



## **Awareness of Using Articaine in Children by Dentists in Chennai- A Questionnaire Survey**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author PKI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author GM managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

Articaine is a short acting local anesthetic agent which is used for minor surgeries. Although there is reluctance to use it on children, studies have shown that it is safe to use it in pediatric patients above the age of 4 years. This survey aimed to analyse the awareness on the use of articaine in children among dentists. A questionnaire containing questions about articaine, its properties and the participant's general view about the local anesthetic was distributed to the dental students and private practitioners in Chennai. The results were statistically analyzed using Chi Square test. Moreover, 65% of the participants were using articaine in children, 26.51% preferred using articaine in children below the age of 4. On the other hand, 43.18% were unsure about the choice of articaine as their default local anesthetic agent. This survey showed that dental students and the participants with 0-5 years of experience used articaine as a local anesthetic in children with the difference being statistically not significant ( $p > 0.05$ ). Moreover, male dentists showed more willingness to prefer articaine as their default local anesthetic agent compared to females, however the difference was not statistically significant ( $p > 0.05$ ).

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## 1. INTRODUCTION

The use of an ideal local anesthetic in paediatrics is important to provide effective loss of sensation with negligible side effects. While lidocaine has been considered as the standard local analgesia agent in dentistry for half a decade, the search for a more effective agent has been continued [1]. Articaine was invented in Germany in 1971 and as an epidural anaesthesia in 1974 [2]. Although articaine possesses additional properties which make it more preferred than lignocaine, its safety has been questioned numerous times due to reports suggesting higher incidence of paresthesia [3]. In dentistry, articaine 4% with adrenaline 5 mg/ml is widely used for infiltration and conduction anaesthesia [4]. The reason for its wide usage is its rapid onset of the block, the excellent quality of the anaesthesia, the low degree of toxicity and the short duration of action.

Articaine is classified as an amide but contains a thiophene ring instead of a benzene ring like other amide local anesthetics. A second molecular difference between articaine and other amide local anesthetics is the extra ester linkage incorporated into the articaine molecule, which results in hydrolysis of articaine by plasma esterases [5].

There are previous studies which show articaine has been used in inferior alveolar nerve blocks as it has an enhanced anaesthetic effect. This is beneficial as an inferior alveolar nerve block does not always result in successful pulpal anesthesia with the rates of failure being as high as 10-39% [6]. Some studies have found failure with the IAN block occurring between 44% and 81% of the time [7,8]. Articaine would be effective with this technique due to its high anaesthetic property.

The reluctance of dentists to use articaine in children even after several bonuses over agents like lignocaine due to complications like paresthesia can be due to lack of evidence. Hence this study aims at analysing the level of awareness on the use of articaine in children among dental students and dental practitioners in Chennai.

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years [9–27]. With this inspiration we planned to pursue research on

Awareness on the use of articaine in children among students and dental practitioners.

## 2. MATERIALS AND METHODS

The survey was conducted on a convenience sample in an online platform where a questionnaire containing questions about properties, indication, contraindication and complications of articaine was sent to dental students and dental practitioners in Chennai. The questionnaire was checked by experts in the field for validity and reliability. A pilot study was also conducted to evaluate the same. The responses were transferred to Microsoft Excel 2016 (Microsoft Office 10) and later exported to the Statistical Package for Social Science for Windows (Version 20.0, SPSS Inc, Chicago, Illinois, USA) and subjected to Chi Square test. The data was converted into bar charts.

## 3. RESULTS AND DISCUSSION

A total of 132 people participated in the study in which 42.42% were males and 56.81% were females (Fig. 1). 54.54% of the participants were undergraduate dental students, 20.45% were postgraduate dental students, 17.42% were dental practitioners who had a BDS degree and the remaining 7.5% were specialists who had a practice setup after their post graduation. 56% were dental students, 26.51% had 0-5 years of experience, 6.06% had 6-10 years of experience and 11.36% had more than 10 years worth of experience.

