecting and entering data; Dr. Rajan Negi contributed to designing the study; Dr. Sakshi Supedia contribution was in the write-up and editing and data analysis. Dr. Malvika Thakur contributed to data collection.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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