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## Knowledge, Attitude and Awareness on Status of Administering Intramuscular Injection Among Dental Students

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HARSHINEE CHANDRASEKHAR<sup>1</sup>, DHANRAJ GANAPATHY<sup>2\*</sup>, KIRAN KUMAR PANDURANGAN<sup>3</sup>, ASHOK VELAYUDHAN<sup>4</sup>

<sup>1</sup>Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077

<sup>2</sup>Professor and H.O.D, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077.

<sup>3</sup>Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077.

<sup>4</sup>Professor and Head, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-600077

\*Corresponding Author

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**Abstract:** Intramuscular Injections are given directly to the muscles as they are rich in blood supply and medications are absorbed faster. The common sites for IM injection include Deltoid, dorsogluteal, rectus femoris, vastus lateralis and ventrogluteal. Larger amount of medication can be given through the IM route compared to other routes of administration. Medications like Atropine, Naloxone, Ketamine, Penicillin, Diazepam, Hepatitis vaccine, Rabies vaccine, Influenza vaccines are administered through intramuscular routes. It is important to know about IM injections as improper administration of medications can cause various complications. Some of the complications include Tissue necrosis, Abscess and Nerve injuries. The Aim of the study is to determine regarding the usage of intramuscular injections and to create awareness among dental students on administration of IM injections. Majority of the dental students within the study were aware of the term intramuscular injections.

**Keywords:** Intramuscular injections, Deltoid muscle, Nerve injury, Tissue necrosis.

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### INTRODUCTION

Intramuscular injection is known to be an injection route where the medication is injected into the muscle fascia. These muscles are rich in blood supply and allow medications to be absorbed faster through muscle fibers compared to subcutaneous routes(Chan *et al.*, 2006). This route is usually used for medication that requires a quick absorption rate but also a reasonably prolonged action. A larger volume of medication can be administered from this route due to their rich blood supply, for example medications like sedatives, antiemetics, hormonal therapies, analgesics, and immunizations. Moreover, muscle tissue is less sensitive than subcutaneous tissue to irritating solutions and concentrated and viscous medications(Ehreth, 2003).

An appropriate technique needed in an intramuscular injection to administer medication into the large muscles of the body(Hogarty, 1974). However, this route is not a benign procedure and unsafe injection practices can lead to significant impact on patient morbidity and mortality. Unsafe injection practice results in millions of dollars in direct medical costs on an annual basis. In addition, this route is given through a skin puncture by a syringe followed with the needle goes deep into a large muscle of the body for prophylactic or curative purposes(Boyd *et al.*, 2013).

In the medical field, injections are the most frequently used medical procedures, as it is estimated as 12 billion administered throughout the world on an annual basis. According to previous literature, 5% of these calculations or less are for immunization and rest are given for curative purposes. However in India, a survey found that about 96% of all injections given by private healthcare providers were antibiotics, vitamins and analgesics(Garris *et al.*, 2010).

Administration of an intramuscular injection is not a benign procedure but its complications are reported as muscle fibrosis and contracture, abscess at the injection site, gangrene and nerve injury. Unsafe injection practice can be the major cause for infections, particularly hepatitis B and C and HIV. Although intramuscular injections are known to have iatrogenic complications, healthcare providers are not imparted proper education(Zaybak *et al.*, 2007). Previous literature showed that techniques used by healthcare providers in administration of injections with this route were little more than a ritualistic practice, one based on tradition, which passes from one healthcare provider to another and from one generation to the next(Nisbet, 2006).

This happens inspire of the fact that there is a vast body of research extending back to the 1920s regarding injection sites, blood flow and absorption in various muscle groups, discomfort, positioning, administration techniques and complications(Burbridge, 2007). In the late 1940s, injections using intramuscular route was an exclusively method practiced by physicians. By the late 1960s, intramuscular injections were routinely administered by healthcare providers. This was the period when glass syringes were being replaced with disposable plastic syringes and needles in most of the countries(Holliday, Gupta and Vibhute, 2019).

Administering an intramuscular injection is a complex psychomotor task that requires skill and knowledge on the part of the clinician who is performing the procedure. Our goal is to maximize the therapeutic effect of the medication, eliminate or minimize the complications and discomfort from intramuscular injection. In addition to being able to physically perform the skill, the clinician needs knowledge of pharmacology, anatomy, physiology, physics and microbiology along with legal and ethical issues(Cocoman and Murray, 2008).

