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## Study On Drug Utilization Pattern in Dental Department of a Tertiary Care Teaching Hospital: A Prospective Study.

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### ABSTRACT

Dental problems are very common in all the ages. But at the age progress, dental related issues are increasing. The present study was carried out for the first time in our hospital dental department with the objective to know the drug utilization pattern in the dental department. A prospective and observational study was conducted in 250 patients from October 2014 to March 2015. Relevant information was obtained from the interview as well the treatment chart of patients, by using a case report form. The present study shows the majority of the patients entered in the study were males (52.4%). Among the study population, most were belonging 31-35 years' age group (16%). Housewives (25.6%) secondary level of literates (32.8%) and smokers (11.2%). The most common dental diseases were periodontitis (38.8%) and apical periodontitis (29.6%). Analgesics (80.8%) and antibiotics (52.4%) were the most commonly prescribed drugs in our study. Among patients (131) prescribed with antibiotics, 45 patients received a minimum of one antibiotic and 86 patients received more than one antibiotic but not necessarily at the same time. Most commonly prescribed a class of antibiotics was Penicillins in combination with  $\beta$ -lactamase inhibitors followed by Nitroimidazoles. Analgesics were prescribed in 80.2% of the study population. Routinely used analgesics were diclofenac in combination with paracetamol (38.4%) and Aceclofenac in combination with Paracetamol (34%). Antacids were prescribed in 12.8% of the study population. Ranitidine was the most commonly prescribed antiulcer agent. A total number of 71 oropharyngeal preparations were prescribed, of this Chlorhexidine mouthwash (43) and toothpaste (15) were more frequent. Among the entire study population, only four patients (1.6%) were provided for with multivitamins. In this present study only 14 (5.6%) patients had drug-drug interactions of mild severity. The enrolled patients were not aware of dental disorders, but only 26.4% of patients following oral hygiene measures. This study clearly showed that prescribing pattern of drugs (antibiotics, analgesics, antacids etc.) needs to be continuously evaluated even in dental diseases in order to promote the more rational prescribing, decrease morbidity and cost of therapy for the patient.

**Keywords:** Periodontitis, Apical Periodontitis, dental caries, dental erosions. FDCs; fixed drug combinations

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## INTRODUCTION

Drug utilization studies began in the early 1960s only for marketing purpose. Not widely available to health care authorities or academic researchers [1]. According to World Health Organization (WHO), drug utilization research is defined as “the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences” [2]

Studies on the drug utilization mainly focus on the prescribing, dispensing. Administering and taking on a medication and its associated events in recent years it has been increasing to compare utilization patterns of a specific drug and for evaluating a quality of medical prescription [1]. Drug utilization researches help in the estimation of the number of patients treated with a specific drug, to describe the extent of usage at certain moments or in certain areas, to estimate the degree of proper or improper use and the pattern or profile of drug use [3].

Dental diseases are the most prevalent chronic diseases worldwide and are increasing in developing countries. Treatments of dental diseases are expensive and accounting for 5% to 10% of total health care expenditures in industrialized countries [5]. The most widely prescribed classes of drugs in dental diseases are antibiotics. Analgesics antiseptics and vitamins. Antibiotics are usually prescribed to treat infection or as prophylactic therapy prior and after a dental surgery. Even analgesics (narcotic or non-narcotic) also are prescribed usually along with antibiotics to relieve or to reduce the post-operative pain due to inflammation or pain due to underlying infection [4, 6].

The misuse of analgesics and antibiotics consequences leads to drug abuse (specifically narcotics) and antibiotic resistance, which are the commonest problem of today [7]. One of the major causes for developing of antibiotic resistance is the improper use of antibiotics such as over- the- counter drugs (OTC), over use, under use, improper timing, use of antibiotics for viral infections, non-adherence to medications and misuse of antibiotics[8,9]. Diet, oral hygiene, tobacco use (chewing and or smoking) and geographical factors (fluorides) Rapid urbanization and literacy level plays an important role in causing various dental diseases in developing countries.