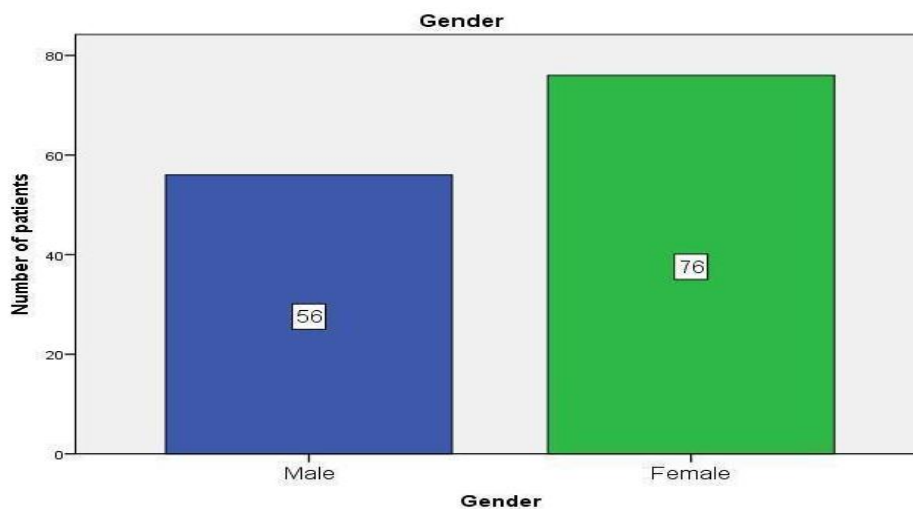
49.24% said that they used articaine as a local anaesthetic agent in children, 32.5% said that they did not use articaine in children (Fig. 2). 47.72% believed that articaine was a better local anesthetic agent, 25% believed that there were other local anesthetic agents better than articaine and the remaining 27.28% were unsure about the question. 46.21% believed that articaine has a different behavioural effect on children, 21.21% did not believe so and the remaining 32.57% were unsure. 36.36% said that they use articaine in an infiltration, 9.09% said that they used articaine in a nerve block, 41.66% said that they used articaine in an infiltration and a nerve block. The remaining 10.6% said that they did not use articaine. 52.27% said that they prefer to use articaine in children above the age of 4, 13.63% said that they would use articaine in children above the age of 2, 26.51% said that they would use articaine in children above the age of 8 and

the remaining were not sure (Fig. 3). 32.57% thought the complication of articaine was paresthesia, 15.9% thought it was methemoglobinemia, 44.69% thought it was both and the remaining were not sure. 10.6% said that the contraindications of using articaine were in patients with metabisulphite allergy, 11.36% said that the contraindication was patients with hemoglobinopathies, 12.12% said that the contraindication was methemoglobinemia, 54.54% said that all three were the complications of articaine and the remaining 11.36% were not aware. 41.6% considered articaine to be better than lidocaine, 23.48% considered lidocaine to be better than articaine and the remaining 34.84% were not sure. 60.6% said that they used articaine while performing an inferior alveolar nerve block while 18.25% said that they used some other local anaesthetising agent when performing an inferior alveolar nerve block. Finally, when asked whether the participants would make articaine their default local anaesthetic agent, 13.3% said yes, 26.51% said no and the remaining 43.18% said that they were not sure (Fig. 4).

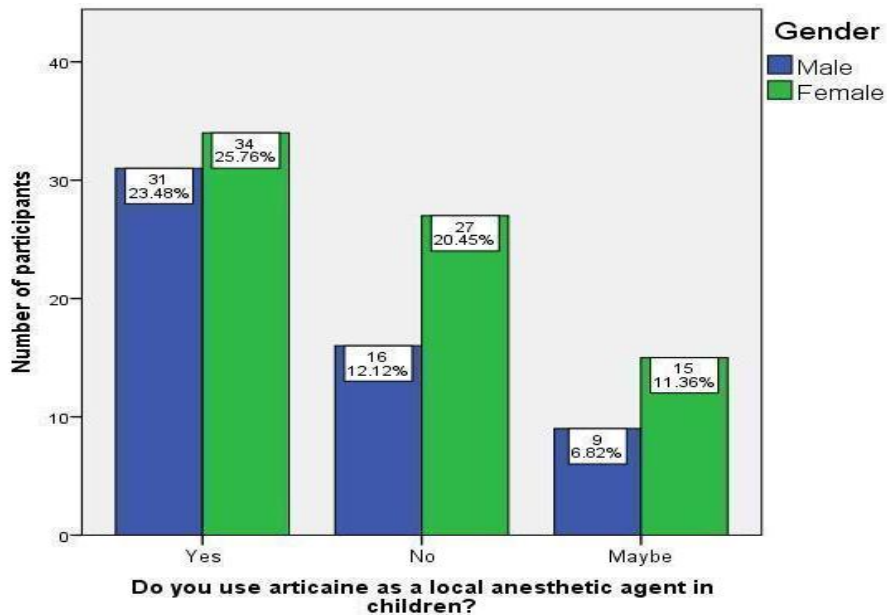
The need for a local anesthetic agent which delivers quality sedation with a lesser quantity and does have minimal or no side effects on the patient is at the forefront. Hence, there are a lot of studies which compare one anesthetic agent with the other to compare their benefits and side effects when used on different populations. In this study, 53.35% of males believed articaine

can be used on children as a local anesthetic. This was more than the female response rate, which was 44.73% [ $p>0.05$ ]. 42.8% of the participants with 0-5 years of experience, 50% of the participants with 6-10 years experience, 60% of the participants with more than 10 years of experience and 50% of the participants who were dental students believed that they can use articaine as a local anesthetic agent in children. [ $p<0.05$ ] (Fig. 5). 48.27% of dentists said that they use articaine in children which is similar to a study done by Brickouse et al in which 50% of the dentists reported using articaine in children [28]. Table 1 shows the responses to certain questions based on gender.

