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Knowledge, attitude and practice guidelines of LSTR therapy as an alternative endodontic treatment modality for primary or permanent teeth among dentists.

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Abstract:

AIM: To determine the knowledge, attitude and practice guidelines followed by general dentists (GDs) and dentists of other specialities regarding LSTR therapy as an alternative treatment option for non-vital primary/permanent teeth.

Materials And Methods: A total of 250 dentists that included general practioners, post graduate students (PGs) of several dental specialities and specialists practicing in India. An online validated questionnaire comprising of 29 questions with a hyperlink was sent to them. Comprehensive descriptive analysis of all the demographic and KAP variables was done using mean and standard deviation for quantitative variables, frequency and proportions for categorical variables. Windows Version 22.0 with SPSS was used to perform

statistical analyses and the value of p<0.05 was considered statistically significant.

Results: Awareness of LSTR was limited to 59.6% of specialists, 57.3% of PGs and least among GDs (36.8%). Its clinical use (62.2%) was quite rare among them. Also, 46.2% of them suggested that LSTR may serve as a good alternative to conventional obturating materials. A significant difference was appreciated in the above responses at P < 0.001.

Conclusion: General dentists showed limited knowledge about antibiotic prescription, LSTR, local use of antibiotic paste as obturating material followed by full coverage restorations in primary and immature permanent teeth compared to PGs and specialists who had fairly good exposure to newer advancements in this field. Thus, we conclude that there is overall inadequate knowledge about using LSTR compared to conventional pulpectomies or extraction since retaining primary teeth until natural exfoliation is the best space maintainer.

Keywords: Lesion Sterilization and Tissue Repair (LSTR), 3Mix paste, antibiotic prescription, Irreversible pulpitis, Nonvital primary/permanent teeth

Introduction

Concept of LSTR was based on healing of damaged tissues when adequate disinfection of pulpal and periapical lesions occur. Several studies are shown to favour local application of antibacterial paste such as 3Mix-MP containing metronidazole, ciprofloxacin, minocycline with macrogol and propylene glycol to eradicate bacteria in root canal treatment successfully [1-4].

It is as an excellent alternative to extractions and routine pulpectomies for nonvital teeth. [5] Researchers have showed great variation in its awareness among pedodontists and endodontists [6] with limited knowledge among GDs and other specialists therefore, this study aimed at assessing their awareness, attitude and practice guidelines of LSTR through questionnaire.

Materials And Methods

The study was conducted for a period of three months through an online survey. A sample size of 250 was estimated, with margin of error as 0.05. The ethical approval for the study was obtained from Institutional ethical committee (EC 112) and review board. Participants with a BDS degree were included in this survey and an informed consent was sought priorly from them. The link to the online questionnaire was provided to the participants through various social media platforms such as WhatsApp, Facebook, Instagram and e-mail. The participants were instructed to answer the questionnaire by clicking the hyperlink.

The online questionnaire consisted of 29 questions excluding personnel information. The questionnaire covered questions pertaining to their pediatric practice, prescribing of systemic and locally placed antibiotics, combinations of drugs in antibiotic paste and its preparation; knowledge of LSTR technique, its indication and their choice of preferred treatment in the existing pandemic scenario.

Comprehensive descriptive analysis of all the demographic and KAP variables was done using mean and standard deviation for quantitative variables, frequency and proportions for categorical variables. Windows Version 22.0 with SPSS was used to perform statistical analyses and the value of p <0.05 was considered statistically significant.

study was conducted for a period of 3 months through an online survey. A sample size of 100 was estimated, with margin of error at 0.10. The ethical approval of the study was obtained from the Institutional ethical committee and review board (IEC:109). The eligibility criteria were doctors with a BDS degree and exclusion criteria were

subjects without a BDS degree. An online questionnaire with a hyperlink was sent to them.

Results

The questionnaire was answered by a total of 250 Indian dentists out of which 106 were GDs, 96 were PGs and 48 were dental specialists.

Among the total participants, 60.8% had the least clinical experience of less than 5 years, 28.8% had an experience ranging between 5-10 years and only 26 participants belonged to 11-20 years and above category [Figure 1].

Of the total respondents,56% treated 1-2 pediatric patients daily in their clinical practice and 87.6% of them advised pulp therapy for pulpally involved decayed primary teeth [Figure 2]. It was decided based on age and radiographic assessment of the involved teeth (81.2%) as shown in Figure 3. Antibiotic coverage was preferred by 62.9% of participants for chronic pulpitis conditions (73.3% of GDs; 57.9% of PGs; 50% of specialists) and 37.6% of them prescribed it prophylactically on the day of diagnosis for five days.

Majority of the dentists performed emergency access opening with antibiotic coverage as shown in Figure 3. Closed dressing with temporary cement was opted by 66 % of them as a convenient choice of dressing after the first appointment.

Of the total respondents, 39.6% preferred prescribing a combination of both systemic and locally applied/ placed antibiotics and 50.6% of them believed systemic antibiotics causes more toxicity in children than placed locally or combination of both [Figure 4].

