Journal of Pharmaceutical Research International

32(17): 114-125, 2020; Article no.JPRI.59747
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Awareness on Intradermal Injection among Dentists

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Authors' contributions

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

Article Information

DOI: 10.9734/JPRI/2020/v32i1730674
Editor(s):
(1) Dr. Prem K. Ramasamy, Brandeis University, USA.
(2) Dr. Dharmesh Chandra Sharma, G. R. Medical College and J. A. Hospital, India.
(3) Dr. Giuseppe Murdaca, University of Genoa, Italy.
Reviewers:
(1) Rania Elhusseiny, Ain-Shams University, Egypt.
(2) Özgür Altinbaş, Gaziantep University, Turkey.
Complete Peer review History: http://www.sdiarticle4.com/review-history/59747

Original Research Article

Received 08 June 2020
Accepted 14 August 2020
Published 25 August 2020

ABSTRACT

An intradermal injection may be given for diagnostic purposes checking for allergy, lymphogranuloma inguinale or tuberculosis and for treating diseases like vitiligo. Due to the limited blood supply of that skin layer, medication injected into the dermis is absorbed slowly. The aim of the study is to determine the level of knowledge and awareness on the use of intradermal injection in dental practice by the dentists. The study was formulated as a questionnaire-based observational study comprising 100 participants. All the subjects were requested to respond to a list of questions regarding the intradermal injections and their use in dental practice by the dentists. More than 88% of the dentists are aware of the intradermal injection and they prefer them during the clinical practice for diagnostic purposes. The intradermal injection of lidocaine reduces the pain in patients and dentists are aware of its use in dental practice.

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Keywords: Awareness; dentists; intradermal injection.

1. INTRODUCTION

Intradermal injections are administered to the outer layers of the dermis, below the upper layer of skin that is the epidermis [1]. This treatment allows the patients to stay very still; anaesthesia is also required so that patients are relaxed enough. Many intradermal injections are aqueous-based solutions that are physiologically buffered to have a neutral pH. If the solution is not buffered, necrosis of the tissue can occur at the injection site. Dose range is 50–100 µL per injection based on the site. Injections beyond this range will cause tissue necrosis due to pressure at the injection site or leakage of the compound out of site [2].

Intradermal injection provides a local systemic effect and very little. It is commonly used for skin testing of tuberculin but can also be used for allergy testing and local anesthetics [3]. A 25-gage or smaller needle is placed just below the epidermis at an angle of approximately 10° to give an intradermal injection [4]. Nonhuman primates are screened for tuberculosis using an intradermal injection. Intradermal injection avoids the barrier presented by the stratum corneum and injection site entry into the general circulation is mainly limited by the rate of blood flow [5]. Nonetheless, these sites usually only permit the administration of small amounts of drugs and tend to be primarily used for local effects, such as local anesthesia [6]. Intradermal vaccine administration was proposed as a way to improve the immunogenicity of the vaccines. Intradermal administration results in the presentation of antigen by dendritic cells in the skin which may improve the process of presenting antigen [7]. In healthy adults, intradermal vaccines allowed lower doses of antigens in the vaccine than in intramuscular vaccines with similar immunogenicity outcomes.

This study was undertaken in order to determine the level of knowledge and awareness about the usage of intradermal injections by the dentist and getting to know how aware they are about the use of intradermal injection in their practice. Previously our department has published extensive research on various aspects of prosthetic dentistry [8–18], this vast research experience has inspired us to research about awareness of intradermal injections among dentists.

2. MATERIALS AND METHODS

The present study is an online-based survey conducted among dental students. The participants were the undergraduate students of BDS and the dentists. Questionnaires were prepared and distributed among undergraduates and dentists through an online link from the google forms. The total number of participants was 100 dentists. Participation in this study was voluntary. The questionnaire contained 15 questions. Independent variables were demographics such as year of study of participants. Dependent variables were knowledge, awareness about the intradermal injection, and the use of injection in clinical practice by the dentists. Only the completed surveys were included for analysis. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. Statistics used for analysis was Descriptive statistics and comparison of variables was done using a chi-square test where $p<0.05$, statistically significant.

