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ORIGINAL RESEARCH

Knowledge and awareness on the usage of antibiotics and analgesics among dental undergraduates

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ABSTRACT

Antibiotics primarily used in treating the bacterial infections when administered unnecessarily can cause antibiotic resistance making the bacteria non responsive against antimicrobials. Analgesics that are used to relieve pain are one of the routinely used medications. Hence, the aim of this study was to check the knowledge and awareness regarding use of both antibiotics and analgesics amongst dental undergraduates. Total 324 participants from different profs and interns submitted their responses for the online questionnaire. A highly statistically significant difference was observed in the knowledge of participants for both analgesics and antibiotics. It can be concluded that the knowledge and awareness on the use of antibiotics and analgesics among dental undergraduates is low indicating lack of basic understanding of oral dose, indications and risks of both medications.

Key words: Antibiotics, Analgesics, Contraindications, Antibiotic resistance, Knowledge, Awareness

INTRODUCTION

Antimicrobials causing destruction or slowing down the growth of bacteria are known as Anitibiotics. Their primary role involves treating the bacterial infections. But unnecessary use of antibiotics would increase the risk of antibiotic resistance. This antibiotic resistance will make the bacteria nonresponsive to the action of given antimicrobial agent and these bacteria will continue their growth and multiplication. In addition to bacterial resistance, inappropriate prescription of antibiotics is also associated with several adverse effects on general population, ranging from gastrointestinal disturbances to fatal anaphylactic shocks. (1)

Antibiotics' wide usage forms an indispensible part in both prophylactic and treatment modalities in documented as well as suspected infections. In dental practice, antibiotics are used mainly after oral surgical and periodontal procedures (2)and invasive surgeries that may cause bleeding and bacteraemia (3). Despite the awareness on antibiotic resistance, dentists show lack of concern in curbing this grave public health problem(b6). It is the duty of every dentist to arrive at the correct diagnosis in order to avoid the misuse of antibiotics (5)

Analgesics, commonly referred as painkillers, are substances which have in various mechanisms to relieve different types of pains experienced by the human body. Over-the-counter (OTC) (non-prescribed) analgesics that are generally used by the public are paracetamol, weak opioids such as codeine, and non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and aspirin. (4)

The aim of this study is to gather information on the knowledge and awareness about antibiotic usage along with emerging drug resistance as well as about the prescription of analgesics among dental students. (3)

MATERIAL AND METHODS

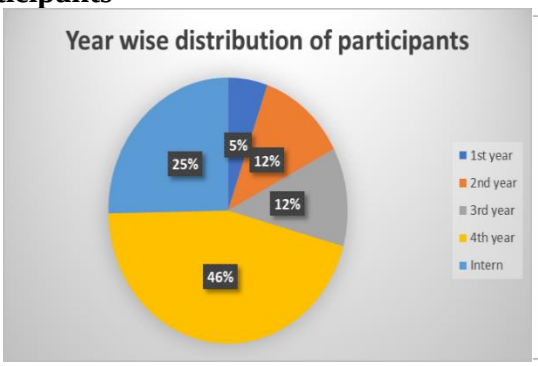
A cross-sectional study was carried using an online questionnaire (https://docs.google.com/forms/d/1ZQdfw7j09Mr4cLCdq6kdsPj21j-e8EtIdpjq5sqD8JM) that included voluntary consent, demographic details and survey items to evaluate the dentists' knowledge, attitude, and practice on prescription of antibiotics and their resistance and usage of analgesics amongst the dental undergraduates. It contained questions about antibiotics, resistance, doses and usage of antibiotics and analgesics and their side-effects. Research questionnaire comprised of 2 parts – First part included a consent form to ensure voluntarily participation and demographic information. Second part contained 30 multiple choice questions regarding knowledge and awareness on Antibiotics and Analgesics. The distribution included Q1-15 on antibiotics and Q16-30 on analgesics. The correct response was marked as 1 and incomplete responses were marked 0.

