

# KAP among Dental Students Regarding Management of Eugenol Induced Adverse Tissue Reactions

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## Abstract:

**Background:** There are few dental materials that can cause adverse reactions in the patient during their use in the treatment. Eugenol becoming one of them as it creates local irritating and cytotoxic effects in the patient. Hypersensitivity reactions also elicited in the patients based on the reported cases. As it is being used in both temporary restorative material as well as temporary cementation material, few adverse reactions were reportedly arise after the treatments.

**Aim and Objective:** To study the knowledge, attitude and practice among dental practitioners regarding management of eugenol induced adverse tissue reactions

**Materials and methods:** The study sample was derived from 60 dental students, both male and female from third and final years at a private dental college during the academic year of 2017. There were 30 dental students each from third and final years, who completed the study questionnaire regarding knowledge, attitude and practice regarding management of eugenol induced adverse tissue reactions. A predesigned validated questionnaire consisting of 12 pre-tested questions was used.

**Results:**Data from the study revealed that majority of the dental students were aware of use of eugenol that can induce adverse tissue reactions while few of them lack in knowledge regarding allergy reactions towards the use of eugenol in certain patients.

**Conclusion:** The study revealed that more than 50% of the dental students acknowledge the use and adverse reactions associated with the use of eugenol. Most of them (approximately 70%) know how to treat allergy reactions towards eugenol and aware that replacement of dental materials with non-eugenol dental materials is one of the best methods for the allergic treatment.

**Keywords:** Adverse Reactions, Eugenol, Knowledge, Practices, Management.

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## INTRODUCTION

Some plants such as clove and bay leaves contained para-substituted phenolic compound called eugenol. In dental clinic, eugenol has been widely used as both an analgesic and anti-inflammatory drug to treat toothache and pulpitis<sup>1</sup>. In addition to its use as a pulp-capping agent, temporary filling and a root canal sealer when in combination with zinc oxide, eugenol also can be used as a fragrant and flavouring agent in many cosmetics and food products<sup>2</sup>. An acceptable daily intake of eugenol of 2.5 mg/kg body weight for humans has been allowed by the joint Food and Agriculture Organisation/WHO committee on food additives<sup>3</sup>. Food and Drug Administration has recognised eugenol as safe as it is considered non-carcinogenic and non-mutagenic<sup>4</sup>. Eugenol can act as an antioxidant and anti-inflammatory agent when it is in low concentrations whereas in high concentrations, as a result due to enhanced generation of tissue damaging free radicals, it acts as pro-oxidant<sup>5,6</sup>.

Zinc oxide eugenol is formed when unrefined form of eugenol is mixed with zinc oxide<sup>7</sup>. Zinc eugenolate is produced in the setting reaction between zinc oxide and eugenol and unstable in the presence of water. This is due to release of free eugenol as it surfaces undergoes hydrolysis which can induce type IV hypersensitivity reactions in addition to anaphylactic symptom<sup>8</sup>.

Eugenol is one of the commonly used materials in dentistry. Though there was only several reported side effects, yet still not a bio-friendly material when it comes to

soft tissues in the oral cavity. In addition to local irritative and cytotoxic effects, use of eugenol also results in hypersensitivity reactions. There were two cases reported regarding the adverse local reaction to eugenol, present in both temporary restorative material and a temporary cementation material.

There are many material that are currently used in dentistry. Not only eugenol, other materials also produce allergy reactions towards them which has been current headings in papers<sup>9,10</sup> and an editorial<sup>11</sup>. It becomes a topical issue since there is increase in public or practitioner awareness that these dental materials able to create adverse reactions. Furthermore, hypersensitivity type reactions are common nowadays in patients. Dental amalgam, a traditional material<sup>9</sup> may potentially produce allergy in addition to other adverse reactions, though it is not a common one. Just like eugenol, increasingly used material such as hydroxyethyl methacrylate can cause similar reactions<sup>10</sup>