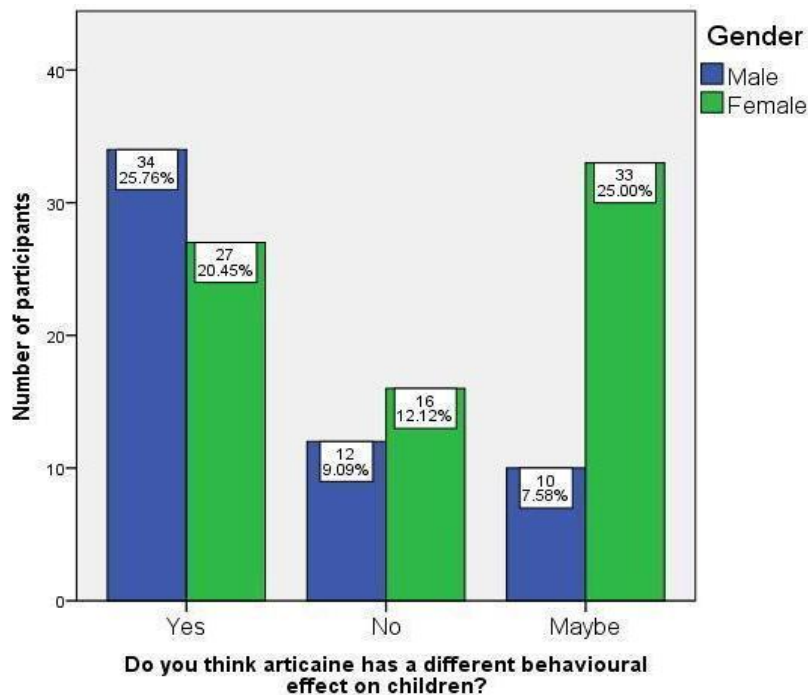
60.71% of the males and 100% of others believed that articaine had a different behavioural effect on children while 43.42% of the females did not believe that articaine had a different behavioural effect on children [ $p<0.05$ ]. 54.28% of the participants with 0-5 years of experience, 60% of the participants with more than 10 years of experience and 41.89% of the participants who were dental students believed that articaine has a different behavioural effect on children. Only 62.5% of the participants with 6-10 years of experience believed that articaine does not have a different behavioural effect on children [ $p<0.05$ ] (Fig. 6). This contradicts the findings in the study done by Ram et al which showed no difference in the behaviour of patients while using articaine [29].



**Fig. 1. Bar graph representing the gender of the participants. 42.42% were males, 57.57% were females. X axis represents the gender of the participants and Y axis represents the number of participants**



**Fig. 2.** Bar graph representing the association between gender and the response to the use of articaine as local anaesthetic in children. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents. 44.73% of females said that they used articaine as a local anesthetic agent in children



**Fig. 3.** Bar graph representing the association between gender and response to articaine having a different behaviour effect on children. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents. Higher number of males believed that articaine had a different behavioural effect on children while a higher number of females thought there may be an effect

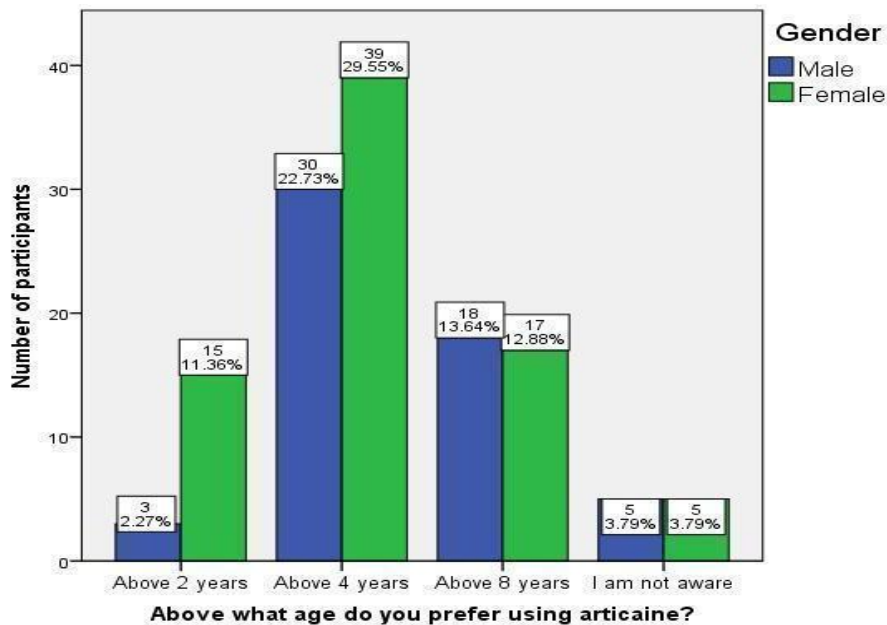


Fig. 4. Bar graph representing the association between gender and the response to the age above which the participants would use articaine in children. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents. Females preferred using articaine in children above the age of 4