Antibiotics can be prescribed without analgesic as well as implied by 60.4% of respondents. Around 63.6% suggested calculation of dosage for drugs in children based on weight/body surface area [Figure 4]. A significant difference was appreciated in the above responses which was derived at P <0.001.

Awareness of LSTR was limited to 59.6% of specialists, 57.3% of PGs and least among GDs (36.8%) [Figure 5]. Its clinical use was quite rare (62.2%). All pulp therapies /root canal treatment required meticulous instrumentation as stated by 49% of them. Around,70% of respondents supported that LSTR was indicated for tooth with chronic irreversible pulpitis, tooth having internal /external resorption showing poor prognosis and those involved in an endo-perio lesion.

A significant proportion of GDs (93.4%) suggested the use of antibiotics for teeth with weeping canals [Figure 5] while 60% of all respondents indicated its need for young immature teeth and 56.4% did not consider its need for tooth with resorbed roots.

A combination of three drugs was suggested by 60.6% of respondents in antibiotic mixture /paste which should be freshly prepared before every use (44.8%). The most commonly used drug combination for LSTR was ciprofloxacin, metronidazole and minocycline suggested by 47.2% of GDs and 50% of PGs [Figure 6]. These drugs were used in the ratio of 1:1:1 according to the original authors of 3Mix paste (61.6%) as seen in Table 1. Before every use, they should be pulverized and mixed with a vehicle such as normal saline preferred by 33% of GDs and 42.7% of PGs or distilled water or propylene glycol as suggested by 54.2% of specialists [Figure 6]. Of the total respondents,46.2% suggested that LSTR may serve as a good alternative to conventional obturating materials. A significant difference was appreciated in the above responses which was derived at P <0.001.

Use of LSTR therapy in the current pandemic: For acute tooth pain in children prescribing antibiotics was considered necessary by 49.1% of GDs whereas 56.3% of specialists suggested its need based on presence/absence of infection.

In the current pandemic situation,42.1% of PGs and 35.4% of specialists think that single-visit LSTR treatment will be a better treatment modality in comparison to 37.7% of GDs supporting two-visit conventional pulpectomy for chronically decayed primary/permanent teeth[Figure 7].About 39.6% of the total respondents preferred pulpectomy followed by stainless crown for a pulpally involved badly destroyed primary tooth with intact roots, whereas 37.2% believed in LSTR therapy followed by stainless steel crown (P = 0.03).

Discussion

In the present study, majority of the participants advised pulp therapy as the best treatment for pulpal involvement in primary teeth (87.6%) based on age of the child and radiographic assessment of involved teeth (81.2%). This was not in accordance with Aman Moda et al. and Hussain et al. as they preferred extraction of necrotic primary teeth [7,8].

According to the American Association of Endodontics (AAE), antibiotic prescription in medically healthy patients are indicated when there is diffuse swelling or/with systemic manifestations [9]. Agnihotry et al. demonstrated that antibiotics does not appear to reduce toothache caused by irreversible pulpitis. Neither the administration of penicillin reduces pain perception, percussion pain nor the quantity of pain medication required by patients with irreversible pulpitis [10]. In the present study, 62.9% of respondents advised antibiotics for teeth with chronic pulpitis majorly supported by GDs (73.3%) followed by PGs (57.9%) and specialists (50%). However, 37.1% did not prescribe antibiotics unless it was necessary, as stated by PGs and specialists. This was in accordance with the study done by Manal Maslamani et al. which stated that older and more experienced participants prescribed antibiotics for pain management more often than younger and less experienced participants, based on anecdotal evidence from their own experience [11].

In the current study, 37.6% of dentists prescribed antibiotics on the day of diagnosis and instructed its use for the next five consecutive days before commencing endodontic treatment. Ideally antibiotic course should be given in the shortest cycle possible in order to prevent both clinical and microbiological relapse. Most acute infections are resolved within three to seven days [12].

The initial line of treatment for tooth with pulpal involvement or apical periodontitis should be an emergency access opening, extirpating the necrotic pulpal tissue followed by placing an interim restoration until next appointment. In the present study 76% of respondents performed emergency access opening in their clinical practice and almost 65.9% performed it with antibiotic coverage. Around 66% of them opted for closed dressing with temporary cement at the end of first appointment.

According to Rand BC et al. [13] a combination of systemic and locally placed is more effective than systemic antibiotics and this was in accordance with present study as 39.6% of dentists preferred combination of systemic and locally placed/applied antibiotics in their set up. Also, irrational use of systemic antibiotics leads to more toxicity in children.

Antibiotics can be prescribed without analgesics as implicated by 60.4% of dentists in the present study. This was in accordance with A.F. Fouad stating that antibiotics have anti-inflammatory properties besides their antimicrobial nature and can help reduce the inflammation thereby reducing pain [14]. Vallerand AHA mentioned that most of the drugs in children are dosed according to body weight (mg/kg) or body surface area

(BSA) (mg/m^2) which was in accordance with our study [15].

LSTR therapy is a novel caries, pulpal and root canal treatment technique that uses an anti-bacterial drug combination to eliminate causative bacteria from lesions; establish sterilized zone where the lesions are repaired or regenerated by the host's natural tissue recovery process [16].