## MATERIALS AND METHODS

The study sample was derived from 60 dental students, both male and female from third and final years at a private dental college during the academic year of 2017. The data of interest were included age, gender, year of study of dental students attended a private dental college. Study level and gender were included as they are possible indicators which could influence in answering the questions based on the experience undergone so far. There were 30 dental students each from third and final years who has completed

the study questionnaire regarding knowledge, attitude and practices regarding management of eugenol induced adverse tissue reactions. A predesigned validated questionnaire consisting of 12 pre-tested questions was used. The questions were prepared in order to assess the knowledge of the participants regarding the use of eugenol, adverse reactions associated with it and its management. The obtained data were tabulated and performed in the form of a bar chart. For the purpose of analysis, the questions were categorized into yes and no options.

**RESULTS**

The sample description is presented in table 1 showing the number of dental students participated in this study. It should be noted that the student body can be characterized as homogenous in terms of educational background in

which students participated in this study were those has joined clinical years. The number of students answered for each question are tabulated as follow in Table 2. The questions are tabulated according to number of students who has answered yes and no. Figure 1 shows the results obtained from the study. Each bar chart depicts number of students answered for each questionnaire.

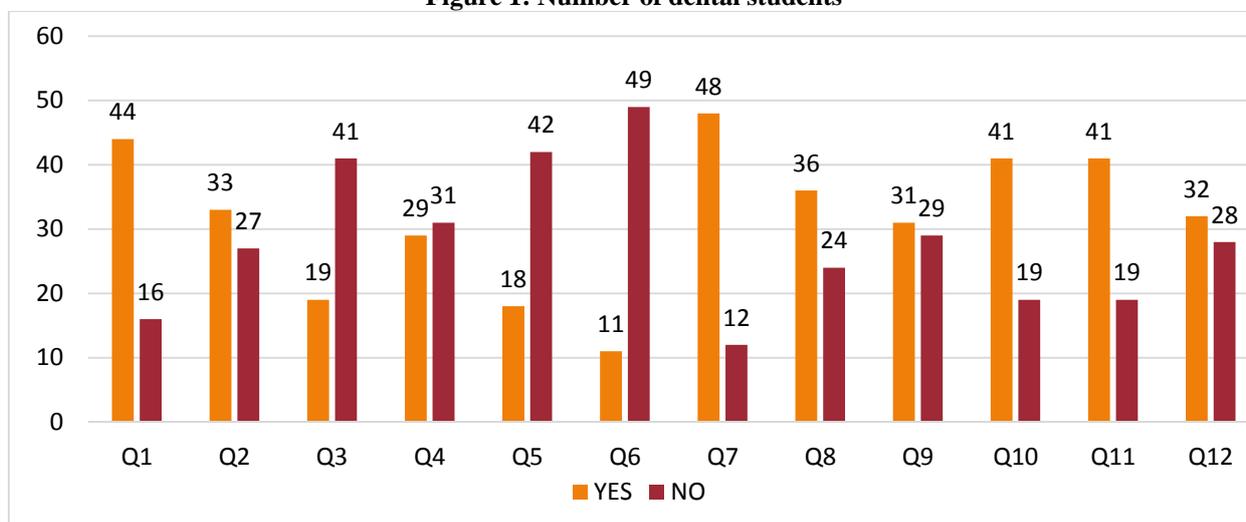
**Table 1. Number of participants**

Year of study	N	Gender	
		Male	Female
Third year	30	11	19
Final year	30	13	17
Total	60	24	36

