

KNOWLEDGE AND AWARENESS OF DENTAL STUDENTS IN MANAGING HYPERGLYCEMIC PATIENTS INDICATED FOR EXTRACTION

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ABSTRACT

Hyperglycemia is a condition in which there is an increase in the blood glucose level of the person. It is one of the most common systemic conditions in middle aged Indians. It is important for a dentist and dental students to be aware of the condition especially while performing invasive procedures as delayed wound healing, coma and hypoglycemic shock are some of the most common complications encountered in some patients. Hence, it is important to know about this condition to prevent any kind of medical emergency on a dental chair. The aim of the study was to assess the knowledge and attitude of dental students while managing hyperglycemic patients indicated for extraction. This study was carried out in a self administered questionnaire format among the students of a dental university. The questionnaire was created on an online platform called "Survey Planet" and was filled by 100 students. The questionnaire consisted of the major aspects of knowledge on hyperglycemia and how students will manage the patient before performing the extraction procedure on them. Based on the tabulated results, it was seen that dental students have greater knowledge towards dealing with hyperglycemic patients indicated for extraction. 64% said that they can perform extraction on a hyperglycemic patient. 93% said that they would test an elderly patient to check their blood glucose level before the procedure. 72% were aware of the management of hyperglycemia. 45% of the participants said that they would do the treatment only after the patient consulted a physician. 11% said that they would deny the treatment. 82% of the participants said that they would keep the appointment for the extraction in the morning. Thus we can conclude that dental students have good knowledge and attitude toward managing hyperglycemic patients indicated for extraction.

Keywords: Extraction, glucose, hyperglycemia, healing, physician

INTRODUCTION

Hyperglycemia is a condition characterised by increase in the serum glucose level. This condition occurs due to many factors including carbohydrates rich diet, hormone insufficiency and tissue dysfunction. Its

persistence and aggregation leads to diabetes mellitus which is one of the major health concerns in India. (Yesudian *et al.*, 2014) It is a complex disease which is of multifactorial origin.

Biomedical discourse and research on Indian diabetes focuses on the individual level- factors like diet and exercise. (Little *et al.*, 2017) Its effect on the human body like delayed wound healing and increased risk of wound infection makes it an important systemic condition for dentists to be concerned about patients. Similarly, saliva is an important secretion of the oral cavity as it has many important biomarkers(Maheswari *et al.*, 2018) and its health also dictates the oral cavity's health, connecting it to the health of the body. Extraction is one of the most common dental procedures performed in India. (Kumar and Lavanya, 2016) So, it is imperative to evaluate the patient before the procedure is done. Similarly, patients who have renal diseases, thyroid diseases or any other organ diseases should be treated first for their medical condition, before an extraction is done on them. Neuropathic pain is also associated with some of these conditions(Subha and Arvind, 2019). Some bone pathologies make it easier to extract teeth, e.g. osteoradionecrosis, idiopathic root resorption. (Choudhury *et al.*, 2015; Muthukrishnan, Kumar and Ramalingam, 2016)

There are a lot of studies which indicate blood glucose levels to be an important factor when post operative healing of any wound is considered. The fact that in a person with a high blood glucose level, an open wound acts as a good substitute for the growth of microbes which leads to the open wound being prone for infections.(Zerr *et al.*, 1997) Hence, dental students should be aware and have proper knowledge on how to manage these patients before performing any surgical procedures on them. Since hyperglycemia can cause complications during an invasive dental procedure, dentists need to be aware of the conditions to handle any medical emergencies the patient might come across on the dental chair. Hence, this study aims to assess the knowledge and attitude of dental students while managing hyperglycemic patients indicated for extraction.

MATERIALS AND METHODS Study design and setting

A descriptive cross sectional study was conducted at a university dental hospital in Chennai among 100 students via simple random sampling. The participants consisted of third year undergraduates, fourth year undergraduates, interns and post graduates as these students are posted in the clinics where they come across patients as seen in Figure 1. The questionnaire was pre-tested on dental students.

Data Collection

An online platform known as “Survey Planet” (www.surveypplanet.com) was used. The questionnaire was uploaded on this site and the link to the survey was sent to these 100 students. Table 1 shows the questionnaire. Data was verified by an external viewer.

Statistical Analysis

Data was recorded in 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). The results were analysed using Chi-Square test in SPSS and the responses were tabulated in the form of pie charts.