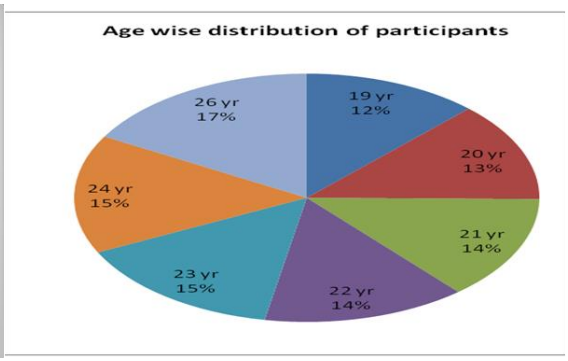
RESULTS

DEMOGRAPHIC DATA

The present research was conducted to gather knowledge and awareness on usage of antibiotics and analgesics in dentistry. Data was collected from 324 participants from BDS 1st yr, 2ndyr, 3rd yr & 4th yr and interns from DIRDS Faridkot. Out of 324 filled online questionnaires 24 forms were found incomplete so excluded from analysis, thus finally comprising of 300 forms. The age groups of participants were in range of 19- 26 years with a mean age 22yrs and S.D 1.22yrs shown in fig.1. The responses included 16 participants from 1st year, 36 participants each from 2nd and 3rd year, 136 participants from 4th year and 76 interns shown in fig.2

Fig.1: Age wise distribution of study participants Fig.2: Year wise distribution of study participants



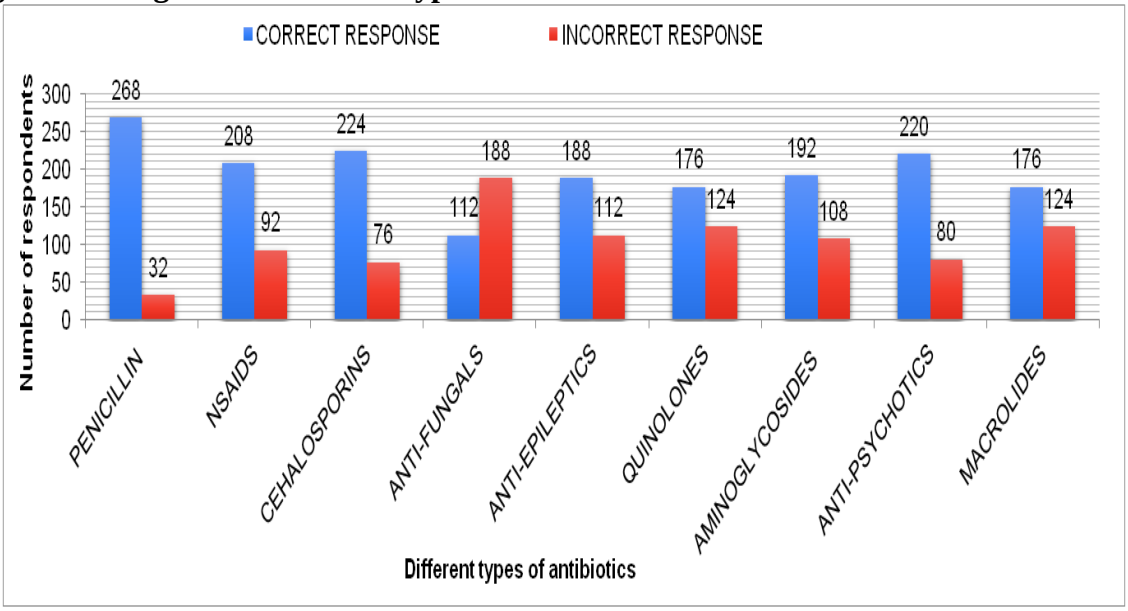


KNOWLEDGE OF PARTICIPANTS REGARDING ANTIBIOTICS

First question was asked about the types of antibiotics used in dentistry. 268/300 (89.33%) participants responded correctly that Penicillin is an antibiotic and 69.33% (208/300) responded correctly that NSAIDS are not prescribed as antibiotics. (224/300)74.66 % study

participants responded correctly that Cephalosporins are used as antibiotics. Also Anti-fungals were not correctly categorized as antibiotics by 122/300) % shown in Fig 3.