3. RESULTS AND DISCUSSION

The participants of the survey were the undergraduate students of BDS and the dentists. The survey results obtained by the statistical analysis is discussed here, the participation by BDS students of the first year is 10%, the second year is 8%, the third year is 21%, the fourth year is 17%, interns were 16% and the dentists in practice were 28% (Fig. 1). The awareness of intradermal injection among participants shows that 88% are aware and 12% are not aware of the injection (Fig. 2). The knowledge on the types of drugs administered by intradermal injection among the dentists shows that 83% of the participants are aware and 17% are not aware of it (Fig. 3). The preference of situations to administer intradermal injection by the participants is that 52% prefer for diagnosis purpose 33% prefer for therapeutic purpose and 15% of the participants prefer both therapeutic and diagnostic purposes (Fig. 4). The knowledge on intradermal injections purpose among the participants is that 38% are aware of tuberculin injection 14% aware of allergy sensitivity test 37% are aware that it is used in local anaesthetic and 11% are aware they are used for BCG vaccine (Fig. 5). 89% of the participants agree that intradermal injections are effective and 11% disagree (Fig. 6).77% of the participants are

aware of the complications in using intradermal injection and 23% are not aware (Fig. 7). 79% of the dentists agree that the angle of insertion for intradermal injection is approximately 10 degree (Fig. 8). 88% of the participants agree that intradermal injection is a method for administration of local anaesthesia and 12% disagree (Fig. 9). 79% of the participants agree that lidocaine is the most commonly used drug intradermally in dentistry (Fig. 10). 87% of the participants agreed that intradermal infiltration of local anesthesia would be pain-free and 13% disagreed with them (Fig. 11).

Comparison of the year of study qualification and the frequency showing the awareness of intradermal injection was done and the majority of the participants are aware of the intradermal injection. This was found to be statistically not significant where p=0.98 (Fig. 12). Comparison of the year of study qualification and the frequency showing the awareness of complications in intradermal injection was done and the majority of the participants are aware of the complications in intradermal injection. This was found to be statistically not significant where p=0.36 (Fig. 13).

Comparison of the year of study qualification and the frequency showing the knowledge on optimal usage of intradermal injection in the infiltration of local anesthetic would be pain-free among the participants was done and majority of the participants agree that intradermal injection would be pain-free. This was found to be statistically not significant where p=0.67 (Fig. 14).

Intradermal injections are injections given into the dermis just under the epidermis. The injection pathway has the longest processing period of all parenteral pathways. Some types of injections are used to assess immunity, such as tuberculosis, sensitivity test, and local anesthesia. [19] The benefit of these experiments is that the body reaction is visualizable quickly and the degree of reaction can be measured. [20] The intradermal injection of lidocaine reduces the pain in patients and dentists are aware of its use in dental practice.

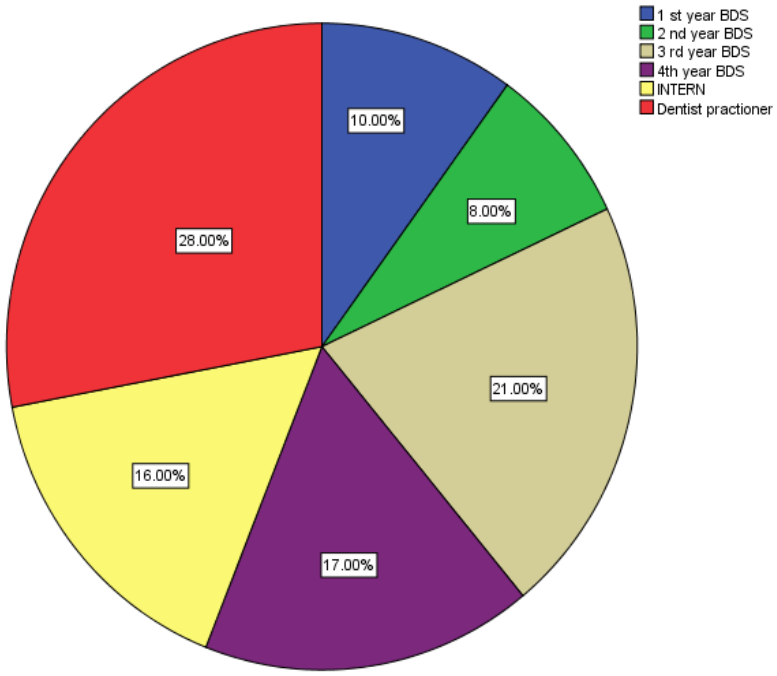

Fig. 1. The pie chart depicting the distribution of dentists participated in the survey. Blue colour indicates the first year bds students (10%),green colour indicates second years (8%),beige colour third years (21%),purple colour indicates fourth years (17%), yellow colour indicates interns and red colour indicates the dentists