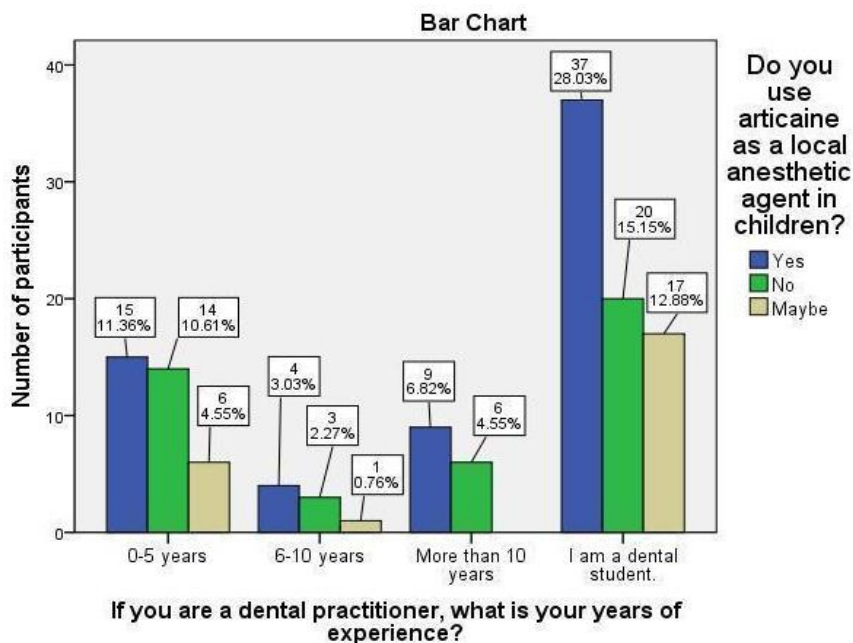


Fig. 5. Bar graph representing the association of years of experience with the response to the use of articaine as local anaesthetic in children. The X axis represents the various years of experience of the participants and the Y axis represents the number of participants with a particular response. Blue represents the choice yes, green represents the choice no and beige represents the choice maybe. Dental students, followed by participants with 0-5 years experience, participants with more than 10 years of experience and participants with 6-10 years of experience believed that they can use articaine as a local anesthetic agent in children

**Table 1. Table depicting the responses of the participants of selected questions based on gender**

Questions	Percentage of responses among various genders. [M=Males, F=Females]			
	Do you use articaine as a local anesthetic agent in children?	Yes M- 55.35% F- 44.73%	No M- 28.57% F- 35.52%	Maybe M- 16.07% F- 19.73%
Do you think articaine has a different behavioural effect on children?	M- 60.71% F- 35.52%	M- 21.42% F- 21.05%	M- 17.85% F- 43.42%	
Above what age do you prefer to use articaine?	Above 2 years M- 5.35% F- 19.73%	Above 4 years M- 53.57% F- 51.31%	Above 8 years M- 32.14% F- 22.36%	I am not aware M- 8.92% F- 6.57%
Do you think articaine is a better alternative to lidocaine?	Yes M- 41.07% F- 42.10%	No M- 28.57% F- 19.73%	Maybe M- 30.35% F- 38.15%	
Do you use articaine while performing an inferior alveolar nerve block?	Yes M- 66.07% F- 56.57%	No M- 33.92% F- 43.42%		
Will you use articaine as your default local anaesthetic agent?	Yes M- 37.5% F- 25%	No M- 23.21% F- 28.94%	Maybe M- 39.28% F- 46.05%	