Dental infections are polymicrobial in nature. Hence, the use of broad-spectrum antibiotics in dental infections is increasing and contributes to the development of antibiotic resistance [5, 10]. The data from the previous studies on drug prescribing patterns of dental practitioners are scarce and need to have more studies on prescribing habits [4]. Hence, this study focuses on the drug utilization pattern and Diseases (Eg. Dental caries, Dental erosions, periodontitis etc.) in dentistry department of Adichunchanagiri Hospital and Research Centre, B.G.Nagar, with the following .

### Objectives

- To study the incidence of various Dental disorders in outpatients.
- To identify various risk factors causing dental diseases.
- To study the prescribing patterns of various drugs & related interventions (eg. Drug interactions, ADRs).
- To estimate the cost of antibiotic therapy in Dental disorders

## MATERIALS AND METHODS

**Study design:** prospective and observational study

**Source of data and Materials:** Patient medication records and Hospital pharmacy.

**Study period and Study site:** The study was conducted for a period of 8 months from August 2014 to March 2015 in Adichunchanagiri Hospital and Research Center, B.G. Nagara-571448, Karnataka, India.

## Study criteria

### Inclusion Criteria

- All outpatients visiting Department of Dentistry during the study period.
- Patients who are willing to give consent.

### Exclusion Criteria

- Patients are treated as in-patients.
- Patients treated without prescription of drugs

### Study Procedure

The patient who satisfies the criteria were taken consent and details were collected in well design data collection form contained demographics of the patient (Name, Age, Sex, BMI, Socio-economic status, etc.). The other details of the patients like diagnosis, prescribed drugs, indication and their route of administration, Frequency were also collected in the dental clinic case file, while prescribed the drug by the dental doctor. The prescribed drug was quickly checked for any drug interactions and patient also interviewed and counselled about their medications. The patients were even Followed up (during the course of 6 months) returning with the same or other dental problem. The obtained data were tabulated and analysed by using Statistical Package Social Sciences version 20. For a mean number of drugs prescribed and its regimen (eg: dose, route of administration and frequency). The cost of antibiotics for each prescription and mean cost of antibiotics per prescription.

## RESULTS

Among 250 patients 136 (54.4%) were males and 114 (45.6%) were females. The mean age of the patients was  $38.65 \pm 16.46$ . Among the Major proportion (82.4%) of patients 31-35 years age group (16%) followed by, 21-25 years (14%), 46-50 years (12%), 26-30 years (10%), 41-45 years (8.8%), 36-40 years & 51-55 years were (7.6%), 11-15 years age group (6.4%) patients., rest of groups accounted for a minor fraction (17.6%). Majority of the patients were house wives 64 (25.6%) followed by students 54 (21.6%), farmers 52 (20.8%), mechanical (auto mobile workers 27; 10.8%), technical 20 (8%), teachers 18 (7.2%), daily wagers 14 (5.6%) and a minor fraction were business people 1 (0.4%). Majority of the study population was literates (228; 91.2%). Among the literates, most of them are having secondary level of education (82; 32.8%), followed by under graduates, pre university level and post graduates. Literacy level was high among female population than males (92.10% vs. 90.44%).

Most of the study populations (159; 63.6%) were not having any habits. Among the population having personal history, majority were smokers (28; 11.2%) followed by alcoholics (19; 7.6%), betel nut chewers (16; 6.4%), smoking and alcoholics (14; 5.6%), tobacco chewers (11; 4.4%), both tobacco chewing and smoking (2; 0.8%) and both betel nut chewing and smoking (1; 0.4%). A total of 66 patients were following oral hygiene. Of them two were smokers and two were alcoholics. All betel nut chewers were females and among tobacco chewers three were females and rest was male population.

Majority of the patients were having already having tooth problems (46; ) as medical history followed by type 2 diabetes mellitus (type 2 DM; 24), hypertension (HTN; 14), type 2 DM and tooth problem (8), other co-morbidities (eg: hypothyroidism etc., 8), type 2 DM and HTN (4), asthma (2) and HTN and tooth problem (1). Two asthma patients were not on regular medication. A total of 16 patients were not aware of medications what they were on but on proper adherence to therapy. (Table1&2)

Among 65 patients who had history of dental problems, most of them were on over the counter medication (OTC), majorly analgesics (46), seven patients were not known about the medication what they took, only one patient took antibiotic and the rest were not taken any medication prior to the consultation of dentist.

