Effectiveness of an Educational Feedback Intervention on Drug Prescribing in Dental Practice

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ABSTRACT

Background

Irrational use of drugs as well as inappropriate and over drug prescribing leads to unnecessary expenditures and emergence of resistant bacterial strains. Feedback intervention on drug prescribing habits and face to face educational intervention of prescription audit would be effective in rationalizing prescribing practices.

Objective

To measure the impact of educational feedback intervention on the prescribing behavior of dental surgeons.

Methods

Prospective audit of twelve hundred outpatients prescriptions in dental OPD at BPKIHS of those dental surgeon who attended the educational intervention session was collected randomly by trained persons on customized data collection sheet before and after educational intervention.

Results

A total 1200 prescription were collected, 300 before and 300 after intervention period at the internal of one month, three months and six months. Majority of the prescriptions (39.33%) contained four drugs but after intervention, prescriptions contained mostly one drug, 73% in first month, 78.67% in third month and 65.34% in six month. Mean number of drugs per prescription after intervention were decreased. There was increased number of generic names of drugs after intervention. Amoxicillin, Metronidazole, Chlorhexidine, Povidone iodine gargle, Nimesulide, Ibuprofen, Ibuprofen + paracetamol, and Paracetamol were most commonly prescribed by dental prescribers before and after intervention. Selection of antimicrobial was done on empirical basis which was correct because Amoxicillin concentration reaches effectively in gingival crevicular fluid and Metronidazole covered effectively against anaerobic bacteria were found in orodental infection. The uses of topical anti-infective preparation as irrigants of choice that can kill majority of micro-organisms found is root canal and dental tubules and minimize systemic use of antimicrobials. Nimesulide prescribing needs to be rationalized.

Conclusion

Feedback educational intervention of prescription audit is effective to improve their prescribing behaviors and rationalize drug utilization pattern for the benefit of the patients.

KEY WORDS

Dental prescriber, drug utilization, feedback educational intervention

INTRODUCTION

With escalating health care costs and dwindling budgets, governments around the world, especially in developing countries, are struggling to provide optimal health care. Hence, it is very important to sensitize the prescribers about dangers of polytherapy and importance of cost-effective prescribing to contain healthcare costs. The main factor leading to the growth in expenditure is the preference of prescribers for new and expensive drugs for conditions for which cheaper alternative drugs are available.[1] It is recognized that changing prescriber behavior is difficult and often requires educational intervention. Intervention by feedback has been adopted in the United Kingdom to analyse the prescribing data of the practitioners.[2] Prescriber feedback alone without educational intervention and audit was found to have only a modest impact. In a developing country like Nepal where prescribing habits are irrational, dental practitioners also prescribe more expensive antimicrobial agents and multivitamins to a large number of patients increasing the cost of therapy.[3,4] Hence evaluation of prescriptions after educational feedback intervention on prescribing habits and comparison with the baseline data will reveal its impact on reduction in irrational use of drugs.[5,6] Even a small reduction in polypharmacy would be worth while achievement in changing the prescribing behavior.[7, 8]

Educating future healthcare providers about the importance of judicious antimicrobial use and its impact on containing health care costs would be effective in rationalizing prescribing practices.[9] Pharmacotherapy is one of the most rapidly changing aspects of clinical medicine and practitioners must be knowledgeable and update their knowledge on latest trends in treatment.[10] This has lead to a sharp decline in the number of antimicrobials prescribed when frequent prescription audit and feedback sessions were held with practitioners.[11-14]

Hence the aim of the present study was to measure the impact of educational feedback intervention on prescribing behaviour of dental surgeons at BPKIHS.

METHODS

Prospective audit of twelve hundred outpatients prescriptions in dental OPD at BPKIHS of those dental surgeon who attended the educational intervention session was collected randomly by trained persons on customized data collection sheet before and after educational intervention and feedback presented to dental prescribers and discussed. This study was approved by BPKIHS institutional ethical committee.

Principal investigator had highlighted about rational use of drugs to dental prescribers and discussed use and misuse of antimicrobial agents, multi-vitamins, benefit of generic drug and essential drug list (EDL) of Nepal, problem of antimicrobial resistant and disadvantages of polypharmacy. Principle investigator had also mentioned and discussed WHO prescribing indicators method.