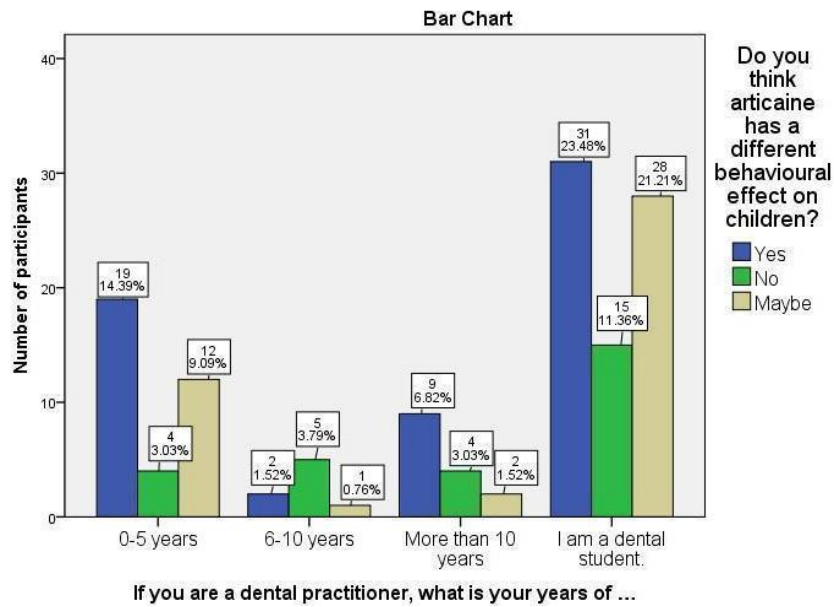
In this study, 53.57% of males and 51.31% of females preferred to use articaine in children above the age of 4 [ $p>0.05$ ]. 40% of the participants with 0-5 years of experience, 25% of the participants with 6-10 years of experience, 78.57% of the participants with more than 10 years of experience and 52.7% of the dental students preferred to use articaine in children above the age of 4 years [ $p<0.05$ ] (Fig. 7). A study by Wright et al showed that it was preferred to use articaine in children above the age of 4 as the volume required to achieve required sedation was much higher in patients younger than 4 years [30].

41.07% of males and 42.10% of females thought articaine was a better solution than lignocaine [ $p>0.05$ ] (Fig. 8). 50% of the participants with 6-10 years of experience and 66.66% of the participants with more than 10 years of experience believed that articaine was a better alternative to lignocaine [ $p>0.05$ ] (Fig. 9). A study by Ram et al showed no difference between usage of articaine and lignocaine [29].

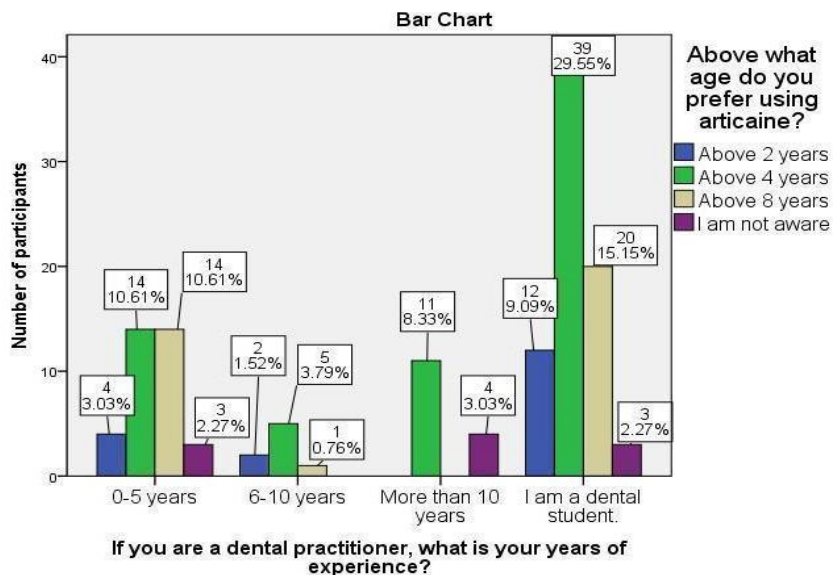
66.07% of the males and 56.57% of the females said that they use articaine while performing an inferior alveolar nerve block [ $p>0.05$ ] (Fig. 10). 65.71% of the participants with 0-5 years of experience, 76% of the participants with 6-10 years of experience, 73.33% of the participants with more than 10 years of experience and

54.05% of the participants who were dental students said that they used articaine while performing an inferior alveolar nerve block [ $p>0.05$ ] (Fig. 11). A study done by Claffey et al showed no difference in the anesthetic success of IAN between articaine and lidocaine [31]. However, another study by Arali et al showed that the usage of 4% articaine achieved anesthetic effect at a faster rate than 2% lignocaine without the side effects [32]. Another study by Chopra et al showed the block with lidocaine was more painful when compared to articaine [33].