In the present study awareness of LSTR was better among specialists and PGs who are constantly updated and adopting newer treatment protocols in comparison to GDs that account for 36.8%(least). Asnani et al. found that 68.4% of pedodontists knew LSTR concept from journals and books while among endodontists the awareness of concept was about 36%. Endodontists (56%) did prefer LSTR therapy over pulpectomies compared to pedodontists (33.3%) [6]. LSTR is also known as non-instrumentation endodontic treatment (NIET) because it depends on elimination of bacteria from root canal system and not on mechanical preparation of the dentinal walls which was in accordance with our study [17].

In the present study, clinical application of LSTR by participants was quite rare owing to their inadequate awareness and knowledge of its success rate. However, majority of dentists stated that LSTR has been indicated for tooth with chronic irreversible pulpitis [18]; tooth having internal/external resorption showing poor prognosis [16,19]; those involved in endo-perio lesion or indicated for extraction.

Antibiotics have been used as a component of intra-canal medicaments and irrigants in several studies for permanent teeth. The efficacy of the mixture of Ciprofloxacin, Metronidazole and Minocycline against endodontic micro-organisms was proved by various studies conducted by Sato, Hoshino & Takushige [20]. This was in accordance with our study where PGs students were well informed about the above mentioned three drugs used in triple antibiotic paste. They are used in the ratio of 1:1:1 by volume [21] or 1:3:3 by volume [4] and are freshly prepared before every use [22].

The drugs are pulverized into powder and mixed with a vehicle containing propylene glycol and macrogol in ratio of 7:1 by volume for every use [23]. The final preparation will be a soft ball-like structure of 1 mm diameter. The prepared powder should be stored in an air-tight container in dark place or in the refrigerator to prevent exposure to light and moisture. Divya D V et al. demonstrated in their study that antibiotic powder can be mixed with normal saline to achieve a creamy paste for use which was accordance with our study (34.8%) [24]. Moreover, 33.6% of dentists suggested that either normal saline or propylene glycol or distilled water can be used as vehicle indicating their lack of knowledge about 3Mix paste preparation. Most of the PGs stated the use of normal saline due to its availability for LSTR therapy.

A tooth having inflamed pulp with spontaneous pain, will recover after LSTR treatment. Since obturation is not necessary, it reduces chair side time and proves to be cost effective both to the dentist and the patient with lesser number of visits [18]. Thus, in the current pandemic situation performing single visit LSTR is best for chronically decayed primary/permanent teeth. However, Trairatvorakul and Detsomboonrat suggested that this technique cannot replace conventional root canal filling material as a long-term therapy in primary teeth [25]. Although in present study, 37.7% GDs prefer two-visit conventional pulpectomies/RCTs while 42.1% of PGs and 35.4% of specialists opted for single visit LSTR.

Due to COVID-19 pandemic and infrequent visits to dentists, majority of patients depend on tele-dentistry where virtual consultation and queries regarding toothache or any gingival problems are dealt with lately.

Prescribing medications over the phone has resulted in misuse of antibiotics and NSAIDs which requires a careful lookout immediately. Nevertheless, the present study reveals that specialists and PGs avoid prescribing antibiotics for acute tooth pain in children unless systemically involved whereas 49.1% of GDs stated its utmost need in the present scenario. As for badly destroyed primary teeth with long intact roots having poor prognosis, this study showed that LSTR therapy done followed by stainless-steel crown (37.2%) was an alternative to conventional pulpectomy with stainless-steel crown (39.6%). Both of which serve as equally good options in comparison to extraction followed by space maintainers (23.2%). This was in accordance with a previously conducted study [20].

Narkonchai et al. conducted a study wherein 3Mix was placed inside the pulp chamber covered with Glass ionomer cement followed by stain-less steel crown in comparison to Vitapex obturation. Greater clinical and radiographic success over 1-year follow up was seen in the 3Mix group suggesting it as good obturating material which came to be in accordance with 46.2% of respondents of our study [26].

Conclusion

The constant hustle to provide safe and effective treatment to pediatric patients posts challenges to look for better options than the conventional endodontic procedures. Most of the pulp therapies are undertaken based on the clinical status of involved primary tooth, development of its successor and cooperation level of the child. Reckless use of antibiotics in children for irreversible pulpitis is widely practiced which needs to be addressed.

Thus, we conclude from our survey that general dentists showed limited knowledge about prescribing antibiotics, local use of antibiotic paste and LSTR compared to PGs and specialists who had fairly good exposure to newer advancements in this field. Similarly, the usage of antibiotic paste as obturating material in LSTR followed with full coverage restorations in primary and immature permanent teeth was suggested as better option compared to extraction with space maintainers among PGs and specialists than GDs. As per our study, GDs should update themselves about recent techniques such as LSTR and its use, since retaining primary teeth is the best natural space maintainer.