**Table 1: Distribution of Dental Disorders**

Diagnosis	No. of Male Patients (%)	No. of Female Patients (%)	Total No. of Patients (%)
Periodontitis	52 (38.2)	45 (39.5)	97 (38.8)
Apical periodontitis	36 (26.5)	38 (33.3)	74 (29.6)
Dental carries	21 (15.4)	12 (10.5)	33 (13.2)
Dental abscess	16 (11.8)	17 (14.9)	33 (13.2)
Gingivitis	11 (8.1)	2 (1.8)	13 (5.2)
<b>Total</b>	<b>136 (100.0)</b>	<b>114 (100.0)</b>	<b>250 (100)</b>

**Table 2: Distribution of Frequently Effected Tooth in Dental Disorders**

Effected Tooth Position	No. of Male Patients (%)	No. of Female Patients (%)	Total No. of Patients (%)
Canine upper mandible	5(3.7)	8(7.0)	13 (5.2)
Canine lower mandible	7(5.1)	0 (0)	7(2.8)
Incisors upper mandible	6(4.4)	6(5.3)	12 (4.8)
Incisors lower mandible	4(2.9)	8(7.0)	12 (4.8)
Premolar upper mandible	36(26.5)	37(32.5)	73(29.2)
Premolar lower mandible	35(25.7)	25(21.9)	60 (24)
Molar upper mandible	29(21.3)	18(15.8)	47(18.8)
Molar lower mandible	14(10.3)	12(10.5)	26(10.4)
<b>Total</b>	<b>136(100.0)</b>	<b>114(100.0)</b>	<b>250(100.0)</b>

Out of 250 patients, 131 (52.4%) were prescribed with one or more antibiotics and the rest 119 (47.6%) were not prescribed with any of antibiotics. 235 antibiotics were prescribed over 131 (52.4%) patients enrolled in the study. Among the patients prescribed with antibiotics, 68 (27.2%) prescriptions contained two antibiotics followed by 45 (18%) and 18 (7.2%) prescriptions containing 1 and 3 antibiotics respectively but not necessarily at the same time. Mean number of antibiotics among antibiotics prescribed patients was 1.79±0.66 (Mean ± SD). (Table3)

**Table 3: Distribution of No. of antibiotics prescribed per patient**

No. of antibiotics	No. of Male Patients (%)	No. of Female Patients (%)	Total No. of Patients (%)
<b>0</b>	65 (47.8)	54 (47.4)	119 (47.6)
<b>1</b>	26 (19.1)	19 (16.7)	45 (18)
<b>2</b>	38 (27.9)	30 (26.3)	68 (27.2)
<b>3</b>	7 (5.1)	11 (9.6)	18 (7.2)
<b>Total</b>	<b>136 (100.0)</b>	<b>114 (100.0)</b>	<b>250 (100)</b>
<b>Mean ±SD (Among patients prescribed with antibiotics)</b>	<b>1.73±0.63</b>	<b>1.87 ±0.7</b>	<b>1.79±0.66</b>

The Majority 128 (51.2%) of the study population received oral antibiotics in tablet form followed by oral gels (local application: 3; 1.2%). Combination of penicillin's and beta-lactamase inhibitors (70; 40.9%) were the most commonly prescribed antibiotic class followed by Nitroimidazoles (39; 22.8%), Fluroquinolones (28; 16.37%), Penicillin's (22; 12.86%), combination of Fluroquinolones and Nitroimidazoles (8; 4.67) Benzimidazoles (3; 1.75%) and Tetracyclines (1; 0.58%) constituted among all the prescriptions. (Table4)

