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DENTISTS' PERCEPTION TOWARDS NEW LOCAL ANESTHETIC DRUG ARTICAINE – A CROSS SECTIONAL SURVEY

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INTRODUCTION

Health science keeps evolving to aid health professionals and public to improve health; there are numerous fields of medical science, in which Dentistry has evolved as vast dynamic field with continues research and development that facilitates introduction of new dental materials, advanced technology. Dentistry is often associated with pain, many reasons are associated with under utilization of dental health services, and Perceived Pain during dental treatment is one among them.

Dentistry has been engaged in the question to control the pain associated with the disease and trauma since years. Pain is one of the most common miseries in human and one of the most unbearable clinical symptoms in patients. Local anesthesia is a technique to induce a reversible loss of sensation in any part of body. Local anesthesia is widely used in dental procedures like extraction, root canal treatment etc.[1] there are wide variety of anesthetic agents used, throughout history, many scientists have attempted to manage pain using many different methods and techniques.

In 1943, Nils Löfgren, a Swedish chemist, synthesized a new amide-based local anesthetic agent, derived from xylidine, and named it "lidocaine." Lidocaine was more potent and less allergenic than procaine and the other ester-based anesthetics. Lignocaine was launched for dental use in 1948; thereafter it is the gold standard for pain management in dentistry.[2] Lignocaine belongs to amide group having intermediate duration of action considered as prototypical Amide anesthetic agent it was roughly twice as potent and twice as toxic as procaine, producing a greater depth of anesthesia with a longer duration over a larger area than a comparable volume of procaine. Consequently, lidocaine quickly became the most popular local anesthetic in dentistry.[3]

Of late Articaine has gained lot of interest in dentistry because of its quick onset and higher success rates than lignocaine. Studies have shown few advantages like articaine does a transient but completely reversible state of anaesthesia, it causes longstanding anaesthesia moreover, in patients having hypokalemic sensory overstimulation, lignocaine is not that useful compared to articaine.[4] Studies concluded that patients treated with articaine become "drug free" more rapidly compared with other local anaesthetics.[5]

Articaine is a new local anesthetic drug introduced to the Indian Dental market.[6] Articaine was originally synthesized as car-ticaine in 1969 and entered clinical practice in Germany in 1976.[7] Articaine is unique among the amide local anesthetic agents due to the presence of thiophene ring which makes it better lipid soluble, because of which it diffuses better through soft tissues than do other anesthetics, thereby achieving higher intraneural concentration and better conduction blockade. Also Articaine gets metabolized both in plasma as well as tissues due to presence of an ester group, thus decreasing the risk of systemic toxicity. Articaine is a safe, well tolerated and effective local anesthetic for use in both children and adults. Articaine has effectively reduced maximum limitations of lignocaine.

There is insufficient data regarding the response of dentists to advances in new technology with its adoption. This shows that there is lack of appropriate methods for introducing advances into dentistry. This provided an impetus to assess the knowledge and perception towards newer articaine from dental health professionals in Pune, Maharashtra, India.

Methodology
This was a cross-sectional study based on the questionnaire. Study was planned and executed by the Public Health Department, D. Y. Patil Dental School, Lohegaon, Pune among dentists in Pune district.

Ethical considerations
Written informed consent was obtained from all the respondents before the start of the survey. Participation in this research was voluntary. Participant identity was kept confidential. The Ethical Approval was received from institutional ethics committee.

Study design
This was a descriptive, cross-sectional survey, conducted through self administered 17 items questionnaire. The study was conducted in Pune district over a period of two months between February 2021 and March 2021.

Study population
The study population was of either gender of the following inclusion and exclusion criteria -
Inclusion Criteria -
Registered Dental Practitioners - BDS and MDS
Exclusion Criteria -
Dental students

Preparation of questionnaire
The questionnaire was designed which consisted of two sections. Section one was about respondent's personal information including gender, age, education, scope of practice and practice experience. Section two of the questionnaire included questions regarding awareness about Articaine, local anesthetic agent commonly used in practice, from which source the information was obtained, details of chemical structural, adverse effects caused by articaine, age groups in which Articaine is preferred, perceptions on articaine over other local anesthetic agents.

A self administered 17 item questionnaire was prepared in February 2021. As a part of pilot testing the questionnaire was given to 10 dentists including 4 general dental practitioners, 2 Pedodontists and 4 Oral and maxillofacial surgeons, and modified accordingly, following the pilot testing, required modifications were made based on respondents' recommendations and final questionnaire was prepared in which additional questions regarding concentration of articaine , pharmacodynamics of articaine and the field in which articaine was firstly used clinically, were included.