Fig.3 knowledge about different types of antibiotics



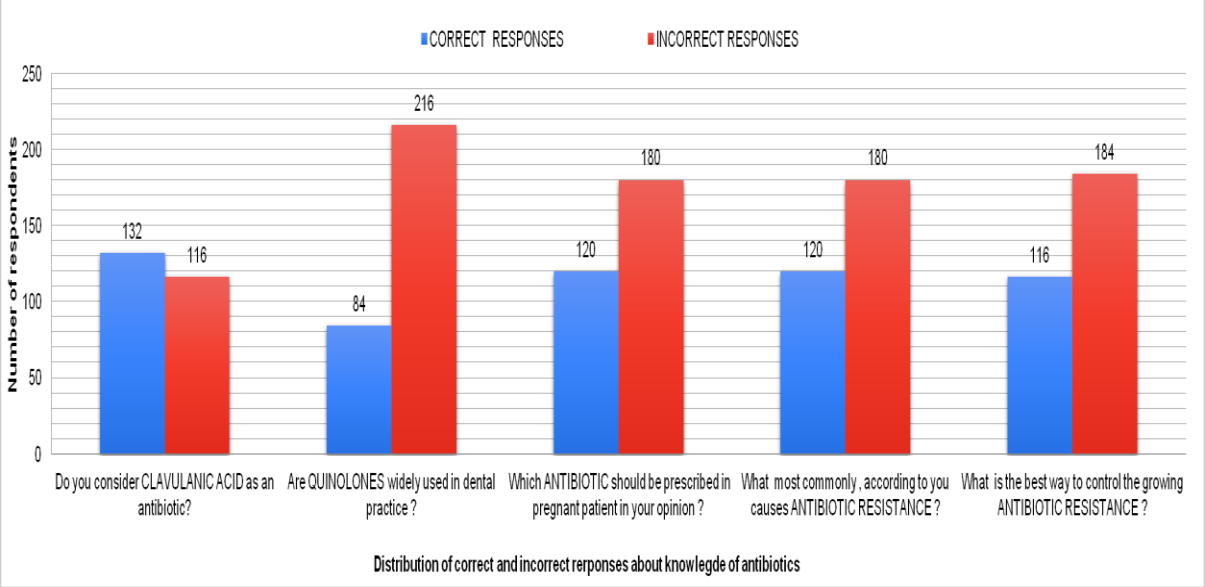
Less than half (116/300) 39% research participants correctly responded that the first approach in prescribing antibiotics in patients with oral infections is broad spectrum antibiotic and sending the sample for culture sensitivity results and then switching to narrow spectrum. Only 39 % (116/300) participants were aware about the Amoxicillin being used as the most common antibiotic for the treatment of oral infections. It was observed that (160/300) 53% of participants were correct aware for prescribing prophylactic antibiotics for bacterial endocarditis shown in table 1.

Table 1: Knowledge of participants about different types of antibiotics

S.no	Statement	Correct response n (%)
. 1	First approach while prescribing antibiotics in patient with oral infections	116(39%)
. 2	Most common antibiotics prescribed for the treatment of dental infections	116(39%)
. 3	Facultative anaerobes (both gram positive and gram negative) bacteria are mostly involved in oral infections	40(13%)
. 4	Antibiotics preferred in gram negative bacterial infections	160(53%)
. 5	Prophylactic antibiotics are required in Bacterial endocarditis	160(53%)
. 6	Antibiotics of choice for treating oral bacterial infections	132(44%)