**Table 4: Distribution of Commonly prescribed class of antibiotics and antibiotics combinations:**

Class of antibiotics	Name of antibiotic	Total No. of prescriptions male patients (%)	Total No. of prescriptions female patients (%)	Total No. of prescriptions (%)
<b>Penicillins + Beta lactamase inhibitors</b>	Amoxicillin + Clavulanic acid	30 (17.54)	40 (23.4)	70 (40.9)
<b>Nitroimidazoles</b>	Metronidazole	28 (16.37)	10 (5.84)	38 (22.23)
	Ornidazole	1 (0.58)	0 (0)	1 (0.58)
<b>Fluroquinolones</b>	Norfloxacin	9 (5.26)	14 (8.18)	23 (13.4)
	Ciprofloxacin	3 (1.75)	2 (1.17)	5 (2.92)
<b>Penicillins</b>	Amoxicillin	17 (9.94)	5 (2.92)	22 (12.86)
<b>Fluroquinolones + Nitroimidazoles</b>	Ciprofloxacin + Tinidazole	4 (2.34)	4 (2.34)	8 (4.67)
<b>Benzimidazoles</b>	Albendazole	3 (1.75)	0 (0)	3 (1.75)
<b>Tetracycline</b>	Doxycycline	1 (0.58)	0 (0)	1 (0.58)
<b>Total No. of prescriptions</b>		96 (56.14)	75 (43.86)	171 (100)

Amoxicillin and Clavulanic acid (70; 40.9%) was the most commonly prescribed antibiotic in the study population followed by Metronidazole (38; 22.23%), Norfloxacin (23; 13.4%), and Amoxicillin (22; 12.86%) constituted for major proportion of antibiotics prescribed. Combination of Ciprofloxacin and Tinidazole (8; 4.67) followed by Ciprofloxacin (5 2.92%), Albendazole (3; 1.75%), Ornidazole (1; 0.58%) and Doxycycline (1; 0.58%) accounted for minor fraction of all prescriptions.

Non-steroidal anti-inflammatory drugs (NSAIDs) in combination with Acetaminophen (paracetamol) were the most commonly prescribed class of analgesics followed by Salicylates in combination with local anesthetic agents (Choline salicylates and Lidocaine in gel form) and Acetaminophen alone. Analgesics were the most commonly prescribed medications (202; 80.8%) in the dental disorders. Most of analgesics were administered as oral tablets (198; 79.2%) followed by oral gel form (8; 3.2%) for local application and combination of oral tablets and gel form (2; 0.8%). (Table5)

**Table 5: Distribution of Commonly prescribed class of Analgesics**

Analgesics prescribed	Class of analgesics	Name of analgesics	No. of Male Patients (%)	No. of Female Patients (%)	Total No. of Patients (%)
<b>Yes</b>	<b>NSAIDs</b>	Diclofenac and Paracetamol	67 (49.3)	29 (25.4)	96 (38.4)
		Aceclofenac and paracetamol	40 (29.4)	45 (39.47)	85 (34.0)
		Ibuprofen and Paracetamol	1 (0.7)	7 (6.14)	8 (3.2)
		Nimuselide and Paracetamol	1 (0.7)	0 (0)	1 (0.4)
		Diclofenac	1 (0.7)	0 (0)	1 (0.4)
		Ibuprofen	1 (0.7)	0 (0)	1 (0.4)
	<b>Salicylates and Lidocaine</b>	Choline salicylate and Lidocaine	2 (1.5)	7 (6.14)	9 (3.6)
	<b>Acetaminophen</b>	Paracetamol alone	0 (0)	1 (0.9)	1 (0.4)
<b>No</b>			23 (16.9)	25 (21.92)	48 (19.2)
<b>Total</b>					250 (100)

**Antiulcer agent’s usage pattern**

Antiulcer agents were prescribed in 32 (12.8%) patients. Antihistamines (H2 receptor antagonists: Ranitidine) was the most commonly (20) prescribed antiulcer agent followed by combination of proton pump inhibitors (PPIs; 11) and antacids (1). Among PPIs, pantoprazole (10) was most commonly prescribed followed by omeprazole (1). In one patient Al(OH)<sub>3</sub> was the prescribed as antacid.

**Supplements usage**

Among the study population, only four patients were prescribed supplements (combination of vitamin B complex, vitamin C and calcium mineral). This was prescribed in two of male and two of female patients. Miscellaneous drugs were prescribed among 15 patients of study population.

**Number of days of drugs prescribed**

Average number of days antibiotics prescribed was found to be 3-5 days  $3.35 \pm 0.764$ , whereas for analgesics average number of days prescribed were 2-3 days  $2.99 \pm 0.38$ .

After the review of 250 out patient’s treatment charts, in 14 drug interventions found in 14 patient’s treatment charts. Of these 11 found in male patients, rest was in female patients.