The first decision that must be made before any intramuscular injection is whether it is necessary and justified. According to WHO, an injection is administered only if it is necessary and it must be safe. Decision of injections route is determined based on the medication and the patient characteristics toward the injection has to be justified. Secondly, a decision has to be made for the site of injection. The selection of injection sites is very important as the medication effect can be enhanced or diminished depending on it(Walsh and Brophy, 2011). Failure in choosing the correct site of injection can lead to complications such as muscle contracture and nerve injury are site dependent. It is also because the site varies depending upon the age of the patient, and vaccines are never administered in the gluteal area even in children, as gluteal fat retards absorption and so affects the antibody titers(Coskun, Kilic and Sensure, 2016).

As a dentist they must have thought that this knowledge is not important for them as they assumed they were only involved within the oral cavity. However, it is Important to be aware of the intramuscular route of injection as they will be using it during emergencies(Kaya *et al.*, 2015). Therefore, this study was conducted to assess and determine the knowledge of administration of intramuscular injection among dental students. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

## MATERIAL AND METHODS

A convenient sample size of 100 consecutive dental students who are currently pursuing in Saveetha Dental College, Chennai participated in the study. A cross-sectional observational online based study was conducted. Questionnaire was constructed on the Survey Monkey website with dichotomous responses and multiple choice questions. The questionnaire consists of 10 questions and all the responses were analysed and recorded.

## RESULTS AND DISCUSSION

Awareness of dental students regarding the Intramuscular injections was evaluated by assessing the first set of questions, about 94% of participants were aware of the term intramuscular injection, whereas 6% of them were not aware of that term intramuscular injection[Figure 1]. As for the second question, about the common site of intramuscular injection, About 88% of the participants agreed with the statement stating that Deltoid muscle is the common site for intramuscular injection and the remaining 12% of them disagreed with this statement[Figure 2]. The third question gives the knowledge of students on vaccinations and about 88% of the participants agreed with the statement of vaccination given through intramuscular injection and the remaining 12% of them does not agree with that statement[Figure 3]. Fourth question gives awareness of students on route of Dopamine administration and about 60% of the participants answered that Dopamine is not given through IM route and the remaining 40% of them assumed that dopamine is given with intramuscular route which is wrong. Dopamine is usually given through intravenously[Figure 4]. The fifth question was asked about whether the blood transfusions are done through intramuscular route and about 35% of the participants agreed with the statement and answered true whereas the remaining 65% of them answered false. Blood transfusion usually will be done through an intraosseous route[Figure 5].

The sixth question gives the students knowledge on the statement 'Nerve injury is the complication of IM injection' and about 70% of the participants agreed with the statement stating that nerve injury is a complication of intramuscular injection and the remaining 30% of them were not aware of that statement. They assumed that nerve injury is not a complication of the intramuscular route of injection[Figure 6]. According to the seventh question, about whether muscular hematoma is a complication of intramuscular injection, about 74% of the participants answered true, remaining 26% answered false[Figure 7]. The eight questions, knowledge of students

on Cephalothin sodium, the cause of local complication in intramuscular injection, 69% of the participants chose the option true and 31% of them chose false [Figure 8]. According to the ninth question about Tissue necrosis, about 76% of the participants agreed with the statement of tissue necrosis is a complication of intramuscular injection 24% of them disagreed with this [Figure 9]. According to the final question, about the knowledge of students on Nicolau syndrome, 64% of participants agreed that Nicolau syndrome is associated with IM Injections and 36% of them disagreed with it [Figure 10].

In the study done by Kruszewski et al., (Kruszewski, Lang and Johnson, 1979) it was found that about 69.5% of the participants had not received any form of training on injection safety. The finding of this study is correlated with studies conducted in Ethiopia and Bangladesh which showed the percentage of participants had training on injection routes which are 66.9% and 73%, respectively.

Many previous literature revealed that the less attention provided in training in developing countries was associated with improper route of administration of medication on patients. Knowledge about vaccination against Hepatitis B which was given intramuscularly among the healthcare workers (79%) a study conducted by Warren et al., (Warren, 2002) was slightly lower than current study (88%). Next, a study by Marshall et al., (Marshall et al., 2013) showed that their students were not aware that deltoid muscles are one of the common sites for intramuscular injections whereas in current study most of the participants are aware of the statement.