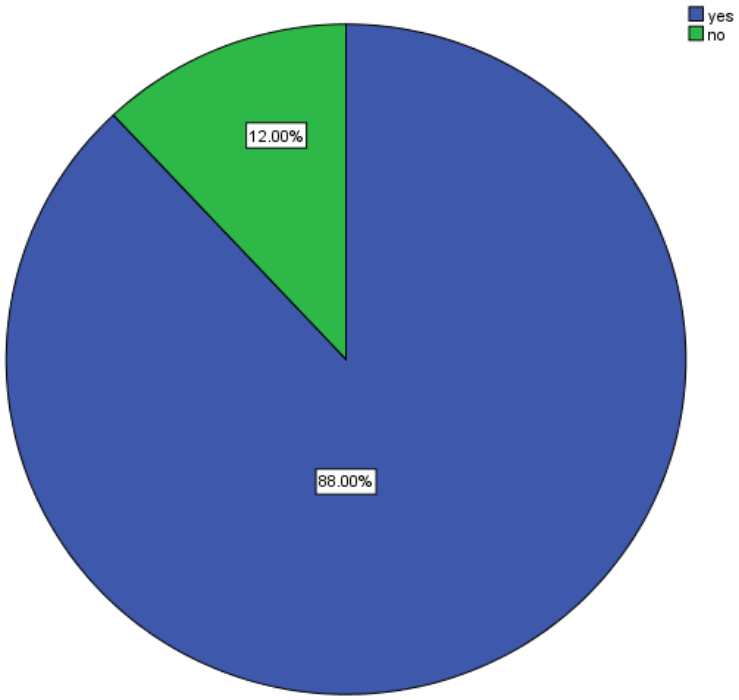

Fig. 2. The pie chart showing the percentage distribution of awareness on intradermal injection among dentists. Blue colour indicates yes (88%) and green colour indicates no (12%)

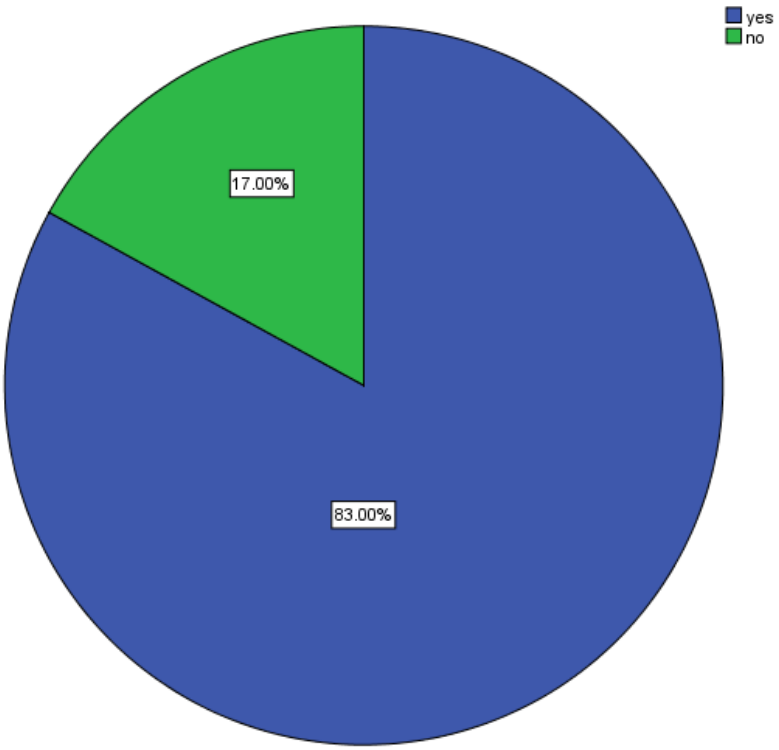

Fig. 3. The pie chart depicts the percentage distribution of knowledge on types of drugs in intradermal injection. Blue colour indicates yes (83%) and green colour indicates no (17%)