All the interventions were drug-drug interactions (metronidazole with diclofenac) and mild in severity.

**Awareness of patient’s or patient’s care taker and Patient counseling:**

All the patients were not aware of dental diseases, unfortunately even among the highly literates were also not aware of dental diseases. Patient counseling was provided about oral hygiene measures, dental diseases and administration of drugs (usage of mouth washes and gargles) and importance of proper medication adherence to 74 (29.6%) patients of the study population. Of these only 18 were following oral hygiene measures. Among the patients not provided the patient counseling, 48 (19.2%) were following oral hygiene measures. Most of the patients following oral hygiene measures were having high literacy level (graduates; 38, post graduates; 10). The treatment cost of the dental disorder were shown below (Table 6)

**Table 6 : Distribution of Treatment cost (medications) in males and females**

	Among male Patients	Among female Patients	Among study population
<b>Total no. of antibiotics prescribed</b>	123	112	235 (among antibiotics prescribed)
<b>Average no. of antibiotics prescribed</b>	$1.73 \pm 0.63$	$1.87 \pm 0.7$	$1.79 \pm 0.66$ (among antibiotics prescribed)
<b>Total no. of drugs prescribed</b>	404	332	736
<b>Average no. of drugs per patient</b>	$2.97 \pm 1.42$	$2.91 \pm 1.37$	$2.92 \pm 1.44$
<b>Average cost of antibiotics per patient (INR)</b>	$96.57 \pm 80.20$	$107.61 \pm 84.71$	$101.62 \pm 82.16$ (among antibiotics prescribed)
<b>Average cost of analgesics per patient (INR)</b>	$17.77 \pm 6.93$	$17.76 \pm 8.19$	$17.77 \pm 7.49$ (among analgesics prescribed)
<b>Average cost of total medicines per patient (INR)</b>	$78.46 \pm 79.66$	$85.58 \pm 87.00$	$81.70 \pm 82.99$

**DISCUSSION**

Drug utilization studies are useful not only in obtaining the usage pattern of drugs, but also in identifying and management of drug-drug interactions and adverse drug interactions (ADRs)/ pharmacovigilance. Analysis of utilization studies helps us in improving the standards of patient care and in identifying the cost effective therapies [3]

The present study shows majority of the patients enrolled in study were males (52.4%). Among the study population majority were belonging 31-35 years age group (16%), housewives (25.6%) secondary level of literates (32.8%) and smokers (11.2%). The most common dental diseases were periodontitis (38.8%) and apical periodontitis (29.6%) whereas the study conducted by Nirav N. Patel et al chronic generalized periodontitis (28.5%) and dental caries (21.5%) were frequent, and another study conducted by Rauniar G P et al reported dental caries (37%) periodontitis (14%) were the most common dental disease. [10]

Analgesics (80.8%) and antibiotics (52.4%) were the most commonly prescribed drugs in our study which is contrary to studies conducted by Rauniar G P et al (20.6% and 40.3%) and Jayanthi M.K et al (25% and 50%) where antibiotics prescription was higher than analgesics. This difference may be due to the change in prescribing habit's dental surgeons or from hospital to hospital and even based on the patient need. Antibiotics were prescribed more in periodontitis, apical periodontitis and dental abscess conditions, similar results found in Nirav N. Patel et al study. [3, 10]

Mean number of drugs prescribed was 2.94 which are little less than the study conducted by Kulkarni M. D et al [1] and more than study reported by Rauniar G P et al. The mean number of antibiotics was 1.79 which is little higher than the study reported by Rauniar G P et al (1.13) and more or less closer to study conducted by Nirav N. Patel et al (1.61).

Most commonly prescribed class of antibiotics were Penicillin's in combination with  $\beta$ -eta lactamase inhibitors followed by Nitroimidazoles, whereas in study conducted by Jayanthi et al penicillin's and Macrolides and in another study conducted by Rauniar G P et al reported penicillins and Nitroimidazoles were the most commonly prescribed class of antibiotics. Amoxicillin-clavulanic acid (70; 40.9%) and Metronidazole (38; 22.23%) were the most frequently prescribed drugs in our study, when compared with other studies, Nirav N. Patel et al study reported amoxicillin alone (64%), Amoxicillin-clavulanic acid (31.5%) and Metronidazole (26.5%), Rauniar G P et al study showed Amoxicillin (37.26%) alone and Metronidazole (27.96%) were prescribed, another study conducted by Jayanthi et al reported Amoxicillin (27.5%) and Azithromycin (15%) were prescribed frequently. Majority of the antibiotics were prescribed in abscess cases for treatment, for surgical prophylaxis and empirically.