A study conducted by Cocoman et al., (Cocoman and Murray, 2010) revealed that only 31.8% of nurses were aware that nerve injuries are one of the complications that arise from inappropriate handling during intramuscular injections. When compared to current study, about 88% of participants were aware about the complication. A self reported questionnaire based study by Yilmaz et al., (Yilmaz, Khorshid and Dedeoğlu, 2016) showed almost all the participants (96.8%) were aware of intramuscular injection practice which is similar to current study, about 96% of participants were aware of it.

A study by Palma et al., (Palma and Strohfus, 2013) indicated that about 92.7% of participants were aware of the injection route of blood transfusions which is intraosseous route. In the current study, only 65% of participants are aware of it, whereas the remaining 35% of them assumed it is an intramuscular route. which is slightly higher when compared with the study conducted currently, which was 88%. The overall study showed that almost all the participants were aware of intramuscular injection routes. Some of them were lacking knowledge regarding this topic as they need to attend a short course regarding route injections. Our institution is passionate about high quality evidence based research and has excelled in various fields ( (Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Chandrasekar et al., 2020; Mathew et al., 2020; R et al., 2020; Samuel, 2021)

## CONCLUSION

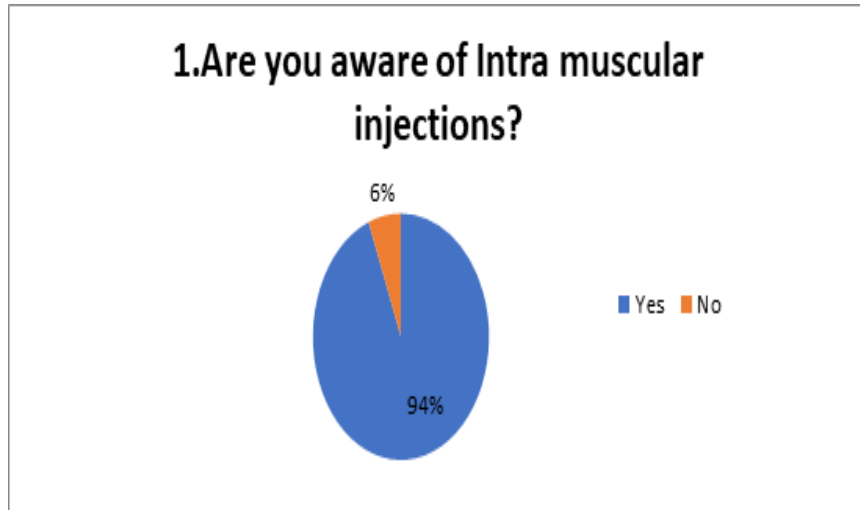
Majority of the dental students within the study were aware of the term intramuscular injections. However, this study was limited to one particular institute which is Saveetha Dental College, Chennai and only 100 participants. Further, study should be conducted in a larger scale area and sample size to get a proper overview regarding this topic within the general practitioner concerning the new advent technologies.