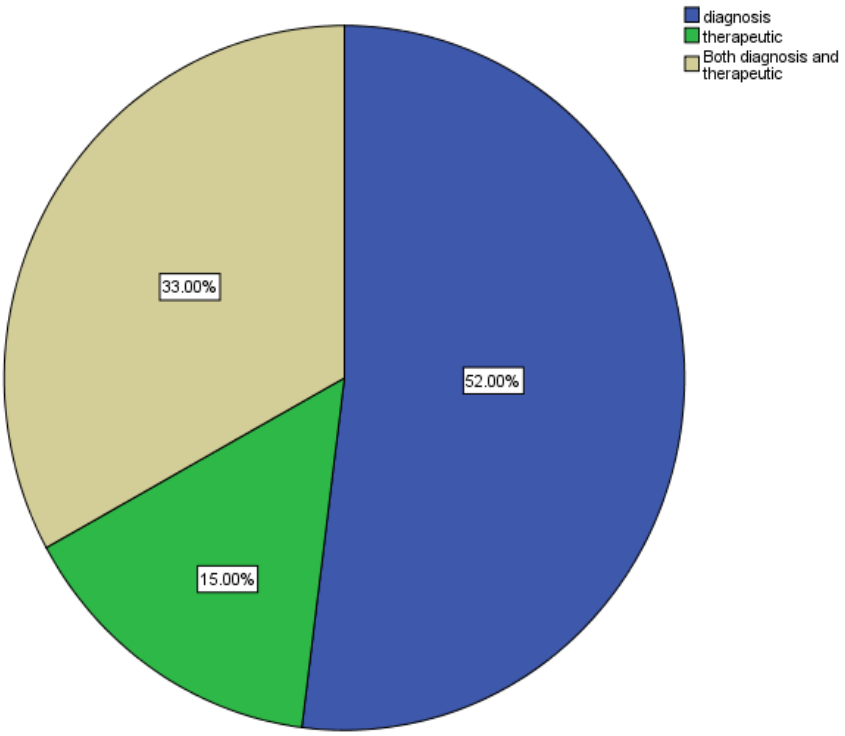

Fig. 4. The pie chart depicts the preference of situations in using intradermal injection. Blue colour indicates diagnostic purposes (52%),green colour indicates therapeutic purposes (15%) and beige colour indicates both therapeutic and diagnostic purposes

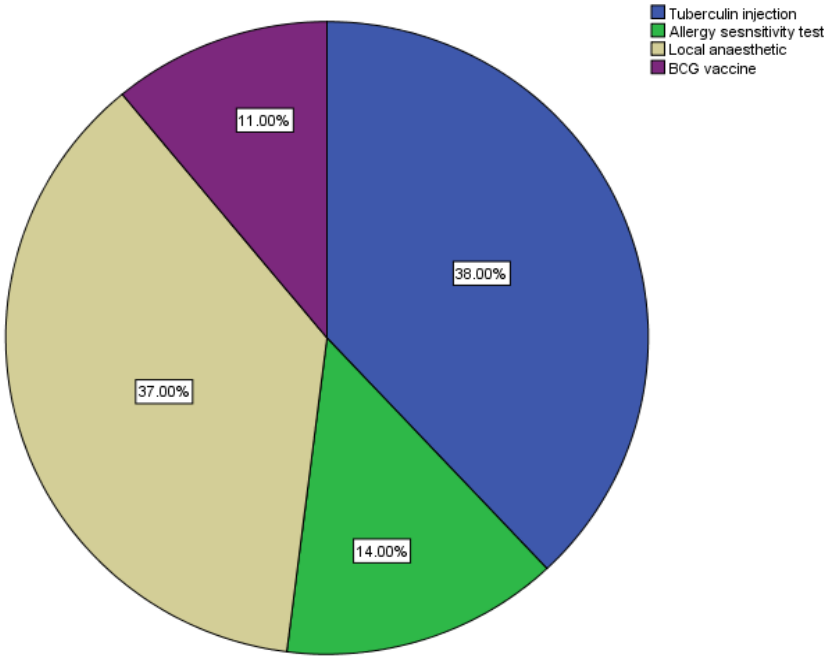

Fig. 5. The pie chart depicts the awareness of different intradermal injections. Blue colour indicates tuberculin injection (38%), green colour indicates allergy sensitivity test (14%),beige colour indicates local anaesthetic and purple colour indicates BCG vaccine (11%)

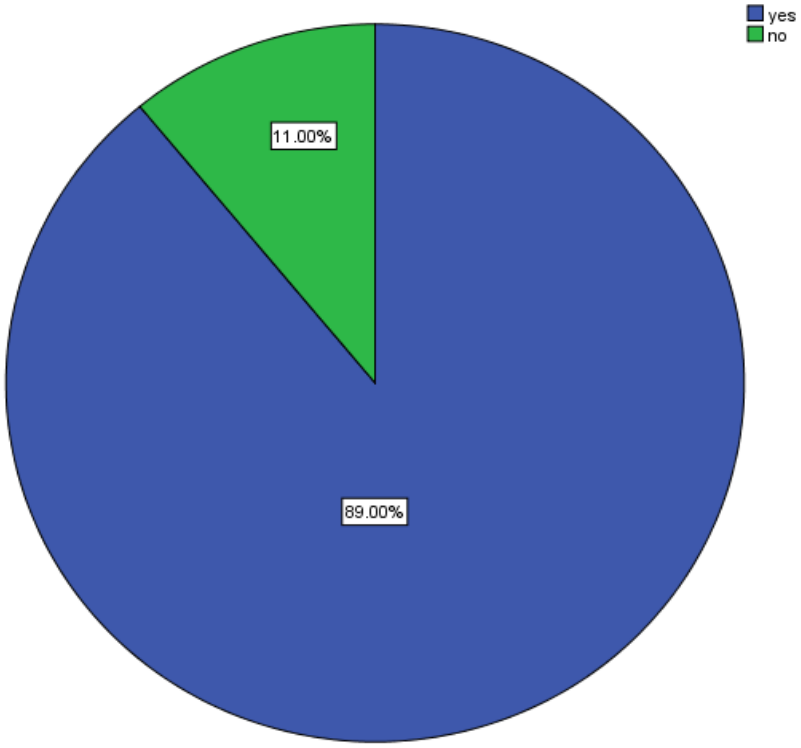

Fig. 6. The pie chart depicts the percentage distribution of awareness on effectiveness of intradermal injection. Blue colour indicates yes (89%) and green colour indicates no (11%)