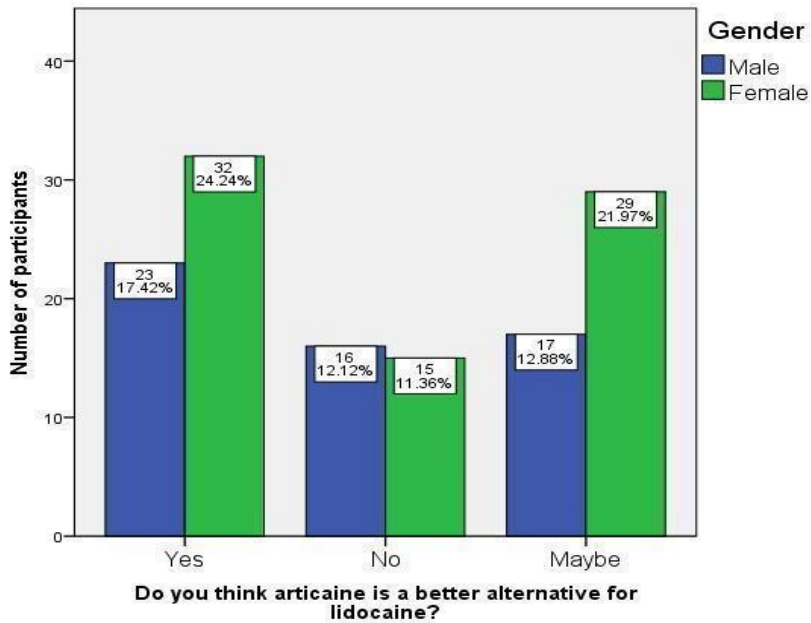
Finally, 39.28% of the males, 46.05% of the female participants said that they were unsure about making articaine their default local anesthetic agent [ $p>0.05$ ] (Fig. 12). 40% of the participants with 0-5 years of experience and 47.29% of the participants who were dental students said that they were unsure about making articaine their default local anesthetic agent. 50% of the participants with 6-10 years of experience said that they would not make articaine their default local anesthetic agent while 60% of the participants with more than 10 years of experience said that they would consider making articaine their default local anesthetic agent. [ $p>0.05$ ] (Fig. 13). This is in correlation with a study done by Brickhouse et al which showed dentists preferring other agents over articaine although using articaine in their practice [28].



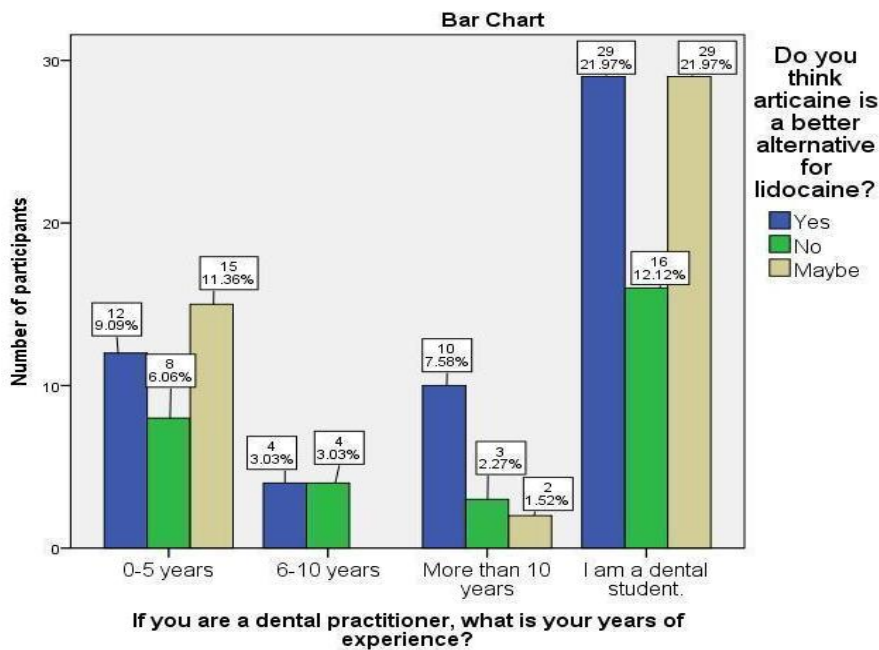
**Fig. 6.** Bar graph representing the association between years of experience and response to articaine having a different behaviour effect on children. The X axis represents the various years of experience of the participants and the Y axis represents the number of participants with a particular response. Blue represents the choice yes, green represents the choice no and beige represents the choice maybe. Participants with 0-5 years of experience, participants with more than 10 years of experience and participants who were dental students believed that articaine has a different behavioural effect on children. Only participants with 6-10 years of experience believed that articaine does not have a different behavioural effect on children



**Fig. 7.** Bar graph representing the association between years of experience and the responses to the age above which the participants would use articaine in children. The X axis represents the various years of experience of the participants and the Y axis represents the number of participants with a particular response. Blue represents the choice 'Above 2 years', green represents the option 'Above 4 years', beige represents the option 'Above 8 years' and purple represents the option 'I am not aware". Dental students, followed by participants with 0-5 years experience, participants with more than 10 years of experience and participants with 6-10 years of experience preferred to use articaine in children above the age of 4 years