Principal investigator had presented baseline feedback data and discussed vigorously with dental prescribers. After baseline data intervention, 300 prescriptions were again collected by trained person at interval of one month, three months and six months to measure the impact of baseline feedback and education of rational drug use on dental prescribers.

Statistical analysis was done by using (a) WHO prescribing indicator method - mean no. of drugs/ prescription, number of prescriptions with antimicrobial agents, number of prescriptions with injections, number of prescriptions with fixed drug combinations (FDC), number of prescriptions with generic name, percentage of drugs from EDL or formulary of Nepal, and (b) ANOVA- Tukey test and $P< 0.05$ was considered statistically significant.[15]

RESULTS

A total 1200 prescription were collected, 300 prescriptions before and 300 prescriptions after intervention period at the internal of one month, three months and six months. Six hundred eighty three (56.92%) female and 43.08 %

Table 1. Trends of dental disease.

Disease	No. (%)			
	Baseline, (n=300)	1 month post (n=300)	3 months post (n=300)	6 months post (n=300)
Dental caries	105 (35.00)	101 (33.67)	52 (17.33)	55 (18.33)
Periodontitis	50 (16.67)	34 (11.33)	87 (29.00)	83 (27.67)
Gingivitis	40 (13.33)	80 (26.66)	57 (19.00)	34 (11.33)
Periapical abscess	25(8.33)	14(4.67)	13(4.33)	20 (6.67)
Trauma	22 (7.33)	5 (1.66)	11 (3.66)	10 (3.33)
Pulpitis	20 (5.00)	33 (11.00)	57 (19.00)	62 (20.67)
Periodontal abscess	16(5.33)	15(5.00)	10(3.33)	13 (4.33)
Cyst	12 (4.00)	6 (2.00)	3 (1.00)	11 (6.67)
Malocclusion	10 (3.33)	12 (4.00)	10 (3.33)	12 (4.00)

Table 2. Educational feedback intervention effect on polypharmacy.

	Total (%)			
No. of drug per pre-scription	Baseline (n=300)	1 month post (n=300)	3 month post (n=300)	6 month post(n=300)
1 drug	68 (22.66)	219 (73.00)	236 (78.67)	196 (65.34)
2 drug	52 (17.33)	65 (21.67)	52 (17.33)	75 (25.00)
3 drug	58 (19.33)	12 (4.00)	10 (3.33)	18 (6.00)
4 drug	118 (39.33)	4 (1.33)	2 (0.67)	9 (3.00)
5 drug	4 (1.33)	-	-	-
6 drug	-	-	-	1 (0.33)
7 drug	-	-	-	1 (0.33)

Table 3. Data on prescribing pattern before and after intervention.

Parameter	No. (%)			
	Baseline	1 month post	3 months post	6 months post
Total no. of prescription	300	300	300	300
Total no. of drugs	838	396	378	449
Mean drug / prescription	2.79	1.33 *	1.26* •	1.49 * • +
Total no. of prescription with AMA	253 (84.33)	82 (27.33) *	63 (21.00) *	102 (34.00) * §
Total no. of AMA	344 (41.05)	82 (20.70) *	67 (17.72) *	114 (25.39) * §
Mean AMA / prescription	1.15	0.27	0.22	0.38
Total no. of prescription with oropharyngeal preparation	164 (54.67)	93 (31.00) *	60 (20.00) * ^	51 (17.00) * ^
Total no. of oropharyngeal preparation prescribed	181 (21.59)	95 (23.98) *	60 (15.87) * •	52 (11.58) * •
Mean no. of oropharyngeal per prescription	0.60	0.31	0.20	0.17
Number of drugs prescribed by generic name	Nil	92 (23.23) *	48 (12.69) * ®	54 (12.03) * ® #
Number of drugs prescribed by as injection	Nil	Nil	Nil	4
Total no. of NSAIDs prescribed	171 (20.40)	207 (69.00) ¶	236 (78.67) ¶ {}	256 (85.33) ¶ {}
Total no. of prescription with NSAIDs	171 (57.00)	207 (52.27) ¶	236 (62.43) ¶ {}	259 (57.68) ¶ {}
Mean no. of NSAIDs / prescription	0.57	0.69	0.78	0.86)
Total no. of multivitamins	142 (47.33)	3 (1.00) *	5 (1.67) *	9 (3.00) *
Total no. of prescription with multivitamins	142 (16.94)	3 (0.75) *	5.1.32) *	9 (2.00) *
Mean no. of vit/ prescription	0.47	0.01	0.01	0.03
% of drug from Essential drug list of Nepal	458 (54.65)	148 (37.37) *	123 (32.54) *	201 (44.77) *
Fixed dose drug combination	46 (5.49)	15 (3.79)	81 (21.43)	69 (15.37)