Collection of data
The data was collected by visiting the dental clinics across Pune district. The purpose of the study was explained to the respondents prior to administering the survey questionnaire. Informed consent was obtained. Participation in survey was voluntary. The questionnaire was provided in English only.

Data analysis
All returned questionnaires were double-checked for accuracy and then the collected data were feed into an excel spreadsheet dataset. 303 participants completed the questionnaire satisfactorily and only those were included for evaluation by descriptive manner.

RESULTS
Total 303 consenting participants satisfactorily completed the questionnaire and were included for evaluation. A majority of survey population were female 168 (55.44%) and males 135 (44.55%) out of which 207 (68.31%) were BDS Graduates with 246 (81.8%) practicing General Dentistry. The survey population was divided into three age groups in which first group (23-34 years) consisted of 205 (67.65%) dentists, second group (34 - 45 years) consisted of 90 (29.75%) and third group (> 45 years) consisted of 8(2.64%) dentists. (Table 1)

Practice experience which was divided in three groups too, consisted of 124 dentists (37 males and 87 females) had practice experience between 0 to 5 years in which there was greater number undergraduates nearly 71.77 % and postgraduates 28.22 %, 93 dentists (44 males and 49 females) between 5 to 10 years which consisted of 67.74% undergraduates and 32.25% postgraduates and 86 dentists (54 males and 32 females) greater than 10 years which had approximately 69.76 % of undergraduates and 30.23 % postgraduates.(Table 2)

Among 303 dentists 256 (84.24 %) dentists were using Lidocaine with epinephrine and 28 (9.24 %) dentists were using articaine in daily practice. 240 (79.2 %) dentists were aware about Articaine local anesthetic agent. 248 (81.8%) were unaware about the entry and country of origin about articaine into dental practice. Majority 144 (47.5%) of participants were aware about the group articaine belonged and 132 (43.5%) were unaware about the articaine group. lignocaine with ephinephrine combination was considered more effective and potent by 186(61.3%) and only 11 (3.6%) opined atricaine better than lignocaine and ephinephrine combination. (Table 3)

Text book and journals was the source of information for 170 (56.1%) dentists and 76 (25.08 %) from web search. Around 70% dentists were unaware about its type, composition and chemical reaction, concentration, adverse or anaphylactic reactions, mean onset time, duration of action and in which field articaine was first used clinically.

Most of the dentists 143 (47.1%) were unaware when questioned about any age specific indication to use articaine. Around 191 (63.03%) opined articaine is not effective and potent compared to lidocaine, however 207 (68.3%) admitted to start using articaine if scientifically proved advantageous than lidocaine. Majority 210 (61.93%) were unaware about articaine use in pregnant

women and 185 (61%) answered atricaine is used in the form of local infiltration in dentistry. 267 (88.11%) dentists currently were not using articaine in their daily dental practice (Table 3)

DISCUSSION

Local anesthetic is the only daily injectable drug that the dentist can give their patients on a routine basis; adequate local anesthesia is the key for a successful dental treatment. Lignocaine, an aide type anaesthetic, is the most commonly employed local anaesthetic worldwide and is considered as gold standard for comparison.[8] Review of literature shows extensive usage of lignocaine by dentist worldwide and in India.[9,10]

With the introduction of articaine, there are few studies in dental literature concerning the use of articaine. Articaine is the core of intense debate in dentistry because of quick onset and higher success rates than lignocaine. It was clinically introduced in Germany 1976 and subsequently throughout Europe, Canada and in 2000 North America.[11] Articaine is used clinically as a 4% solution with epinephrine1:100000 or 1:200000 solution.[12]

The purpose of our study was to know dentists' perception regarding Articaine usage in dentistry Out of 303 respondents; the most 256 (84.24%) dentists commonly used local anesthetic agent was lidocaine with epinephrine. This finding is similar to the study by Laxman Singh Kaira et al which showed that lignocaine (66%) is the local anesthetic most commonly used by dentists in India, followed by mepivacaine and articaine.[10] another study by Hesham Khalil showed that lidocaine (73%) is the local anesthetic most commonly used by dentists in Saudi Arabia.[13]

Most 240 (79.2%) dentists were aware or just have heard about Articaine The probable reason for this would be LA of choice in dentistry across world varies, several European countries (Italy, France, Germany, and the Netherlands) and Canada predominantly use Articaine as their first-line anesthetic and others consider Lidocaine as LA of choice,[14] Also 248 (81,8 %) dentists didn't knew when and where Articaine entered in clinical Practice, Probably due to lack of details about the Articaine during Under Graduation.