**Table 2. List of questionnaires**

Questions	Number Of Patients (N)	
	YES	NO
1. Do you know that eugenol has been widely used as an analgesic and anti-inflammatory drug to treat pulpitis and toothache?	44	16
2. Are you aware of the presence of allergic reactions that may occur after placing eugenol?	33	27
3. Do you know that eugenol can cause contact uticaria as well as chronic uticaria?	19	41
4. Do you know that eugenol is considered as common oral flavouring agents?	29	31
5. Do you acknowledge that high concentration of eugenol can cause enhanced generation of tissue damaging free radicals?	18	42
6. Do you know acknowledge that low concentration of eugenol are known to act as anti-inflammatory agent?	11	49
7. Are you aware that symptoms of immediate hypersensitivity reaction to eugenol include erythema and skin irritation?	48	12
8. Adverse effects related to the use of dental products containing eugenol are ulcer formation and tissue necrosis. Do you agree with it?	36	24
9. Do you know that eugenol can react directly with proteins to form conjugate and reactive patents causing allergic contact dermatitis?	31	29
10. Do you know how to treat the condition of the patient allergic to eugenol?	41	19
11. If YES, do you aware that replacement of dental products with non-eugenol containing material is one of the best methods to reduce and if possible recover the allergic?	41	19
12. Do you know that epicutaneous test should be undertaken for allergy confirmation?	32	28

**Figure 1: Number of dental students**



## DISCUSSION

The pharmacological activities of eugenol includes antimicrobial, anti-inflammatory, analgesic, anti-oxidant and anticancer activities<sup>12</sup>. Based on the results obtained from this study, it revealed more than 50% of the dental students aware that eugenol has been widely used as an analgesic and anti-inflammatory drug to treat pulpitis and toothache. Approximately almost equal dental students had answered yes and no that they were aware that presence of allergic reactions that may occur after placing eugenol. About 70% of the participants knew that eugenol can cause contact urticaria as well as chronic urticarial in comparison only few of them did not aware the possibility of causing contact urticaria as well as chronic urticarial after the placement of eugenol. As eugenol is considered as common oral flavouring allergens, proper history is required to avoid eugenol allergy. It involves whether the patient is allergy to dental materials, preservatives and flavouring agents. This is because eugenol is considered as common oral flavouring allergens. Thus, in order to treat the condition and to prevent recurrences, identification and elimination of the allergen that initiated the reaction is necessary<sup>13</sup>. Almost half of the participants acknowledge that eugenol is considered as common oral flavouring agents as 29 and 31 of them answered yes and no respectively. As depicted in the bar chart, about 70% were unaware that high concentration of eugenol can cause enhanced generation of tissue damaging free radicals. Only few participants agreed with the fact. Less than 20% of the dental students were not know that low concentration of eugenol are known to act as anti-inflammatory agent. In contrast, about 80% of them aware that symptoms of immediate hypersensitivity reaction to eugenol include erythema and skin irritation. Localised irritation of the skin, ulcer formation, allergic contact dermatitis, tissue necrosis, reduced healing and in rare cases even anaphylactic-like shock are the adverse effects related to the use of dental products containing eugenol<sup>4</sup>. Almost 40 participants agreed that adverse effects related to the use of dental products containing eugenol are ulcer formation and tissue necrosis. There are three reaction types that may be elicited as the therapeutic action of eugenol on the pulp is cytotoxic. They are direct tissue damage, contact dermatitis as well as true allergic reaction<sup>14</sup>. As eugenol can react directly with proteins to form conjugate and reactive patents, it can possibly cause allergic contact dermatitis<sup>15</sup>. In this study, almost equal dental students knew eugenol can react directly with proteins to form conjugate and reactive patents causing allergic contact dermatitis. As shown in the bar chart, 31 and 29 answered yes and no respectively. Most of them, about 70% knew how to treat the condition of the patient allergic to eugenol and agreed that replacement of dental products with non-eugenol containing material is one of the best methods to reduce and if possible recover the allergic.

About 53% and 47% dental students chose yes and no respectively that they were aware of necessity of epicutaneous test should be undertaken for allergy confirmation.

## CONCLUSION

Eugenol is a dental material that is widely used in dentistry. It does not necessarily cause incident, however the tissue may be affected in a sensitised individual. The effect is in range of low-grade local reactions to an uncommon, but severe anaphylactic reaction. It is not a bio-friendly dental material, thus not suggested to be used neither to relieve tooth pain nor dentine hypersensitivity. If there is need to use eugenol containing materials, it must be used in suggested amount and follow the instruction provided by the manufacturer. In case of patient allergy reaction towards eugenol, there is eugenol-free alternative available.

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