Note: P-value less than 0.05 considered significant.
* Decrease mean no. of drug per prescription, highly significant compared to baseline

• It was not significant when compared to first month.

§ It was also significantly increased AMAs prescription and AMA when compared to 3rd month post.

^ Significantly decreased compared to 1 month post

® Significantly decreased compared to 1 month post.

+ Significantly increased mean number of drug compared to 3rd month post.

There was no significant change compared to 3rd month post.

¶ Significantly increased prescription with NSAIDs and number of NSAIDs compared to base line

{}Significantly increased number of prescription with NSAIDs and number of NSAIDs compared to 1 month.

(517) male patients were attended during study period; age ranging from three to 80 years. The most common dental disease found was dental caries, periodontitis, gingivitis, pulpitis, dental abscess etc (Table 1). Majority of the prescriptions (39.33%) contained four drugs in base line but after intervention, prescriptions contained mostly one drug, 73.00% in first month, 78.67% in third month and 65.34% in six month (Table 2). Before intervention, only 39.99% of prescriptions contained between one to two drugs but after intervention, 90% or above prescriptions contained the same number of drugs. There was significantly decreased mean number of drugs per prescription after intervention in first, third and six months, compared to base line and this effect persisted till six months of our study when it was compared with third month's data (Table 3).

There was a significant decrease in antimicrobial containing prescriptions as well as number of antimicrobial agents (AMA) after intervention in first, third and six months when it was compared to baseline data; but antibiotic number and antibiotic containing prescriptions significantly increased after six months when compared to first and third months. However, there was no significant change in third month as compared to first month post intervention.

Table 4. Most commonly prescribed drugs before and after intervention.

Name of drugs	No. of prescription (%)			
	Baseline (n=838)	1 month post (n=396)	3 month post (n=378)	6 months post (n=449)
Multivitamins	142 (16.94)	8 (2.02)	5 (1.32)	11 (2.45)
Amoxicillin	120 (14.31)	63 (15.90)	52 (13.75)	65 (14.47)
Nimesulide	103 (12.29)	170 (42.92)	126 (33.33)	136 (30.29)
Chlorhexidine mouth wash	95 (11.33)	44 (11.11)	24 (6.34)	35 (7.79)
Metronidazole	90 (10.73)	13 (3.28)	9 (2.38)	17 (3.79)
Doxycycline	56 (6.68)	1 (0.25)	6 (1.58)	4 (0.89)
Povidone iodine gargle	50 (5.96)	9 (2.27)	-	3 (0.67)
Ibuprofen	47 (5.60)	4 (1.01)	19 (5.02)	24 (5.34)
Amoxicillin + cloxacillin	25 (2.98)	3 (0.75)	-	4 (0.89)
Ibuprofen + paracetamol	21 (2.50)	12 (3.03)	81 (21.42)	50 (11.10)
Listerine mouth wash	-	36 (9.09)	33 (8.73)	6 (1.38)
Paracetamol	-	13 (3.28)	9 (2.38)	32 (7.13)
Diclofenac	-	-	-	16 (3.56)
Thermoseal tooth paste	-	-	-	8 (1.78)
Ampicillin + Cloxacillin	-	-	-	15 (3.34)

There was a significantly decreased oropharyngeal preparation containing prescriptions as well as number of oropharyngeal preparations used after intervention when compared to baseline data. There was also significantly decreased total number of multivitamin containing prescriptions and number of multivitamins in first month, third and sixth months post intervention. In our study it was observed that there was increased number of NSAIDs containing prescriptions as well as total number of NSAIDs used. These increases were highly significant compared to base line after intervention. These increasing effects were significantly persisting in third and sixth months post intervention, as compared with first month, but there was no significant change seen in sixth month post intervention compared to third month. There was significantly increased number of drugs prescribed by generic names after intervention in first, third and sixth month, compared to baseline but increasing effect was significantly declined in third and sixth month when it was compared to first month (Table 3).