When it comes to potency nearly half 186 (61.3 %) of them responded Lignocaine plus epinephrine to be more potent. But study by Malamed states that the potency of Articaine is 1.5 that of lidocaine.[8] This indicate that Articaine may be superior to Lidocaine. Double blinded studies have confirmed that the efficacy of Articaine is comparable to but not superior to that of Lidocaine.[4] To this date there is little evidence other than anectodal evidence to support Articaine being superior over other local anesthetics.[15] This could be the probable reason for less or no use of articaine in daily dental practice.

The most common method by which participants got to learn about articaine as an anesthetic agent was through Textbooks and Journals i.e170 (56.1%). This is in contrast to the study conducted in Australia where continuing professional development courses was cited as a reason for adoption of new technology.[16] Most of the 218 (71.9%) dentists were not aware about the Chemical structure of articaine, compared to Lignocaine, perhaps wide spread use of lidocaine during clinical postings and extensive discussion about lidocaine in curriculum and non introduction of articaine in textbooks advised by University, could be the reason for lack of awareness and not using articaine in daily practice.

Similarly most 212 (70%) of dentists were not aware about the adverse effects or anaphylactic reactions with articaine. The immunogenic potential of articaine is very low. Allergic-type reactions that have been reported with articaine include edema, urticaria, erythema and anaphylactic shock, and the frequency is comparable with that of lidocaine. Patients allergic to articaine likely would be allergic to lidocaine and other amide local anesthetics. Articaine like lidocaine contains the vasoconstrictor preservative sodium metabisulphite and therefore may cause allergic reactions in patients with sulphite sensitivity, such as some people with allergic-type asthma.[11]

Nearly half of the study population didn't know about age specificity of articaine. Very few studies have been done regarding use of articaine in various age groups. Taken into account that articaine shows an age-independent metabolism, there shouldbe no reason to change the dosage in elderly patients. But, it is important to remember that articaine is a highly serum protein bounded drug, and changes in binding to serum are also a factor that could affect pharmacokinetics in the elderly.[17] Existing meta-analysis could not confirm recommendations for its use in children below 4 years of age, since no supporting data were found.[18]

Majority, 207 (68.3%) dentists were encouraged to use articaine if it is scientifically proved advantages over others. The probable reason for not using articaine might be the cost factor and long duration of action.[6] Study by Uzair Luqman et al[19] states that problems with articaine include increased cost and post-injection neuroparexia of lingual or inferior alveolar nerve. However, a study in Australia showed that financial reasons did not appear to be a major influence in non adoption.[16] A Brazilian report showed lignocaine had a significantly greater cost benefit than mepivacaine and articaine.[20] Further studies are to be conducted to determine the selection of anesthesia based on type of dental treatment to be carried out.

Very few studies have been done regarding the use of articaine in pregnant women. Articaine is classified under FDA category C and lidocaine, which is the most commonly used local anesthetic during dental treatments,

is under category B and considered to have almost no negative effect on the mother and the fetus.[21] Articaine use in pregnancy should be limited to cases in which if the predicted benefit validates the risk to the fetus and in nursing women caution should be exercised as no confirmed report have been published citing its non use in human milk. Review of an article stated that Articaine seems to be the LA of the first choice in tissues with suppurative inflammation, for adults, children, elderly, pregnant women, and breastfeeding women, and patients suffering from hepatic disorders and renal function impairment.[22]

About 88% of the respondents were not using Articaine in their daily dental practice. This finding is contradictory to a study conducted among Australian dentists where Articaine was used by a majority of them[16] perhaps lack of awareness and inadequate information about articaine and uncertainity about efficacy potency, etc might be the reason for less usage of articaine in their daily dental practice.