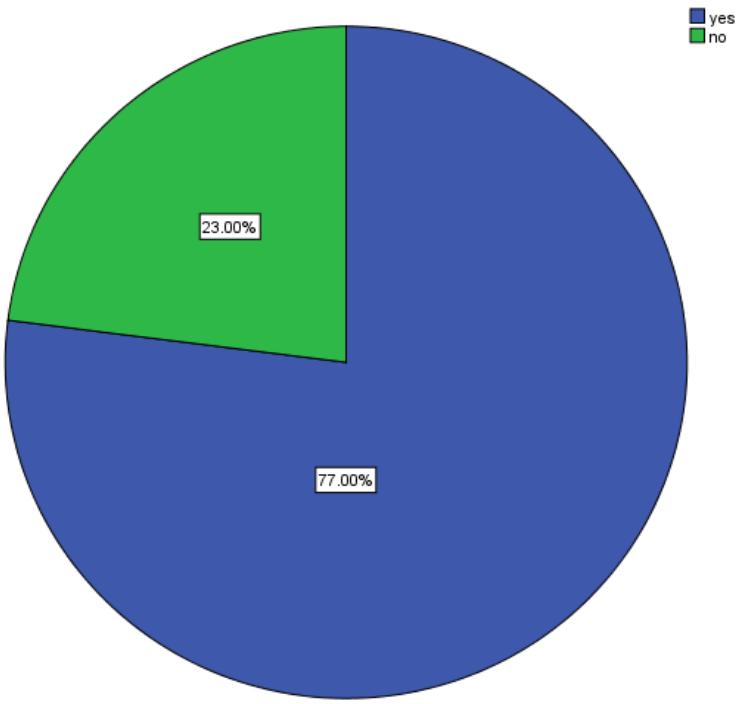

Fig. 7. The pie chart depicts the percentage distribution of awareness on complications in intradermal injection. Blue colour indicates yes (77%) and green colour indicates no (23%)

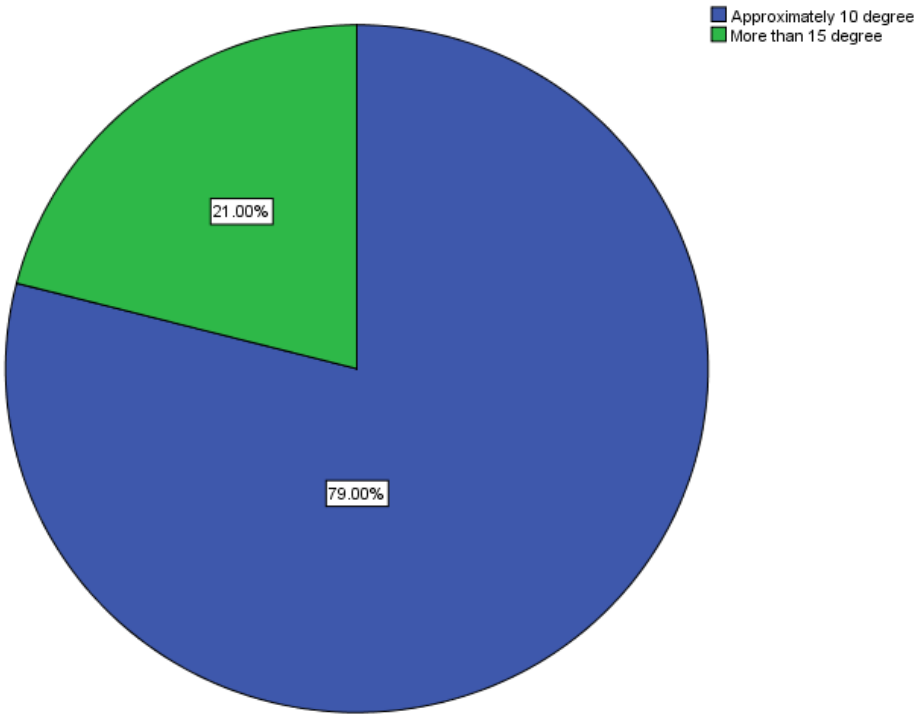

Fig. 8. The pie chart depicts the percentage distribution of knowledge in angle of insertion of intradermal injection. Blue colour indicates approximately 10 degree angle (79%) and green colour indicates more than 15 degree angle (21%)