Number of drugs prescribed in injection form was nil because almost all the drugs were prescribed in either oral form or topical form. It was also observed that number of drugs prescribed from the Essential drug list of Nepal was significantly decreased in first, third and sixth months.

Before intervention, five most commonly prescribed drugs were multivitamins (16.94%) followed by Amoxicillin (14.31%), Nimesulide (12.29%), Chlorhexidine (11.33%) and Metronidazole (10.73%) but after intervention most common drug was Nimesulide (42.92%) followed by Amoxicillin (15.90%), Chlorhexidine (11.11%), listerine mouth wash (9.09%) Metronidazole (3.28%) in the first month while five most commonly drugs were seen in 3rd month like Nimesulide prescribed (33.33%) followed by Ibuprofen + paracetamol (21.42%), Amoxicillin (13.75%), listerine (8.73%) and Chlorhexidine (6.34%) but in the sixth month, five most commonly prescribed drugs were Nimesulide (30.29%) followed by Amoxicillin (14.47%), Ibuprofen + paracetamol (11.10%), Chlorhexidine (7.79%) and Ibuprofen (5.34%) (Table 4). Among antimicrobial agents, Amoxicillin and Metronidazole were most commonly prescribed before and after intervention. As topical oropharyngeal preparation, Chlorhexidine was most commonly prescribed followed by povidone iodine gargle both before and after intervention; but there was an increasing trend of Listerine prescriptions after intervention also. Nimesulide was most commonly prescribed by dental prescribers before and after intervention followed by Ibuprofen, Ibuprofen + paracetamol, Paracetamol. Selection of Nimesulide after intervention by dental surgeon was the commonest choice.

DISCUSSION

Rational use of drugs is a crucial problem in the current context of health care systems confronting continued pressure to provide high quality care. Modifying prescribing patterns has proved to be a formidable challenge to those seeking to promote rational drug use. Inappropriate prescribing include the use of products of doubtful effectiveness and over prescribing of effective drugs such as antibiotics lead to suboptimal care, unnecessary expenditures and the promotion of resistant bacterial strains. Prescribers are primarily concerned with the effectiveness and safety of drug.

Antibiotics prophylaxis without bacteriological investigation may increase antimicrobial resistance. But in dental practice getting uncontaminated material for culture and sensitivity may not always be possible as also the prohibitive cost of culture and sensitivity. But selection of AMA was done on empirical basis which was correct because Amoxicillin concentration reaches effectively in gingival crevicular fluid and doxycycline promotes healing in periodontal disease by stabilizing collagens.[16,17] Metronidazole covered effectively against anaerobic bacteria because in Saini et al study 100% aerobes and 80% anaerobes were found in normal gingival sample while 96 to 97% isolated aerobes and anaerobes were found in orodental infection which were found more sensitive to penicillin and metronidazole.[18] Selection of these AMA definitely decreases the risk of infective endocarditis

infection by following procedures by adopting antibiotic guideline developed by American Heart Association.[19] Prevention of such infection has less benefitted the patients' then doctors because prescriber do not want any risk. The incidence of Endocarditis infection incidence is very low due to dental procedure or dental disease than medical diseases but increases economical burden to the patient.[20-22] In our study though earlier antibiotic utilization was very high, the selection was appropriate but after the intervention, antibiotic prescribing habit was decreased in the later part of study which was not significant. There were increased use of topical anti-infective preparation like chlorhexidine, Listerine in our study as irrigants of choice that can kill majority of micro-organisms found is root canal and dental tubules and minimize systemic use of AMAs.