1. Distribution of study subjects based on their background variables.

Age	Males	Females	Total
23-34	76(37.07%)	129(62.92%)	205(67.65%)
35-45	53(58.88%)	37(41.11%)	90(29.70%)
>45	6(75%)	2(25%)	8(2.64%)
	135 (44.55%)	168 (55.44%)	
Education	**Males**	**Females**	**Total**
BDS	77(37.19%)	130(62.80%)	207(68.31%)
MDS	58(60.41%)	38(39.58%)	96(31.68)
Scope of practice	**Males**	**Females**	**Total**
General	101(41.05%)	145(58.94%)	246(81.18%)
Specialty	34(59.64%)	23(40.35%)	57(18.81%)

2. Distribution of study participants based on their years into dental Practice

Practice experience	Males	Females		BDS			MDS		
			Total	Males	Females	Total	Males	Females	Total
0-5 yrs	37 (29.83%)	87 (70.16%)	124 (40.92%)	20	69	89 (71.77%)	17	18	35 (28.22%)
5-10 yrs	44 (47.31%)	49 (52.68)	93 (30.69%)	24	34	63 (67.74%)	20	10	30 (32.25%)
>10 yrs	54 (62.79%)	32 (37.20%)	86 (28.38%)	33	27	55 (69.76%)	21	10	31 (30.23%)

3. Usage and Perception towards articaine among study participants.

Questions	Answer	Total
1. Which local anesthetic agent do you use in your daily dental practice?	Lidocaine with epinephrine	256 (84.24%)
	Lidocaine without epinephrine	19 (6.27%)
	Articaine	28 (9.24%)
2. Are you aware about the local anesthetic agent Articaine?	Yes	240 (79.2%)
	No	63 (20.7%)
3. In which year Articaine entered in clinical practice and where?	1969, US	10 (3.3%)
	1971, France	03 (0.9%)
	1976, Germany	42 (13.8%)
	Don't know	248 (81.8%)
4. To which group of Local agent does Articaine belongs	Amide type	144 (47.5%)
	Ester type	27 (8.9%)
	Don't know	132 (43.5%)
5. Which Local Anesthetic agent is more potent and effective?	Lignocaine + epinephrine	186 (61.3%)
	Articaine + epinephrine	91 (30%)
	Articaine	11 (3.6%)
	Lignocaine	15 (4.9%)
6. How did you get the information about Articaine?	Textbooks and Journals	170 (56.1%)
	Product company representatives	25 (8.2%)

	Colleagues	29 (9.5%)
	Attending CDE Programs	3 (0.9%)
	Web /Internet	76 (25.08%)
7. Do you know the composition and chemical configuration of Articaine?	Yes	85 (28%)
	No	218 (71.9%)
8. Are you aware of any adverse effects or anaphylactic reactions with articaine?	Yes	91 (30%)
	No	212 (70%)
9. Among which age group do you use Atricaine?	Children's	25 (8.2 %)
	Adults	68 (22.44%)
	All the age groups	67 (22.1%)
	Don't know	143 (47.1%)
10. Do you feel that Articaine is more efficacious than Lignocaine?	Yes	112 (36.9%)
	No	191 (63.03%)
11. Would you be encouraged to start using articaine if it is …	Scientifically proved advantages over others	207 (68.3%)
	Cost Benefit	51 (16.8%)
	Don't know	45 (14.85%)
12. Is Articaine use preferred in pregnant women?	Yes	27 (8.9%)
	No	66 (21.7%)
	Don't Know	210 (69.3%)
13. In which form, is Articaine more often used?	Topical anesthetic	16 (5.2%)
	Local infiltration	185 (61%)
	Don't know	102 (33.6%)
14. Are you using Articaine in your daily dental practice?	Yes	36 (11.88%)
	No	267 (88.11%)
15. Mean onset time of Articaine is	2.22 mins	41 (13.5%)
	4.08 mins	20 (6.6%)
	1.56 mins	26 (8.5%)
	Don't Know	216 (71.2%)
16. Which is the only amide anesthetic agent containing an ester group?	Lignocaine	15 (4.9%)
	Bupivacaine	22 (7.2%)
	Articaine	86 (28.3%)
	Don't know	180 (59.4%)
17. In which field, Articaine was first used clinically?	Medicine	45 (14.8%)
	Dentistry	56 (18.4%)
	Others	2 (0.6%)
	Don't Know	200 (66%)

CONCLUSION

Articaine is not used by majority of dentists in Pune district. Lack of awareness regarding newer local anesthetic agents was evident among most of the dental practioners. Dentists were not updated about Articaine which causes hindrance in adopting new technology. A deliberate effort must be made to improve the awareness regarding articaine among the dental professionals. Dental Associations should take initiative to upgrade scientific knowledge, through continous dental educational courses and Product company representatives, to encourage use of Articaine in daily dental practice. This will help dentists to adopt the new technology and also help patients to experience painless dentistry.

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CONFLICT OF INTEREST

Nil.

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