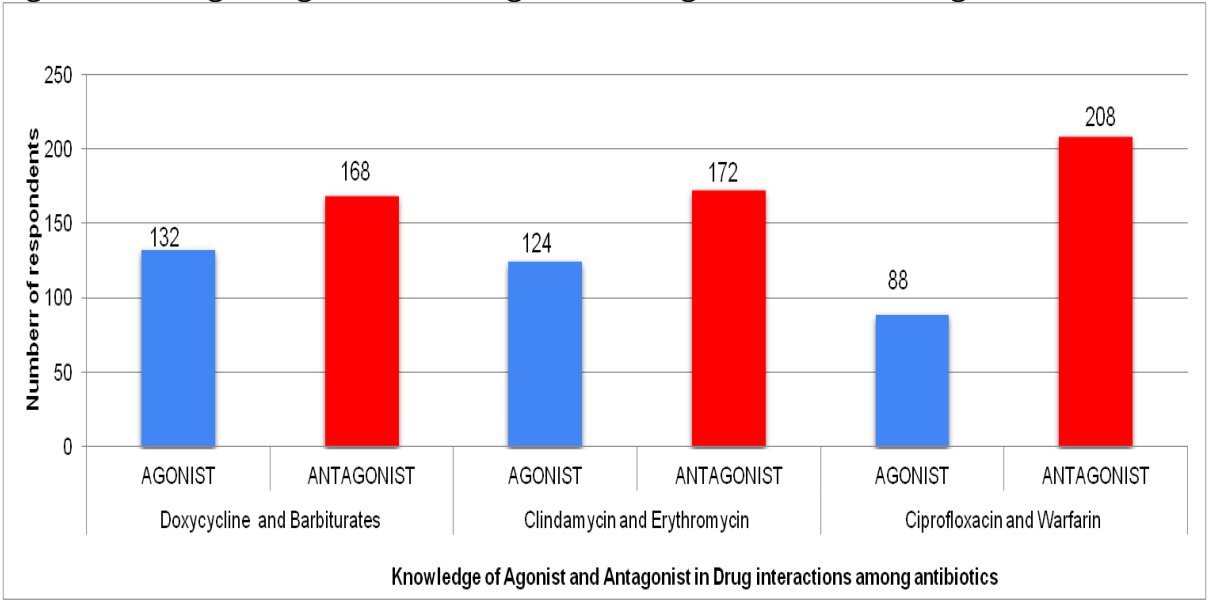
When asked about that clavulanic acid is an antibiotic 132/300 (44%) participants responded incorrectly. Tetracyclines are not safe) in pregnancy and Amoxicillin is safe and should be prescribed was correctly known to 120/300 (40%) participants. Antibiotic resistance is the most common cause of antibiotic failure; 60% of the participants were not aware of factors responsible for drug resistance like poor quality medications ,stopping of medications before full course and prescription of insufficient amount of antimicrobials. The best way to control growing antibiotic resistance is rationale prescription of antibiotics but only 116/300 (38.6 %) participants were aware about it shown in Fig 4.

Fig .4: Distribution of correct and incorrect knowledge about antibiotics



When asked about the knowledge of agonist and antagonist (132/300) 44 % of participants correctly understand that Doxycycline and Barbiturates show antagonistic effect. Just (124/300) 57 % and (88/300)69. % of the participants are right in comprehending that drug interaction of Clindamycin and Erythromycin and Ciprofloxacin and Warfarin respectively shows antagonistic effects shown on fig.5.

Fig.5: Knowledge of agonist and antagonist in drug interactions among antibiotics



KNOWLEDGE OF PARTICIPANTS REGARDING ANALGESICS

Knowledge and awareness on usage of analgesics was also gathered in addition to knowledge of antibiotics. (82%) participants were well aware of the NSAIDS as analgesics, while 39 % have the knowledge that Macrolides are not analgesics .200 out of 300 participants responded correctly that Opioids are analgesics shown in table 2.

Table 2: Knowledge of participants about analgesics in dentistry

Knowledge about analgesics drugs	Correct responses (n)	%
NSAIDS	248	83
MACROLIDES	116	39
OPOIDS	100	33

ANTI-CONVULSANTS	100	33
ANTI-EPILEPTICS	128	43
CEPHALOSPORINS	132	44
TRICYCLIC ANTIDEPRESSANTS	208	69
ANTI-PSYCHOTICS	184	61