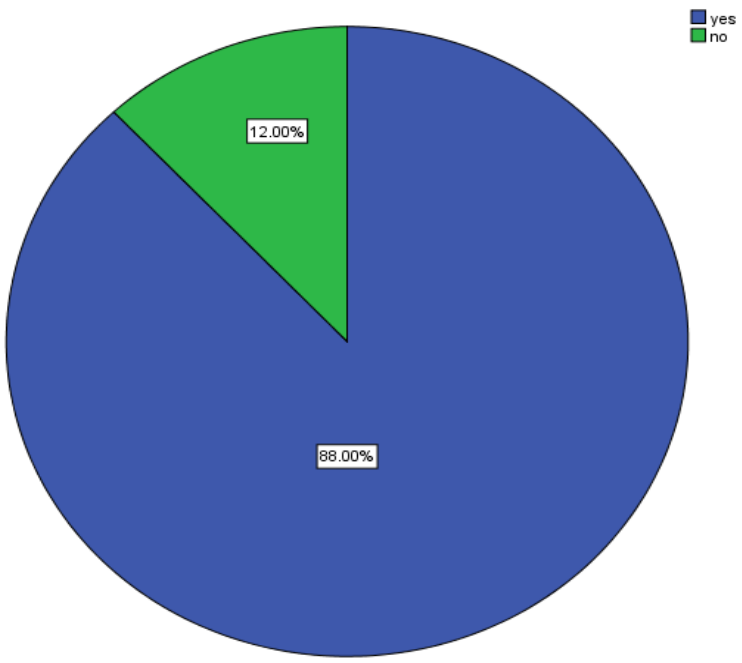

Fig. 9. The pie chart depicts the percentage distribution of awareness on use of intradermal injection for administration of local anaesthetic. Blue colour indicates yes (88%) and green colour indicates no (12%)

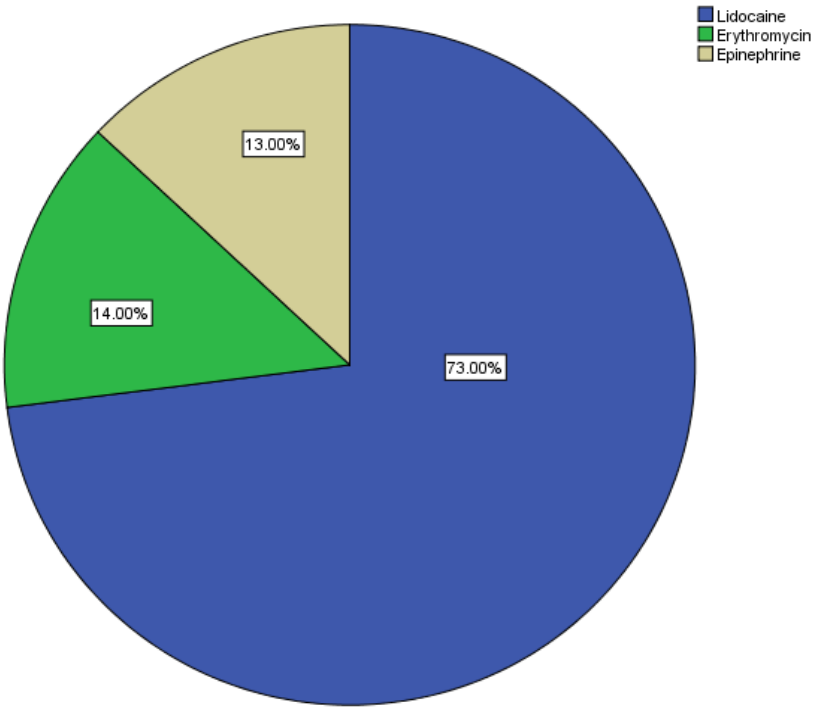

Fig. 10. The pie chart depicts the percentage distribution of knowledge on commonly used drugs intradermally in dentistry. Blue colour indicates lidocaine (73%), green colour indicates erythromycin (14%) and beige colour indicates epinephrine (13%)