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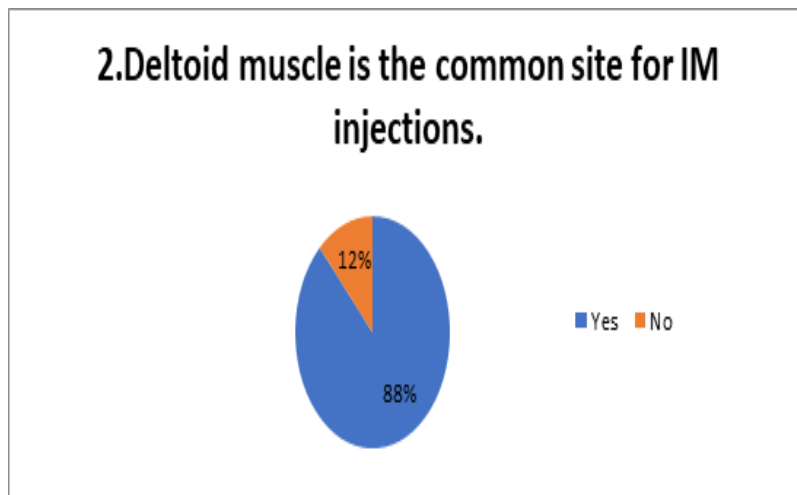
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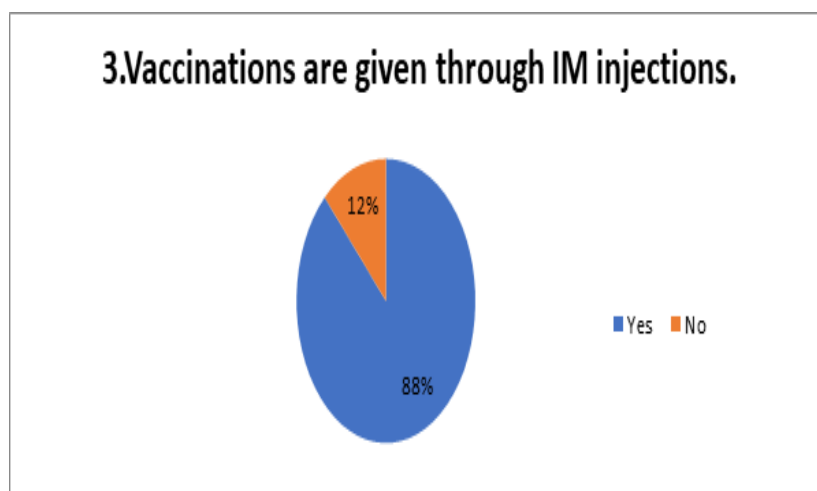
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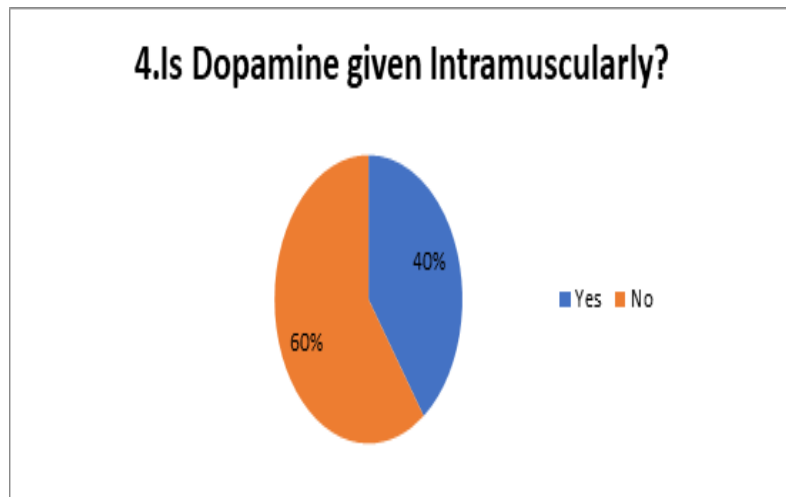
**Fig.1:** Pie chart representing the knowledge of students on awareness of IM injections, 94% students are aware of IM injection and 6% are not aware.



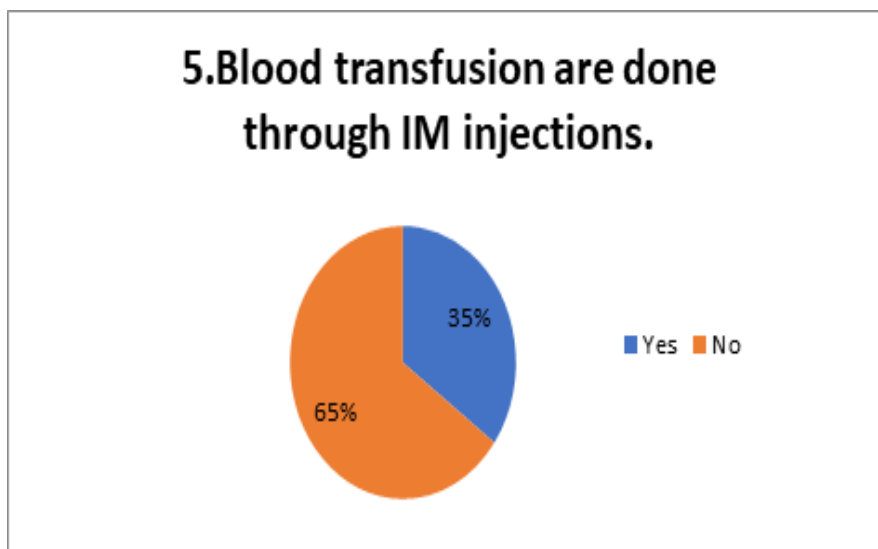
**Fig.2:** Pie chart representing the knowledge of students on deltoid muscle as a common site of IM injection, 88% students answered Deltoid muscle as a common site of injection and 12% answered 'No'