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Figures and tables

Table 1: Comparison of responses on awareness & practice of Antibiotic mixture / paste for Pulpectomy procedure by study participants using Chi Square Goodness of Fit Test

Comparison of responses on awareness & practice of Antibiotic mixture / paste for Pulpectomy procedure by study participants using Chi Square Goodness of Fit Test			
Questions	Responses	%	P-Value
How many antibiotics can be used in antibiotic mixture/paste?	Single broad-spectrum drug	7.6%	<0.001*
	Combination of two	19.7%	
	Combination of three drugs	60.6%	
	More than three	12.0%	
How do you prepare the antibiotic mixture?	Freshly prepared before every use	44.8%	<0.001*
	Use stored mixture	19.6%	
	Commercially available	35.6%	
According to original authors of LSTR, what is the ratio of drugs used in 3 mix paste?	1:1:1	61.6%	<0.001*
	1:3:3	23.2%	
	3:1:3	9.2%	
	1:1:2	6.0%	
Can LSTR be used as an alternative to conventional obturating materials?	Yes	24.9%	<0.001*
	No	28.9%	
	May be	46.2%	

* - Statistically Significant

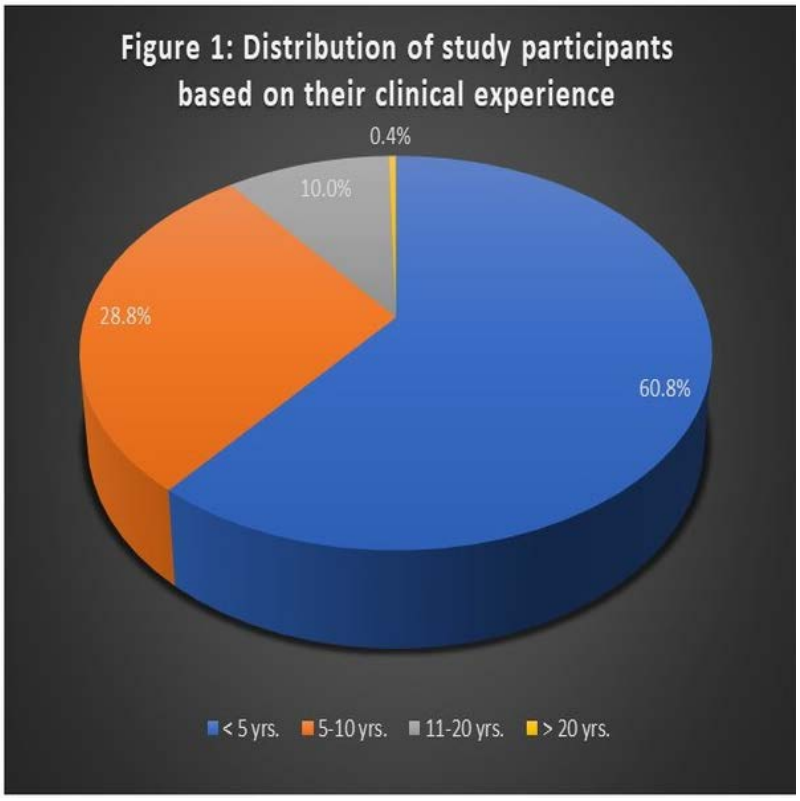

Fig. 1: Distribution of study participants based on their clinical experience.