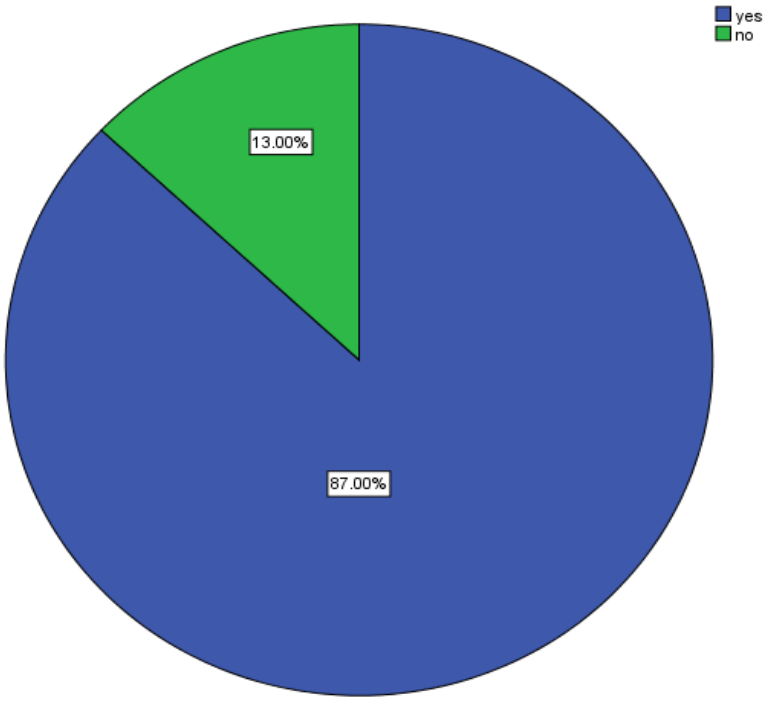

Fig. 11. The pie chart depicts the percentage distribution of awareness on use of intradermal injection prevents pain during infiltration of local anaesthetic. Blue colour indicates yes (87%) and green colour indicates no (13%)

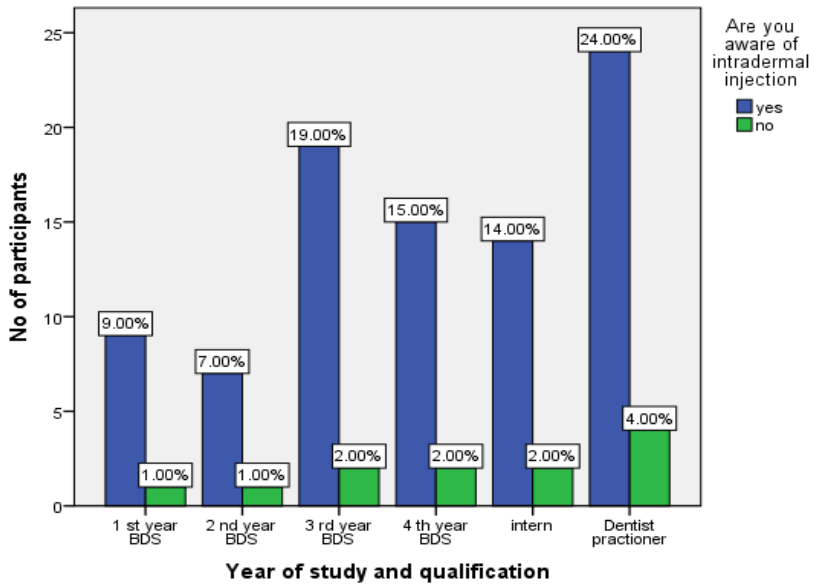

Fig. 12. The bar graph depicts the comparison of year of study , qualification of dentist and the frequency showing the awareness of intradermal injection . X axis denoted the year of study and qualification of dentist and Y axis denotes number of participants .Blue colour indicates that participants are aware of the intradermal injection and green colour indicates that participants are not aware of the intradermal injection. Majority of the participants are aware of the intradermal injection. This was found to be statistically not significant. Chi square test, p=0.98