RESULTS AND DISCUSSION

Based on the tabulated results, it was seen that the level of knowledge of dental students managing hyperglycemic patients is high. 94% considered hyperglycemia to be a relevant condition in dentistry[Figure 2][Figure 17]. 54% consider the normal blood glucose level to be between 80 and 120 mg/dl[Figure 3]. 51% considered a person to be hyperglycemic when the blood glucose level was above 120mg/dl[Figure 4]. 88%

believed that hyperglycemia was also found in younger patients and that it was not restricted to older people[Figure 5]. 64% said that they could perform an extraction in a hyperglycemic patients[Figure 6]($p>0.05$)[Figure 18] and when asked for a reason, 20.8% said that the post operative complications can be managed easily, while 25% said that the extraction can be performed if the RBC values are not too extreme[Figure 7]($p>0.05$)[Figure 19]. 93% said that they would test the blood glucose levels of any elder patients they encounter, irrelevant of history before they perform an extraction[Figure 8]. 90% would do the extraction if the results came out to be normal[Figure 9]. 72% were aware of the management of hyperglycemia[Figure 10]. 43% said that the complications of performing an extraction on a hyperglycemic patient was a combination of delayed wound healing, hypoglycemia and coma. 21% said the complications seen are only hypoglycemia[Figure 11]($p>0.05$)[Figure 20]. 45% said that they would perform an extraction of a hypoglycemic patient only after an opinion is taken from a general physician. 27% said they would continue with the treatment without any reference as seen in (Figure 14). 34% said that it was safer to consult a physician.[Figure 15] 11% said they would deny the treatment until the blood glucose level is in control($p>0.05$).44% said that they would take a physician's opinion before doing any treatment on a hyperglycemic patient[Figure 12]. 37% said that they would refer the physician even before doing a non invasive procedure on a hyperglycemic patient[Figure 13]. 82% said they give a morning appointment to the hyperglycemic patient indicated for an extraction.[Figure 16]

It is common that dentists have to treat patients with systemic illnesses. (Chinnaswami *et al.*,

2017) Majority of patients with systemic conditions cannot undergo invasive dental treatments. Based on this survey, 64% said that an extraction can be performed in a hyperglycemic patient. A study done by Thirunavakarasu et al showed 75% of the population agreeing with the possibility of performing an extraction in a hyperglycemic patient. (Thirunavakarasu and Prabu, 2018) It has been stated that use of insulin insufficiency protocol will lower blood glucose levels in the first 24 hours. (Inzucchi, 2006) Another study shows the treatment of hypoglycemia by standard therapy of sliding scale regular insulin (SSRI) or long acting insulin glargine

administered once daily to be effective. (Gosmanov and Umpierrez, 2013)

In this survey, 25% said that they will perform the extraction if the RBS value is not extreme. 28% said that the complications of doing an extraction are not severe and are therefore manageable. And 10% said that extraction with proper care can be done. This shows a high knowledge among dental students in managing hyperglycemic patients. 18% said that delayed wound healing would occur, but a study by Huang et al suggested there to be no difference in

post extraction healing between diabetic and non diabetic patients. (Huang *et al.* , 2013)

This subject is very debated as healing of a wound depends upon many factors and is subjective. (Guo and DiPietro, 2010) Healing of a wound also depends on other factors too, especially on consumption of tobacco products. Smokeless tobacco is also a major factor(Muthukrishnan and Warnakulasuriya, 2018). They are also a major predisposing factor for oral cancer, Squamous cell being the most common one(Misra *et al.*, 2015) and have adverse effects on the overall oral health(Steele *et al.*, 2015), (Subashri and Maheshwari, 2016; Venugopal and Maheshwari, 2016) Premalignant lesions also turn malignant due to tobacco (Muthukrishnan and Kumar, 2017) Another lesion which shows delayed wound healing due to this is MMP(Dharman and Muthukrishnan, 2016) Though there have been studies showing the difference in wound healing in normal patients and patients with systemic conditions, there are no studies which show any relation between the post operative healing and hyperglycemia. Vitamin C is shown to be a rich antioxidant(

Chakraborty *et al.*, 2014) and shows great healing properties(Chaitanya *et al.*, 2018). In oral mucositis, vitamin C along with vitamin E can be used for its prevention (Chaitanya *et al.*, 2017). This may be imperative for healing of sockets of third molars post extraction.(Rohini and Kumar, 2017) In this survey, 11% said that they would deny the treatment for a hypertensive patient. This may be due to that fact that the students may face anxiety while treating such patients as they lack enough experience. A study showed that dental students face greater anxiety when they have just begun to treat patients. (Kirova, 2011) This may justify the number of people shying away from treatment.