KNOWLEDGE OF PARTICIPANTS ABOUT INDICATIONS AND CONTRAINDICATIONS OF ANALGESICS

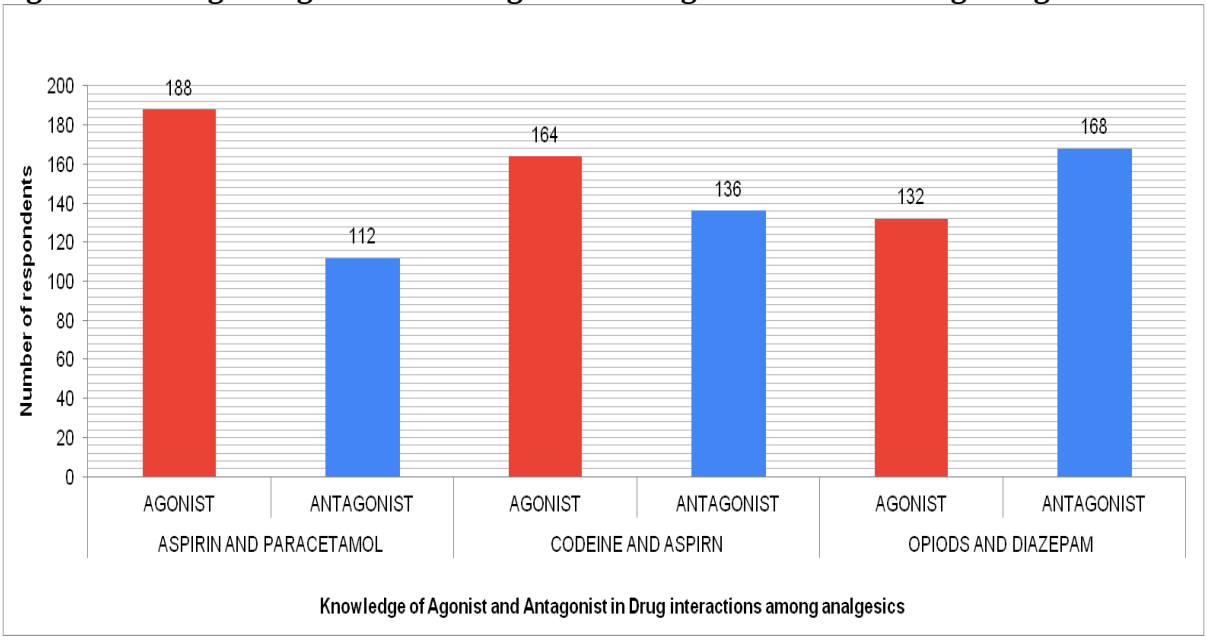
When asked about the most common analgesic preferred in dental practice 61% preferred Diclofenac as the most common analgesic prescribed in dental practice. Nearly half (48%) participants preferred oral route while prescribing analgesics for dental infections and showed knowledge of the influencing factors such as severity of pain, patients' medical condition and uncertainty of the diagnosis during the choice of prescribing analgesics. About 52 % of the participants were aware of most common side effects of analgesics like hypersensitivity, heartburn and diarrhoea. 49% were ware of contraindications while prescribing analgesics like peptic ulcers, irritational bowl syndrome and asthma. 20 % of the participants were aware that Ibuprofen, Nimesulide and Morphine are prescribed in children as analgesics shown in table 3.

Table.3: Knowledge of participants about indications and contraindications of analgesics in dentistry

S.No	Statement	Correct response n (%)
1	most common analgesic preferred in dental practice	116(39)
2	effects to be kept in mind while prescribing analgesics for oral infections	32(11)
3	route is preferred while prescribing analgesics for dental infections	144(48)
4	influencing factors during the choice of prescribing analgesics	144(48)
5	side effect of analgesics	156(52)
6	Contraindication of analgesics while prescribing them	148(49)
7	analgesic (non-narcotic) to be prescribed in patient taking anti-coagulants	156(52)
8	analgesics are used in children	60(20)
9	anti-inflammatory action of OPIOIDS	120(40)
10	main side effect associated with OPIOIDS analgesics	168(56)
11	drug used as an analgesic in patient exhibiting an OPIOID dependence	128(43)
12	Are double analgesics effective?	100(33)

When asked about agonistic and antagonistic effects of drug combinations 188/300 (62.66%) and 164/300 (54.66%) of participants correctly responded regarding agonistic effects of combining Aspirin and Paracetamol and Codeine and Aspirin shown in fig.6

Fig.6: Knowledge of agonist and antagonist in drug interactions among analgesics



COMPARISON OF KNOWLEDGE ABOUT ANTIBIOTICS, ANALGESICS AMONG STUDY PARTICIPANTS (BDS STUDENTS, INTERNS)

A highly statistically significant difference (p= 0.001) was observed in the knowledge of participants for analgesics. A highly statistically significant difference (p =0.000) was observed in the knowledge of participants for antibiotics. A highly statistically significant difference (p =0.000) was observed in the overall knowledge of participants (Tab.4).