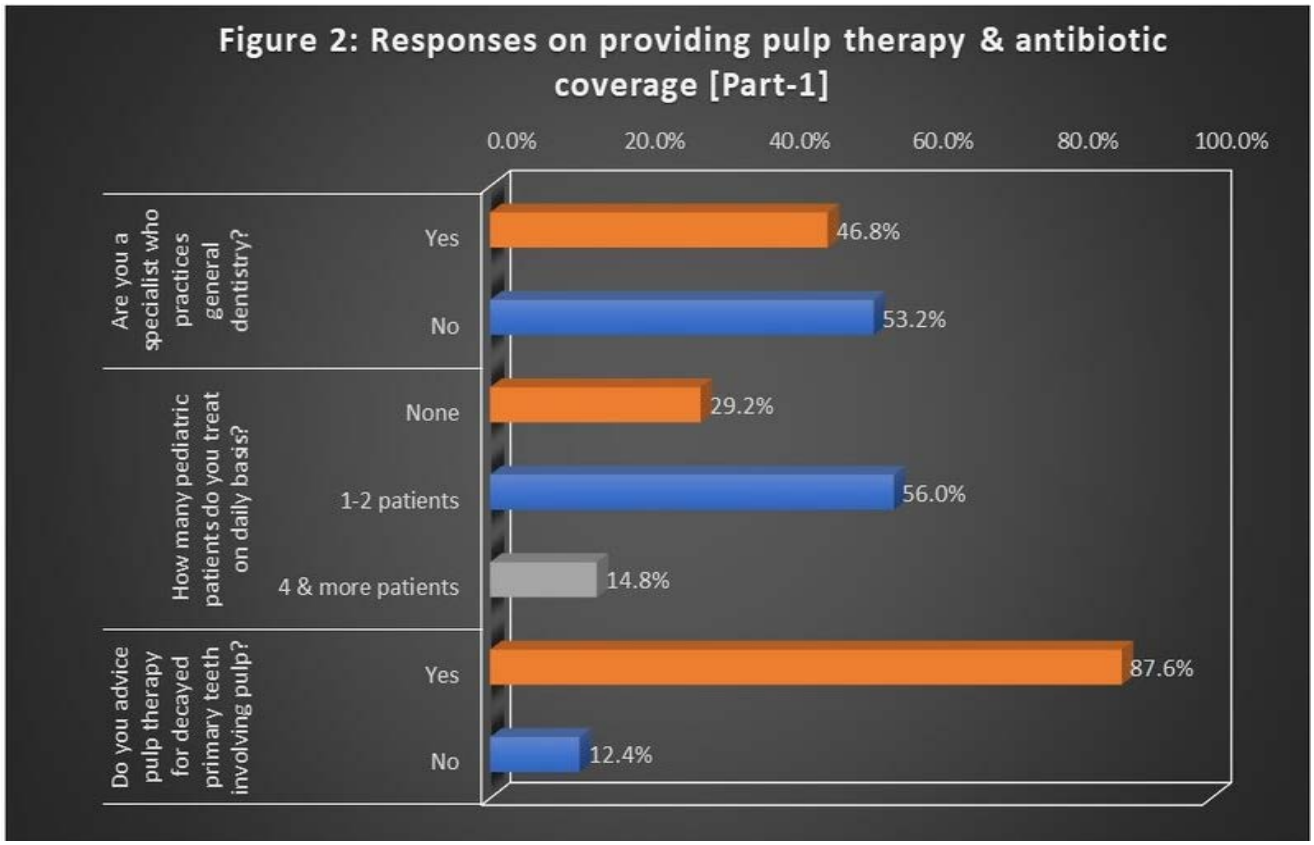

Fig. 2: Distribution of responses on providing pulp therapy & antibiotic coverage [Part-1].

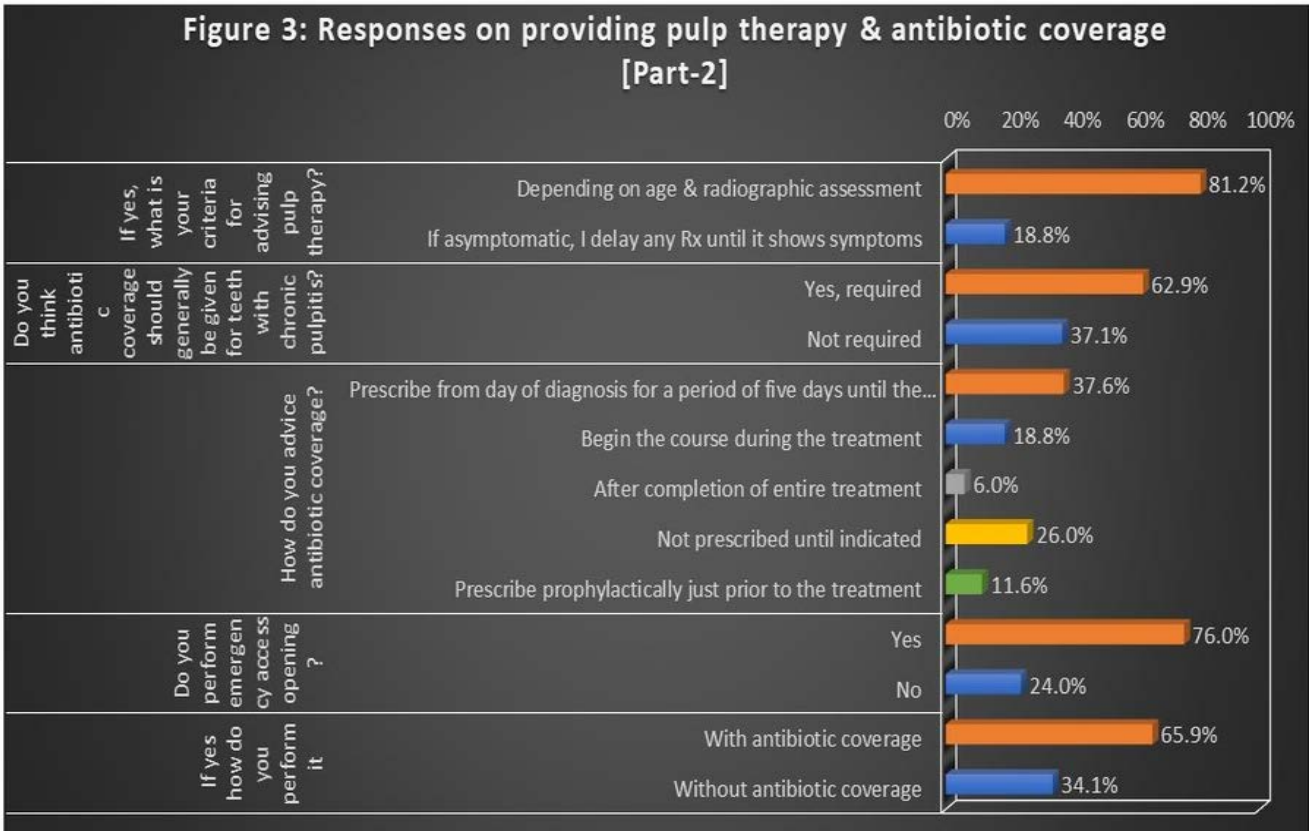

Fig. 3: Distribution of responses on providing pulp therapy & antibiotic coverage [Part-2].