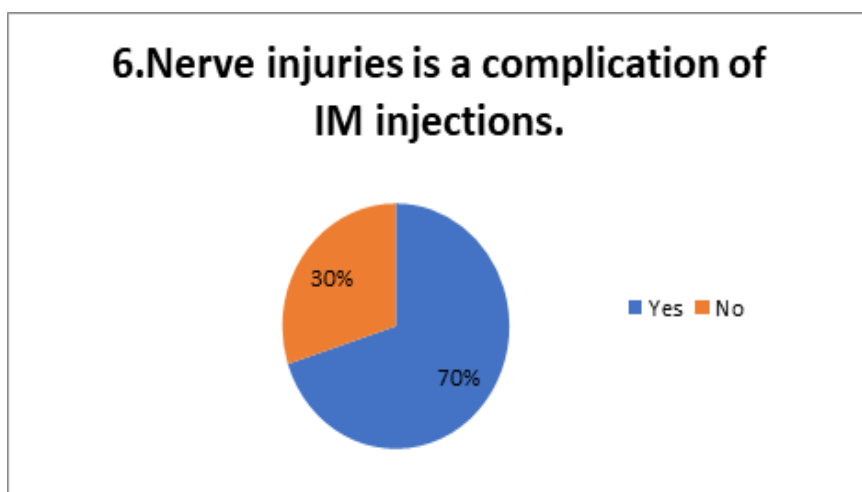
**Fig.3:** Pie chart representing the knowledge of students on awareness of route of vaccinations, 88% answered that vaccinations are done through IM route and remaining 12% answered vaccines are not given through IM



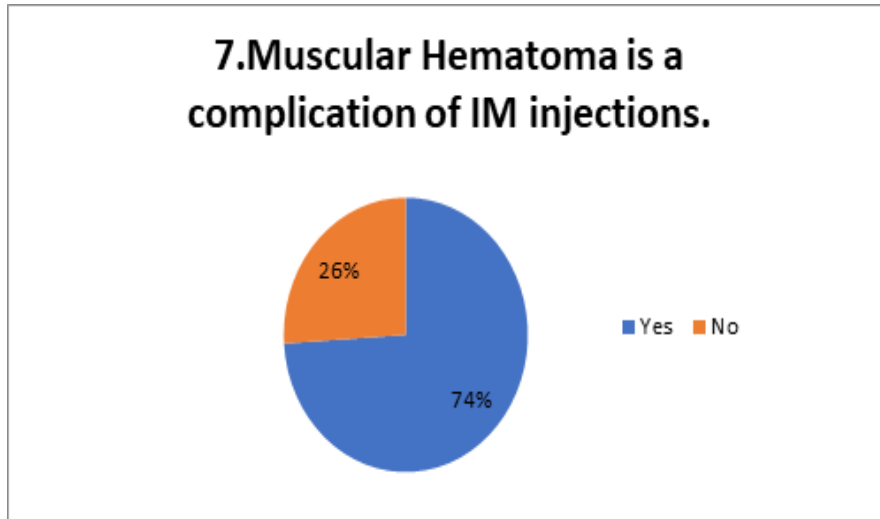
**Fig.4:** Pie chart representing the knowledge of students on awareness of route of Dopamine, 40% answered that dopamine is given through IM route and 60% answered that dopamine is not given through IM



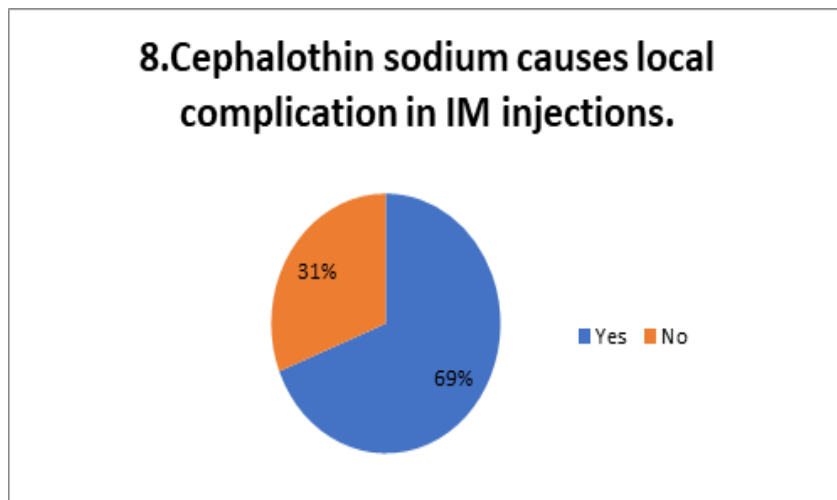
**Fig.5:** Pie chart representing the knowledge of students on awareness of route of blood transfusion, 35% answered that blood transfusion are done through IM route and 65% answered that blood transfusion are not done through IM