Table.4: Analysis of variance (ANOVA) of knowledge among students, interns depending on year of medical education

Variable		Sum of Squares	df	Mean Square	F	Sig.
Knowledge of analgesics	Between Groups	0.309	4	0.077	4.633	0.001*
	Within Groups	4.926	295	0.017		
	Total	5.235	299			
Knowledge of antibiotics	Between Groups	1.128	4	0.282	16.538	0.000*
	Within Groups	5.032	295	0.017		
	Total	6.16	299			
Total knowledge of antibiotics and analgesics	Between Groups	0.717	4	0.179	14.295	0.000*
	Within Groups	3.702	295	0.013		
	Total	4.419	299			

Multiple comparison of total knowledge of both parameters (antibiotics and analgesics in dentistry) showed a statistically significant difference (p value ≤ 0.005) among different years of dental education (students and interns), which itself acted as a confounding factor (Tab.5).

Table.5: Multiple comparison of knowledge among undergraduate students and interns depending on year of dental education using analysis of variance (ANOVA)

Dependent Variable	(I) PROF	(J) PROF	Mean Difference (I-J)	Std. Error	Sig.
Overall Knowledge and awareness	1st yr	2nd yr	-0.081	0.034	0.120
		3rd yr	-.18056*	0.034	**0.000***
		4th yr	-0.046	0.030	0.537

		Interns	-.11447*	0.031	**0.002***
	2nd yr	1st yr	0.081	0.034	0.120
		3rd yr	-.10000*	0.026	**0.002***
		4th yr	0.035	0.021	0.457
		Interns	-0.034	0.023	0.566
	3rd yr	1st yr	.18056*	0.034	**0.000***
		2nd yr	.10000*	0.026	**0.002***
		4th yr	.13497*	0.021	**0.000***
		Interns	.06608*	0.023	**0.031***
	4th yr	1st yr	0.046	0.030	0.537
		2nd yr	-0.035	0.021	0.457
		3rd yr	-.13497*	0.021	**0.000***
		Interns	-.06889*	0.016	**0.000***
	Interns	1st yr	.11447*	0.031	**0.002***
		2nd yr	0.034	0.023	0.566
		3rd yr	-.06608*	0.023	**0.031***
		4th yr	.06889*	0.016	**0.000***

*. The mean difference is significant at the 0.05 level.

DISCUSSION

In this research of 300 undergraduate participants, it was seen that most of them lacked knowledge and awareness on usage of antibiotics and analgesics.

For antibiotics, the professor always needs to approve first and then sign the prescription. As majority of participants in my research lacked the knowledge and awareness about what should be the first approach as well as the most common antibiotic and its correct dosage while prescribing. This has a direct effect on the safety and health of patient, so administering antibiotics correctly becomes a critical issue. Also inappropriate recommendations- very high doses for prolonged duration of treatment may result in complications like toxicity (6).

Just 38% of participants considered amoxicillin to be the most common choice in oral infections while some authors consider the natural and semisynthetic penicillin (amoxicillin) to be the options of first choice (7). This is in contrast to my study as around 58.6% chose combination amoxicillin + enzyme inhibitor as the mainly prescribed antibiotic. (8)

It is observed that only 13 % of the participants were aware that mostly obligate anaerobic bacteria are involved in causing oral infections.

Just 40 % of the participants were aware that amoxicillin is safe in pregnant patients and antibiotics like tetracyclines and aminoglycosides are teratogenic, under group D. (9) The United States Food and Drug Administration (FDA) has established four levels of drugs that are risk during pregnancy.

The results of a survey conducted by Tomas-Carmona et al. (10) on the knowledge and approach to the prevention of bacterial endocarditis among Spanish dentists showed that fewer than 30% of the professionals were aware of correct antibiotic indications and posology. However, my research showed over 50 % participants knew that antibiotic prophylaxis should be prescribed in bacterial endocarditis patients.

Controlling the emerging incidence of antibiotic-resistance bacteria is very important for the correct use of antibiotics in treating infections (11). Participants seem confused on the causal factors of antibiotic resistance and the effective approaches to stop it further in our study.

Regarding analgesics, most common preferred route is oral which is in compliance with knowledge with 48% participants.