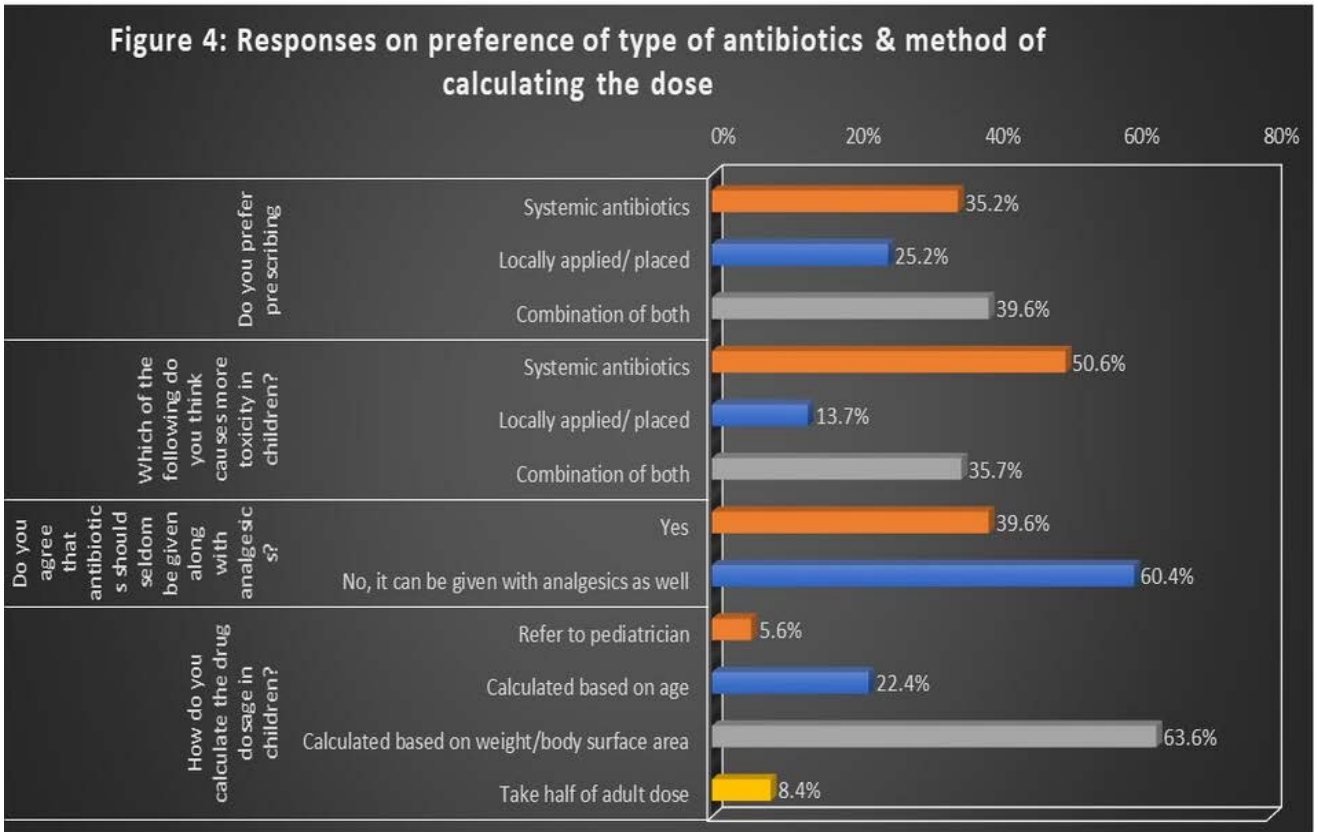

Fig. 4: Distribution of responses on preference of type of antibiotics & method of calculating the dose.