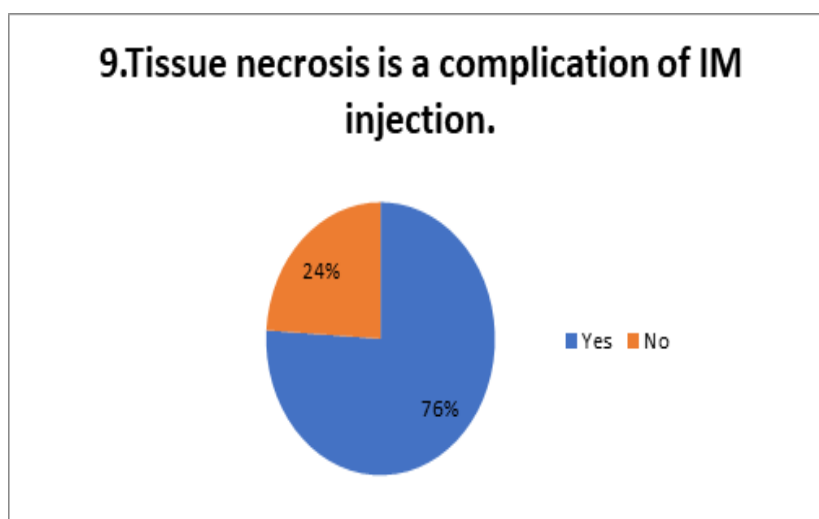
**Fig.6:** Pie chart representing the knowledge of students on Nerve injuries as the complication of IM injection, 70% answered 'Yes' and 30% answered 'No'



**Fig.7:** Pie chart representing the knowledge of students on Muscular hematoma as the complication of IM injection, 74% answered 'Yes' and 26% answered 'No'

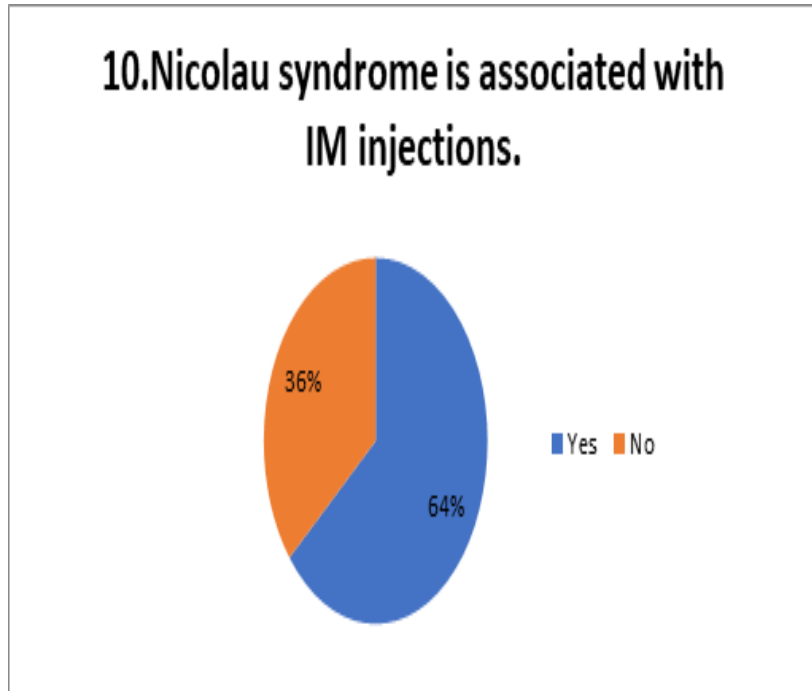


**Fig.8:** Pie chart representing the knowledge of students on Cephalothin sodium, 69% of students aware that cephalothin sodium causes the local complication of IM injections and 31% of students are unaware.



**Fig.9:** Pie chart representing the knowledge of students on Tissue necrosis as the complication of IM injection, 76% answered 'Yes' and 24% answered 'No'





**Fig.10: Pie chart representing the knowledge of students on association of Nicolau syndrome with IM injections, 64% of students answered that Nicolau syndrome is associated with IM injection and 36% answered it is not associated.**