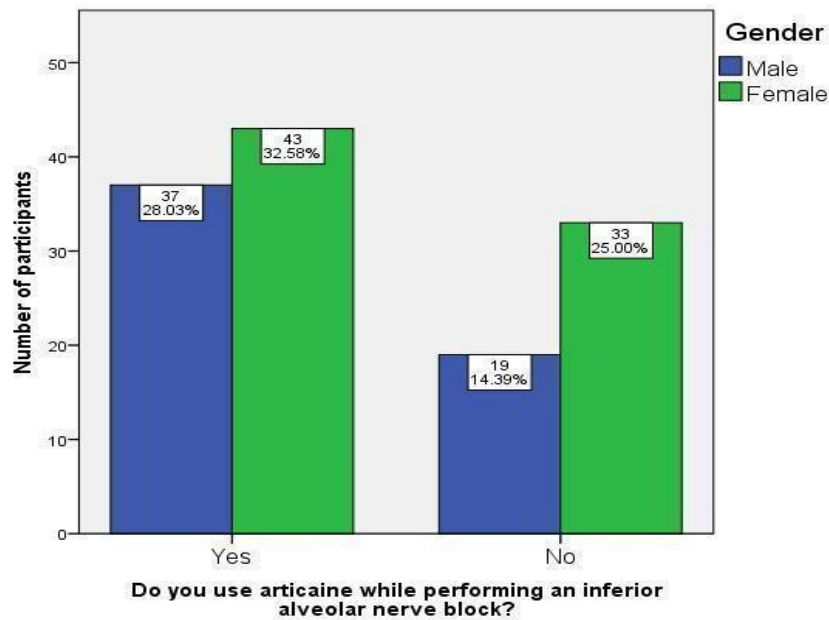


**Fig. 8.** Bar graph representing the association between gender and the response to whether articaine was a better alternative to lidocaine. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents Females think that articaine is a better alternative for lignocaine

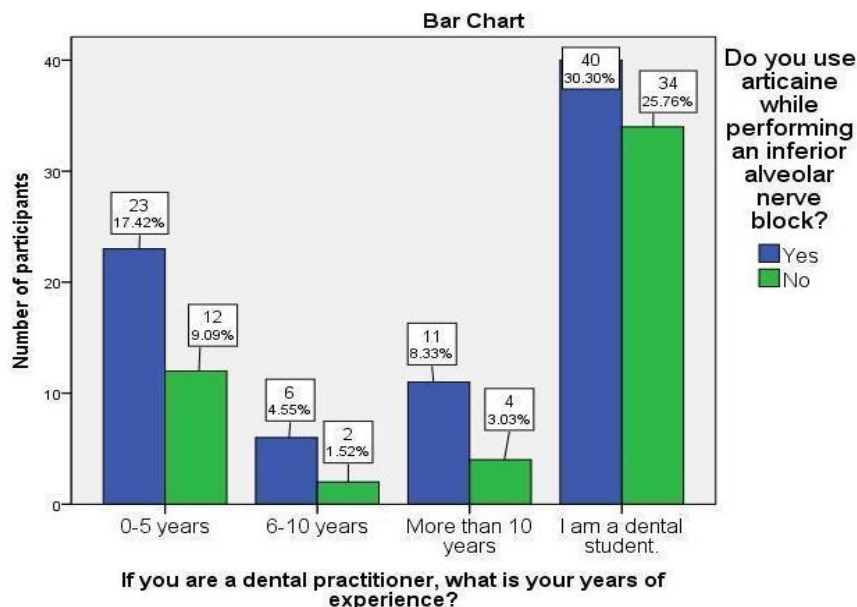


**Fig. 9.** Bar graph representing the association between years of experience and the responses of whether articaine was a better alternative to lidocaine. The X axis represents the various years of experience of the participants and the Y axis represents the number of participants with a particular response. Blue represents the choice yes, green represents the choice no and beige represents the choice maybe. Equal number of dental students thought articaine was superior and were not sure. Participants with more than 10 years of experience preferred lignocaine