Analgesics were prescribed in 80.2% of study population which is in similar to Kulkarni MD et al study where analgesics (86%) prescription was higher than antibiotics which is in contrary to Jayanthi et al study, reported only 25% of analgesics prescription. Most commonly prescribed analgesics were NSAIDs (76%), which is contrast to Jayanthi et al and Rauniar G P et al studies, where monotherapy of analgesics was dominating. Routinely used analgesics were Diclofenac in combination with Paracetamol (38.4%) and Aceclofenac in combination with paracetamol (34%), entirely contrasting results were found in Rauniar G P et al study reported ibuprofen + paracetamol (11.8%), Jayanthi et al study showed ibuprofen + paracetamol (5%) and diclofenac + paracetamol (5%) fixed drug combinations (FDC) at minor proportions.

Antacids were prescribed in 12.8% of study population which is little higher than Kulkarni M. D et al study. Ranitidine was the most commonly prescribed antiulcer agent as same as reported by Kulkarni M. D et al. Antacids were prescribed only along with analgesics and or antibiotics especially who are having history of peptic acid disorders in a high rational manner.

A total number of 71 oropharyngeal preparations were prescribed, of this chlorhexidine mouth wash (43) and tooth pastes (15) were more common and similar results were found in Rauniar G P et al study, showed chlorhexidine gluconate mouth wash in 43 and tooth pastes in 15 prescriptions.

Among the entire study population only four patients (1.6%) were prescribed with multivitamins which is completely in contrast to Rauniar G P et al, Jayanthi et al and Kulkarni MD et al studies reported 19.5%, 25% and 12.3% respectively. None of the drugs were prescribed with generic name.

Average days of antibiotics prescribed were found to be minimum 3 days to maximum 5 days, whereas average days of analgesics prescribed were found to be 2-3 days, similar results were found in Nirav N. Patel et al.

Average costs of total medicines per patient were 81.70 INR. Antibiotics accounted for major cost followed by analgesics and other drugs. Similar studies were found in Jayanthi et al (105INR).

In the present study population drug related problems were observed among 14 (5.6%) patients and all drug-drug interactions only with mild severity

## CONCLUSION

Periodontitis (periodontal diseases) and apical periodontitis were the most frequent reasons for hospital visits to department of dentistry. Majority of the study population was prescribed with broad spectrum antibiotics (Amoxicillin-Clavulanic acid), and most of the times prescribed for treatment and surgical prophylaxis in the dental treatment. Only oral use of antibiotics was observed which may increase the cost of therapy. Most commonly prescribed analgesics were NSAIDs like Diclofenac and paracetamol (FDCs). This is misused and overused by patients as over the counter drugs and inappropriate prescription of drugs (broad spectrum antibiotics) by the physicians accelerate the emergence of drug resistance, especially in case of antibiotics, which intern affecting the outcome and cost of therapy. Prescription by Generic drug intensifications the cost effective options for the patients and reduces the administrative inconvenience. Decreasing the unnecessary administration of drugs, especially antibiotics will also reduce treatment cost. Hence prescribing pattern of drugs (antibiotics, analgesics, antacids etc.,) needs to be continuously evaluated further in dental diseases in order to promote the more rational prescribing of drugs, to minimize the morbidity, to reduce the cost of therapy and to develop hospital formulary.

### Future directions:

- This type of study can be conducted for longer period for getting a clear understanding about dental disorders and prescribing patterns in dentistry.
- Creating awareness regarding oral hygiene is essential for the rural population.
- Antibiotic resistant studies are essential in dental department.

### Limitations:

- Complete information obtaining from the patients was not possible due to lack of time.
- Minor problems like small decay or procedures like scaling does not require mediation hence these patients are not included.
- The study was conducted in short period i.e. 8 months; even this study can be extended.
- The patient's follow up was difficult because of out-patients

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