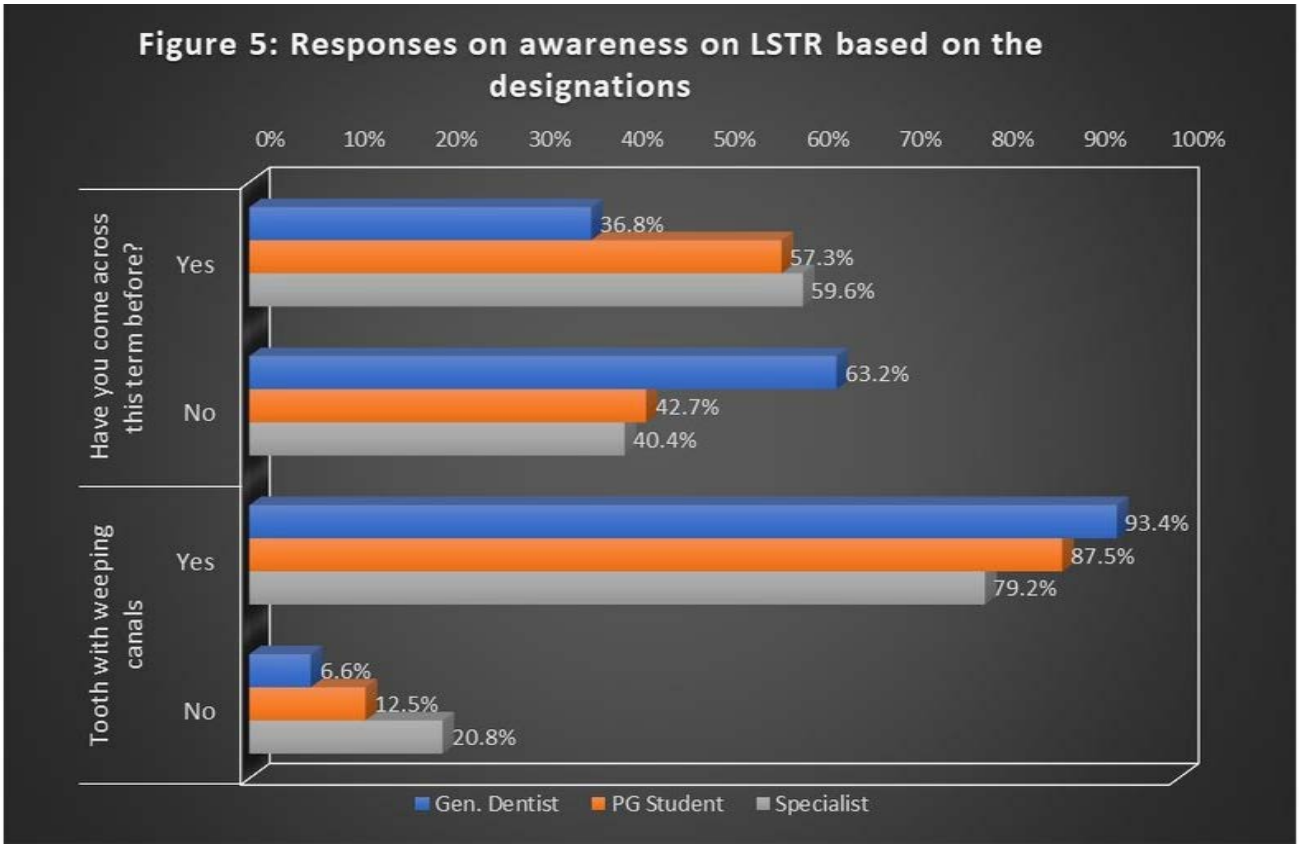

Fig. 5: Distribution of responses on awareness on LSTR based on the designations

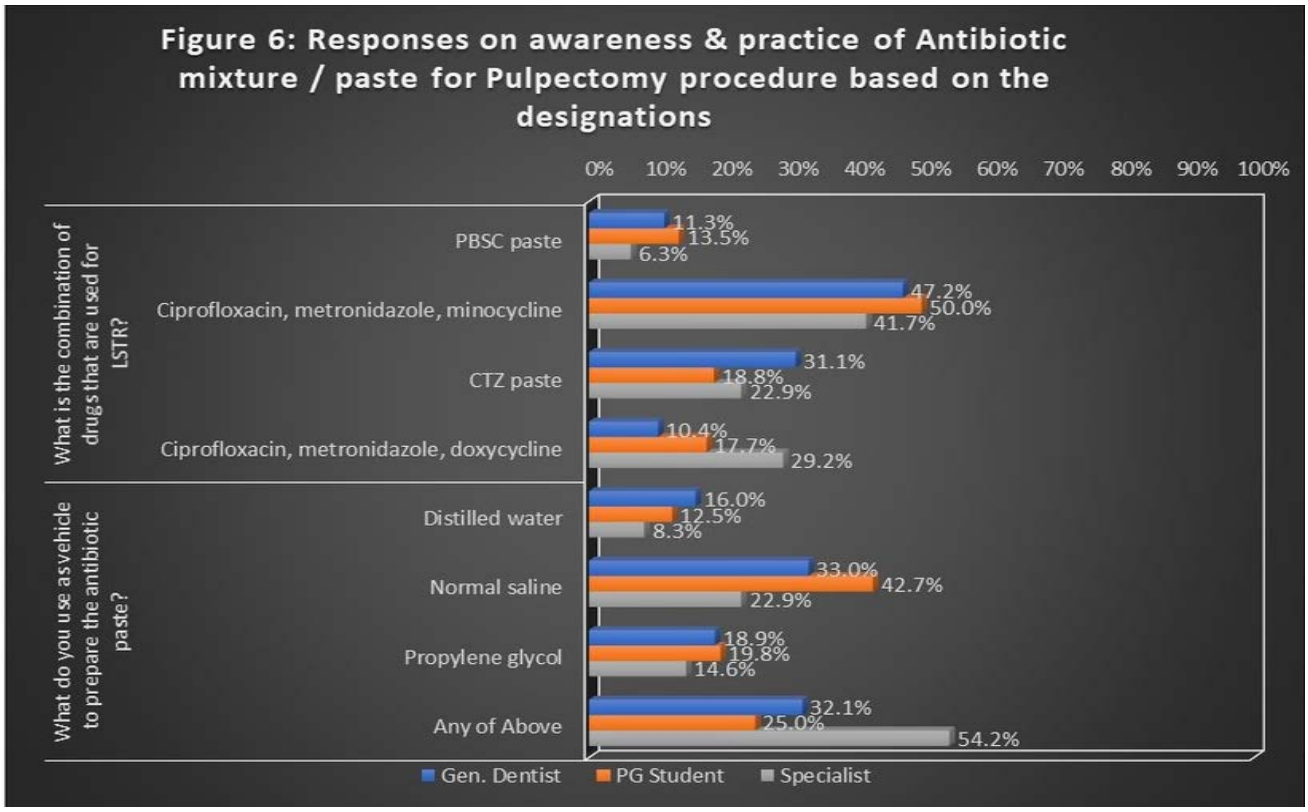

Fig. 6: Responses on awareness & practice of