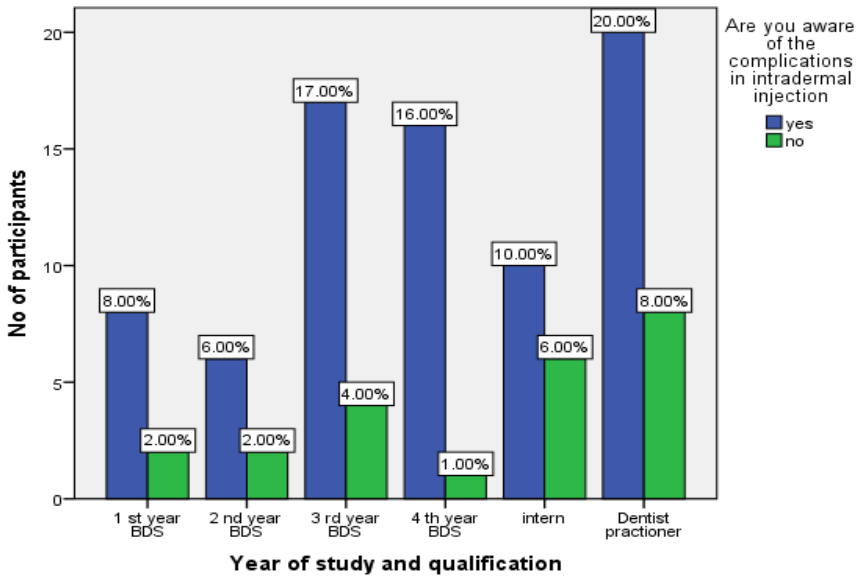

Fig. 13. The bar graph depicts the comparison of year of study , qualification of dentist and the frequency showing the awareness of complications of intradermal injection . X axis denoted the year of study and qualification of dentist and Y axis denotes number of participants .Blue colour indicates that participants are aware of the complications of intradermal injection and green colour indicates that participants are not aware of the complications of intradermal injection. Majority of the participants are aware of the complications of intradermal injection. This was found to be statistically not significant. Chi square test, p=0.36

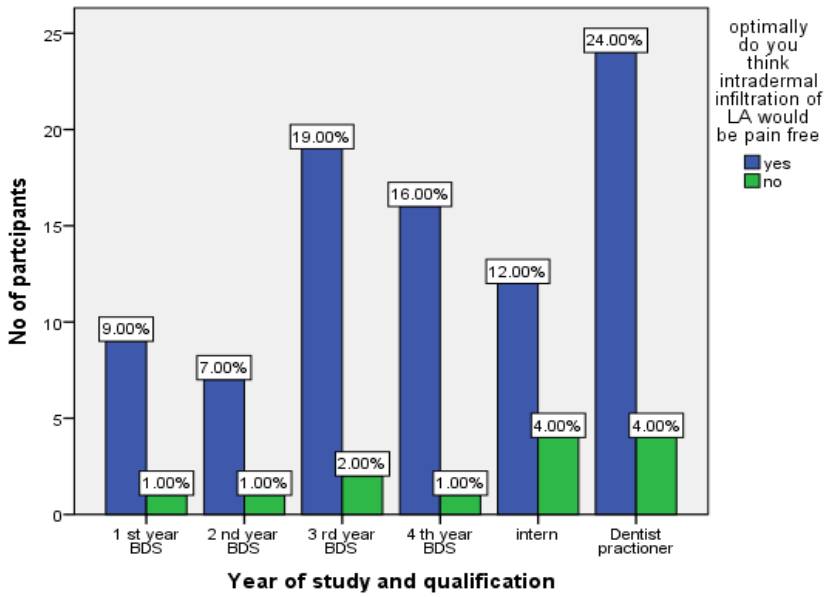

Fig. 14. The bar graph depicts the comparison of year of study , qualification of dentist and the frequency showing the knowledge on optimal usage of intradermal injection in infiltration of local anaesthetic would be pain free among the participants . X axis denoted the year of study and qualification of dentist and Y axis denotes number of participants .Blue colour indicates that participants agree that intradermal injection would be pain free and green colour indicates that the participants disagree with them.This was found to be statistically not significant. Chi square test, p=0.67

After a burn injury, the hemodynamics of a patient is changed. There is usually a fall in hematocrit. In addition to this, there is the loss of blood during the grafting procedure. Some patients cannot tolerate this loss of blood. The method used to help decrease the loss of blood during skin grafting is an injection of epinephrine intradermally before the graft and eschar are excised. The authors have found this method to be useful in a select group of patients [21] like erythromycin have been used intradermally in non irritating skin test concentrations for commonly prescribed antibiotic testing [21–23]. One-third of patients with chronic idiopathic urticaria (CIU) have circulating functional autoantibodies against the high affinity IgE receptor FcεRI, or IgE. The intradermal injection of autologous serum causes a weal and flare reaction in many patients with CIU, and this reaction forms the basis of the autologous serum skin test (ASST) [24].

Miniaturized microneedle devices are being developed for painlessly targeting vaccines to the immune cell populations in skin. As skin immunization studies are generally restricted to animal models however, where skin architecture and immunity is greatly different to human, surprisingly little is known about the local human response to intradermal (ID) vaccines. The complex molecular and cellular host responses to a candidate influenza vaccine comprising nanoparticulate virus-like-particles (VLPs), administered via conventional hypodermic injection or reduced scale microneedles was studied and positive results were observed paving a channel of vaccine administration intradermally [25].

4. CONCLUSION

This survey aims to create awareness among dentists about the use of intradermal injection in clinical practice. It also creates awareness about the complications and advantages of using intradermal injection. From the results of the survey, it is clear that most of the dentists are well aware of the use of intradermal injection in clinical practice and also proper knowledge about the complications and techniques of using intradermal injection.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

ACKNOWLEDGEMENT

The authors would like to thank the study participants for their participation and kind cooperation throughout the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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