When asked about doing a non invasive procedure on a hyperglycemic patient. 37% said that they would take a physician's opinion and 37% said that they would do the treatment without any opinion from a physician. Finally, 45% said that they would do an extraction on a hyperglycemic patient only after a physician's advice and 17% said that they would ask the patient to stop the intake of the drugs for hyperglycemia. When asked for a reason, they said it was to prevent a hypoglycemic shock. Some studies suggest giving an early morning appointment and asking the patients to stop taking hypoglycemic drugs one day before the extraction to prevent a hypoglycemic attack on the chair due to blood loss. (Martí Álamo, Jiménez Soriano and Sarrión Pérez, 2011) This is especially true if the tooth in question is a mandibular molar with three roots which might cause more trauma. (Patil *et al.*, 2018)

It was noted that although dental students showed a high level of knowledge in terms of hyperglycemia and its relation to dentistry, few of them showed reluctance choosing to perform an extraction in a hyperglycemic patient[Figure 18]. Fortunately, this was seen only in undergraduate third years as interns and post graduates were more confident with their approach towards such patients. This can be due to a lack of experience in the earlier years of dealing with patients which slowly subsides with more clinical exposure. This is compounded by the fact that the maximum responses given by the undergraduate IIIrd year students to the reason for their reluctance was the fear of delayed wound healing/excessive bleeding during the extraction[Figure 19].

Managing hyperglycemic patients is an important skill for a dentist to have as the number of diabetic patients are on a rise. Some things to consider when managing such patients are to give early morning appointments, checking blood glucose level prior to the procedure, treatments under local anesthesia should be arranged at least with meal times. (Little *et al.*, 2017) It is imperative for dental students to know about the conditions as it makes the patient care smoother.

CONCLUSION

From the results of the present study, it can be concluded that dental students have good knowledge and attitude towards managing hyperglycemic patients indicated for an extraction. Undergraduate third years showed a little reluctance in the idea of doing an extraction on a hyperglycemic patient, but there was increased confidence level among the students in the higher academic years. Hyperglycemia is a relative condition in dentistry and students should be aware of it to treat those patients without any complications.

AUTHOR CONTRIBUTIONS

All the authors have equally contributed towards the research.

CONFLICT OF INTEREST

None

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Table 1: Table representing the Questionnaire distributed in the study

- Name
- Year of study
- Is hyperglycemia a relevant condition in dentistry?
 - Yes
 - No

- The normal random blood glucose level is
 - 80-120 mg/dl
 - 120-140 mg/dl
 - 60-100 mg/dl
 - Above 140 mg/dl
- When is a person considered hyperglycemic?
 - When RBS is above 200 mg/dl
 - When RBS is above 80 mg/dl
 - When RBS is 100 mg/dl
 - When RBS is above 120 mg/dl
- Do you find hyperglycemia only in older patients or can you find it even in younger patients?
 - Yes
 - No
- Can you perform extraction in a hyperglycemic patient?
 - Yes
 - No
- What is the reason for your answer?
 - (Answer)
- Is it necessary to check the blood glucose level of any elder patient indicated for extraction?
 - Yes
 - No
- If the blood glucose level after the test came to be normal, will you perform the extraction?
 - Yes
 - No
- Are you aware of the management of hyperglycemia?
 - Yes
 - No
- What are the complications which can occur in a hyperglycemic patient during or after dental extraction?
 - Delayed wound healing
 - Hypoglycemia
 - Coma
 - All of the above
- For hyperglycemic patients, whose opinion do you seek before carrying out the dental procedure?
 - Primary physician of the patient
 - Colleagues
 - Any medical practitioner
 - None (I will perform the procedure without prior consultation)
- What would you do if a non-invasive dental procedure is required for patients with hyperglycemia?
 - Deny treatment

- Take an opinion from the patient's general physician
- Ask the patient to stop the consumption of drugs before the treatment
- Continue with the treatment without stopping the drug
- If an extraction is indicated for your patient who is hyperglycemic, what will you do?
- Deny the treatment
- Take an opinion from the patient's general physician
- Ask the patient to stop the consumption of drugs before the treatment
- Continue with the treatment without stopping the drug
- Explain your answer for the previous question
- (Answer)
- If you are going through with the treatment, when will you give the patient an appointment?
- Morning
- Afternoon
- Evening

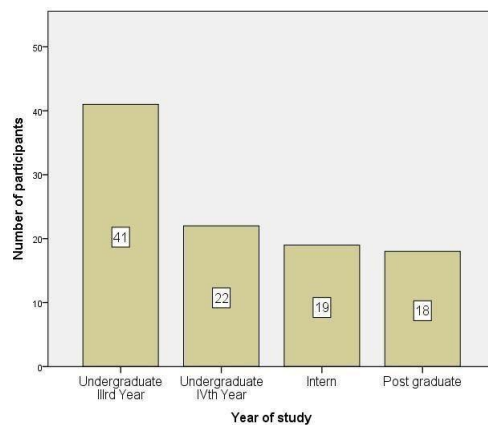


Figure 1: Bar graph representing the different years of studies in the population which filled the questionnaire. 41% of the respondents were IIIrd year undergraduate students, 22% of the respondents were IVth undergraduate students, 19% were interns and 18% were post graduates.