Antibiotic mixture / paste for Pulpectomy procedure based on the designations.

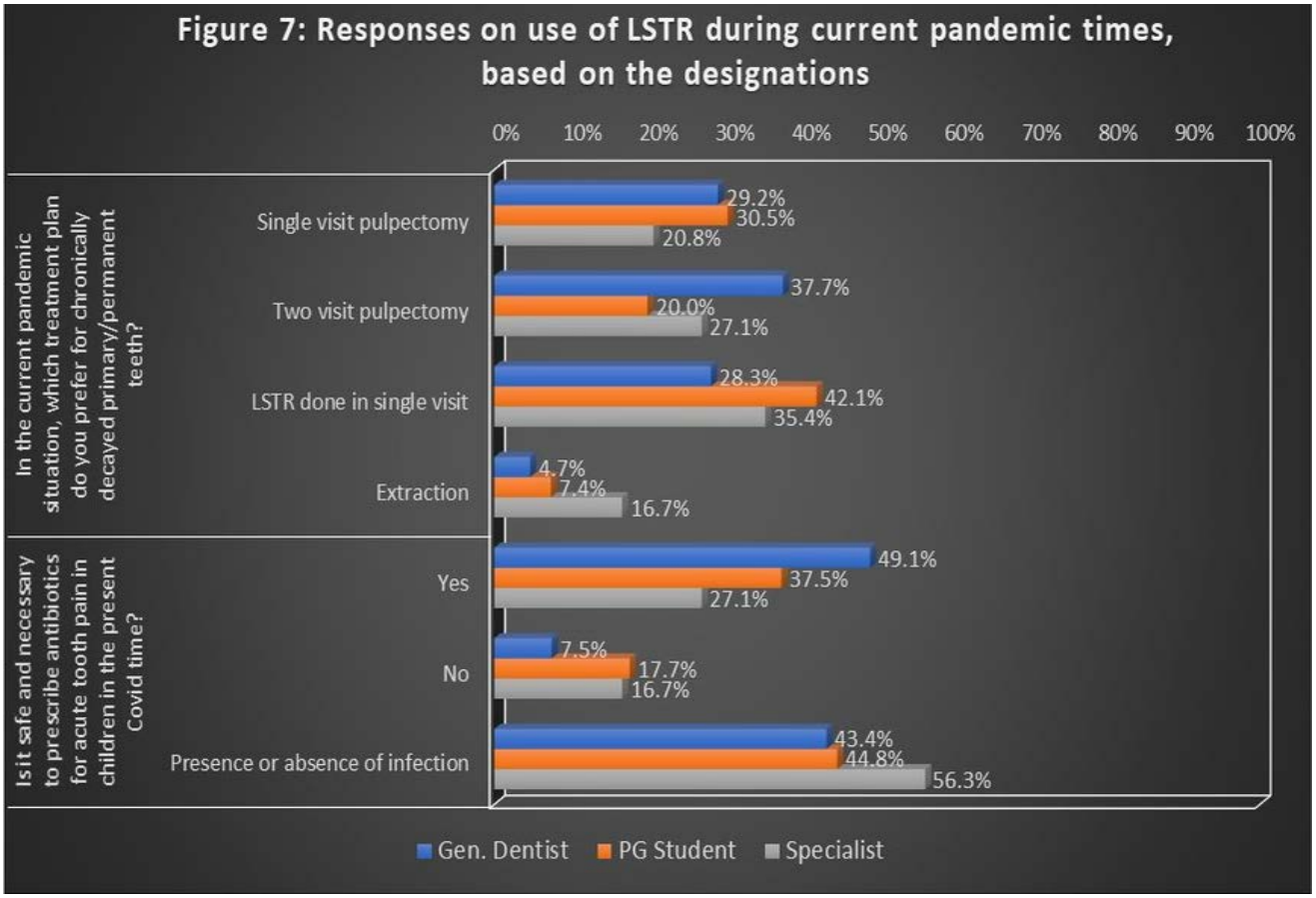

Fig 7: Responses on use of LSTR during current pandemic times, based on the designations.