52% of the participants analysed that heartburn, diarrhoea and hypersensitivity can result on inappropriate use of analgesics. Toxicity results in affecting gastro-intestinal, renal and hepatic systems from Non-Steroidal Anti-inflammatory drug therapies used in management of fever and oral infections. (12) Therefore, the knowledge of safe dose and proper administration is highly necessary for dentists while treating patients. (13)

According to studies, diclofenac proved to be effective in managing postoperative dental pain after minor surgical procedures. (14) In my research study, 38.66% participants opted for diclofenac which in correspondence with study conducted by Dionne *et al*.(15) that stated that though ibuprofen suppresses pain but diclofenac was the preferred drug because of its good tolerability and tissue penetrability when compared to ibuprofen, whereas the latter provides faster pain relief.(16)

NSAID-exacerbated respiratory diseases are more commonly seen among children as the lipoxygenase pathway is activated, which in turn produces leukotrienes and exacerbates asthma in patients sensitive to these drugs (17). A study conducted in Taiwan by Lo *et al*. (18) affirmed that ibuprofen and diclofenac increase the risk of asthma. NSAIDs must be prescribed with caution in conditions like asthma, irrational bowl syndrome and peptic ulcers. In my research,49.33 % participants had awareness of these contractions for prescribing analgesics.

A study by Cristina Rebordosa et al found that there is no association between acetaminophen use and risk of preterm complications, miscarriages, stillbirths, low birth weight or small size for gestational age (19).

In my research, just 10.66 % of participants were correct in analysing that analgesics prescribed in oral infections should have more anti-inflammatory and less analgesic effect which is in concurrence with the article (20) on pain management in dentistry stating that most painful problems that require analgesics will be due to inflammation, so effective and excellent pain relief management drugs includes non-narcotic analgesics (e.g., non-steroidal anti-inflammatory drugs, paracetamol, etc) or opioids (i.e., narcotics).

38% of the participants preferred diclofenac as the most preferred analgesic which is in contrast with the article by K Hargreaves [1], P V Abbott stating NSAIDs like aspirin and ibuprofen are the most common analgesics in oral infections (20).

52% of the participants in my study were correct in preferring acetaminophen in patients on anti-coagulant therapy which is coordination with a case report on Warfarin and acetaminophen interaction (21) which mentions that acetaminophen or a metabolite enhances the effect of oral coumarin anticoagulants by augmenting vitamin K antagonism. Thus, significantly elevating the anticoagulant effect of warfarin .

Opioids were not considered to be anti -inflammatory in action according to 40 % of the participants .This is contrast to the article by Katerina S.Iwaszkiewicz ,Jennifer j.Schneider and Susan Hua explaining the activation of peripheral opioid receptors producing analgesic and anti-inflammatory effects without side effects like respiratory depression, dependence (24).Also, most of analgesic mechanism involves release of opioid peptides, endocannabinoids ,somatostatin or anti-inflammatory cytokines (25,26,27)

Methadone should be preferred in patient exhibiting opioid dependence, and 42.66 % of participants in my study were correct in this contest. It is in similarity with information on Methadone Maintainence Treatment (MMT) that states methadone significantly reduces the death rate associated with opioid dependence (22).

It was observed that 33 % of participants considered that giving double analgesics is an effective approach to pain relief. This is in parallel with the information by R B Raffa which states that when the individual analgesics act through different mechanisms synergistically, they act through multiple pain-inhibitory pathways providing more effective pain relief for a broader spectrum of pain, and also reducing adverse drug effects (23).

CONCLUSION

Finally, we can conclude that the knowledge and awareness on the use of antibiotics and analgesics among dental undergraduates is low indicating lack of basic understanding of oral dose, indications and risks of both medications. Antimicrobial resistance is an emerging serious health concern arising the immediate need to adopt the right approach while prescribing and completing antibiotic coverage in order to control drug resistant strains. It is very important for every dental practitioner to treat any oral infection effectively and accurately with broad spectrum antibiotics initially and later switching on to narrow spectrum. Factors like severity of pain, patients' medical condition and uncertainity of diagnosis should be considered prior to choose an analgesic. Hence, a compulsory assessment examination including questions on correct dosage, indications, contra-indications, combinations, etc should be added in curriculum before dental graduates start practicing and prescribing medicines to the patients. Moreover, prescription writing should be under proper guidance of senior professors and experienced staff; hereby, inculcating the accurate knowledge to practice efficiently.

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