Presenting prescribers with research and evidence based data can be effective intervention in changing prescribing habit. [23] Face to face education visits by trained personnel with individual health practitioners have consistently shown to be effective in changing behaviors and prescribing practice.[24] Feedback is successful when it is immediate, specific and able to identify the problem. By combining the methods of educational outreach with audit and feedback to deliver concurrent prescriber feedback to change prescribing behavior.[25]

Prescribers need to be aware of the issues and believe the quality use of medicines is important. They need to be able to recognize when they have to act. Each country used different feedback methods and all were successful because sharp decline in number of drug use and antibiotic but the effect decayed once feedback stopped which was also seen in our study.[11,13,26,27] The potential of practice communities as a variety of formal and informal, internal and external professional groups, team gathering associations, societies in which identification of the individual professional to influence the value of doctors and dentists.[28] Practitioners need to promote their carrier goals for enhancement of quality of care. Educating of health care providers,whether medical or dental, about the importance of judicious use of antibiotics, and other categories of drugs, is very important to prevent antibiotic resistance as well as minimize the poly- pharmacy by feedback and face to face education strategies to enhance effectiveness. Our study showed prevalence and incidence of dental disease were similar before and after intervention but mean number of drug utilization was high in baseline which was decreased after intervention and subsequently decreases polypharmacy.

NSAIDs are valuable for managing the dental pain and inflammation. Dentists relied exclusively on either Paracetamol or on agents like Ibuprofen, Diclofenac (have risk of gastrointestinal irritation, ulceration, bleeding) or selective cyclo-oxygenase- 2 inhibitor such as Nimesulide, celecoxib etc to minimize adverse systemic effect. NSAIDs also stabilizes the periodontal condition by reducing the rate of alveolar bone resorption.[29] In our study most commonly prescribed NSAID was Nimesulide in more than 50% of cases followed by Ibuprofen and paracetamol either alone or in combination, before and after intervention. Selection of Nimesulide in our study was the primary choice because of less adverse effects and good tolerability except rare hepatotoxicity (mechanism is not unknown, probably caused by idiosyncratic reaction).[30] Dental prescriber has never seen any such toxicity in their patients at BPKIHS and were reluctant to this reaction and preferred Nimesulide,though recently several instances of fulminant hepatic failure have been reported with this drug and it has not been marketed in many countries having effective ADR monitoring like UK,USA,Australia,Canada.[31]

In our study, before intervention multivitamins were prescribed 16.94% of the total drug prescribed as rejuvenating agents which may increase economic burden to the patient but after intervention dental prescribers reduced use of multivitamins which was highly significant and this significant reduction effect seen in the entire intervention study period.[32] Vitamines, analgesics and antimicrobials were the most commonly prescribed fixed dose drug combination (FDC) in present study (table 4) and such FDC use was also seen in medical patient reported by Rauniar et al.[33] There was decreased number of FDC use after intervention by dental prescribers, only preferred combination was Ibuprofen plus paracetamol because their different spectrum as an analgesic and anti-inflammatory agent provides greater benefit and minimal adverse effect.[34] This proves the rationality of such use.

There was no drug prescribed in injection form except local anesthetic which was not included in this study. The dental prescribers are not willing to prescribe by generic names because dental prescribers did not wanted to substitute the branded drugs because same drugs from other brands may not be of as good quality in our region. Generically prescribed drugs may be dispensed as a branded product or lower cost non-branded one, quality wise which may not be as good.[35] Prescribers preferred drugs from branded companies which is safe for their patient. Only about 30-50% of the drugs were prescribed from essential drug list of Nepal before and after intervention. Prescribers wanted to update essential drug list of Nepal and include few new common safe and effective drugs.

CONCLUSION

Prompt detailed prescriber feed back and face to face educational intervention of prescription audit is effective because there is decrease in the use of unnecessary drugs, antimicrobials, multivitamins, and an increase in the use of generic name of drugs.

If such feedback and educational intervention of prescription audit could be carried out on other specialties like medical and surgical health care, then definitely it would improve their prescribing behaviors and rationalize drug utilization pattern.

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