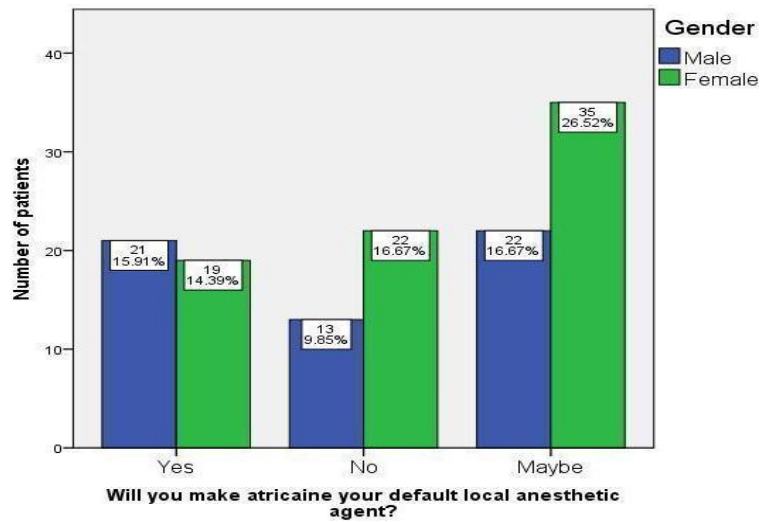




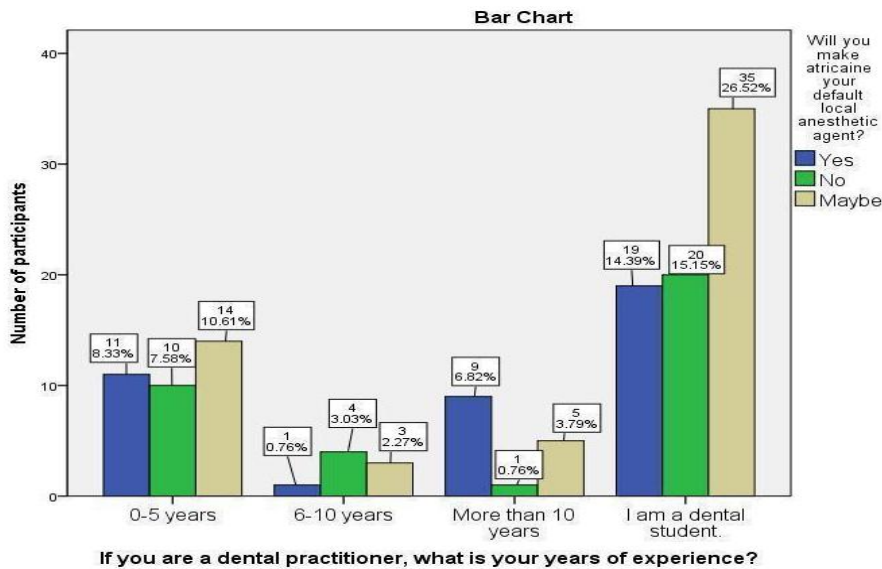
**Fig. 10.** Bar graph representing the association between gender and the response to whether the participants use articaine while performing an inferior alveolar nerve block. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents. Females [more than males] said that they use articaine while performing an inferior alveolar nerve block



**Fig. 11.** Bar graph representing the association between years of experience and the response to whether the participants use articaine while performing an inferior alveolar nerve block. X axis represents the various years of experience of the participants and the Y axis represents the number of participants responding to a particular choice. Blue represents the option yes and green represents the option no. Dental students, followed by participants with 0-5 years experience, participants with more than 10 years of experience and participants with 6-10 years of experience said that they used articaine while performing an inferior alveolar nerve block



**Fig. 12.** Bar graph representing the association between gender and the response to whether the participants will make articaine their default local anesthetic agent. The X axis represents the various choices for the question and the Y axis represents the number of participants with a particular response. Blue represents the male and green represents the female respondents 39.28% of the males and 46.05% of the female participants said that they were unsure about making articaine their default local anesthetic agent



**Fig. 13.** Bar graph representing the association between years of experience and the response to whether the participants will make articaine their default local anesthetic agent. The X axis represents the various years of experience of the participants and the Y axis represents the number of participants with a particular response. Blue represents the choice yes, green represents the choice no and beige represents the choice maybe. Dental students, followed by participants with 0-5 years experience, participants with more than 10 years of experience and participants with 6-10 years of experience said that they would consider making articaine their default local anesthetic agent

Articaine has been shown to have better anesthetic properties without the side effects when compared to lidocaine by various studies. But, the limitations of said studies revolved

around the age of the population in which the study was conducted. In the surveys done involving dentists and pediatrics, articaine was used regularly in different procedures, but

lidocaine was preferred in most cases. Articaine has been shown to have a better effect when used in an infiltration when compared to lidocaine used in an inferior alveolar nerve block [6,34]. The limitations in the current study are the lack of diversity in the experience of the dental practitioners. The limits of the study can be overcome by performing another study with a larger and a diverse group of dentists without including dental students.

#### 4. CONCLUSION

The study showed dentists and dental students to have a good knowledge on the use and properties of articaine. Dental students and the dentists with 0-5 years of experience compared to other practitioners used articaine as a local anesthetic in children [p>0.05]. Male dentists showed more willingness to make articaine their default local anesthetic agent compared to females, however the difference was not statistically significant [p>0.05].

#### DISCLAIMER

We declare that no competing interests exist as the products used for this research are predominantly used in this country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge.

#### CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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