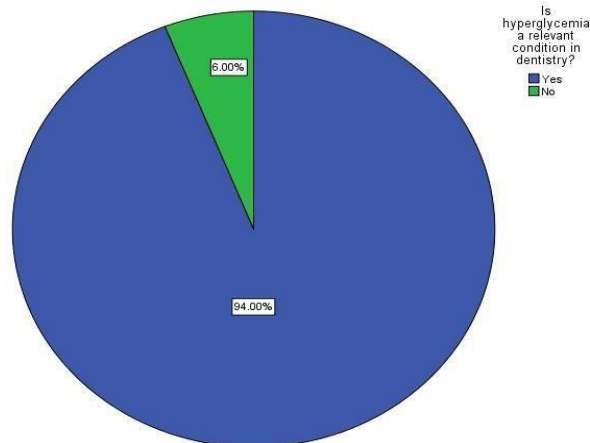


Figure 2: Pie chart representing the responses to the question: Is hyperglycemia a relevant condition in dentistry? Blue represents people who think hyperglycemia is a relevant condition in dentistry and green represents people who think that hyperglycemia is not a relevant condition in dentistry. 94% of the respondents said that hyperglycemia is a relevant condition in dentistry. Remaining 6% said that hyperglycemia is not a relevant condition dentistry

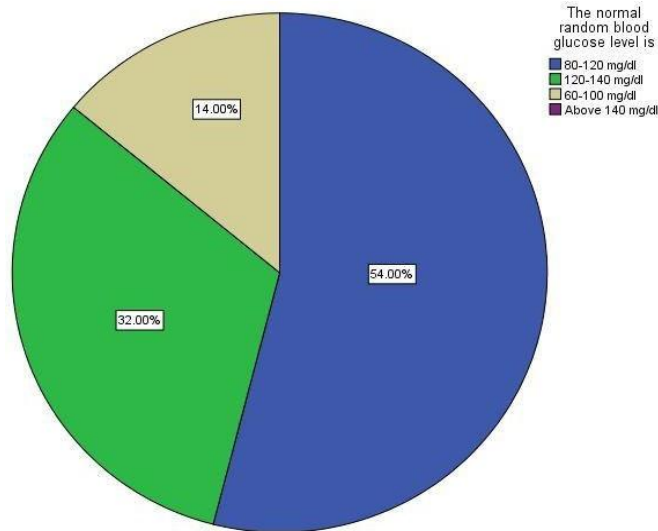


Figure 3: Pie chart representing the responses to the question: The normal random blood glucose level is. Blue represents people who think the normal random blood glucose is 80-120 mg/dl, green represents people who think it is 120-140 mg/dl, beige represents people who think it is 60-100 mg/dl and purple represents people who think it is above 140 mg/dl. 54% of the respondents said that the normal random blood glucose level is 80-120 mg/dl, while 32% said it was 120-140 mg/dl. Only 14% said that it was 60-100 mg/dl.

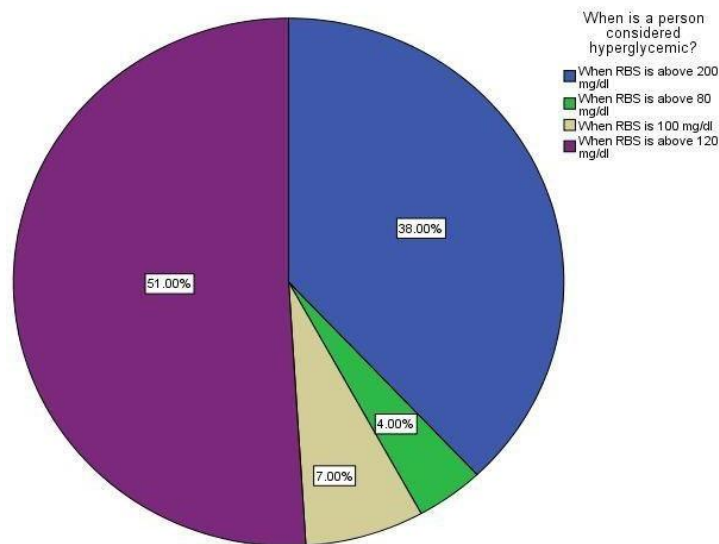


Figure 4: Pie chart representing the responses to the question: “When is a person considered hyperglycemic?” Blue represents people who consider a person to be hyperglycemic when RBS is above 200 mg/dl, green represents people who think it is above 80 mg/dl, beige represents people who think it is 100 mg/dl and purple represents people who think it is above 120 mg/dl. 51% responded by saying that a person

is considered hyperglycemic when their RBS value is above 120 mg/dl, 38% said when it is above 200 mg/dl, 7% said when it was above 100 mg/dl and 4% said when it was above 80 mg/dl.

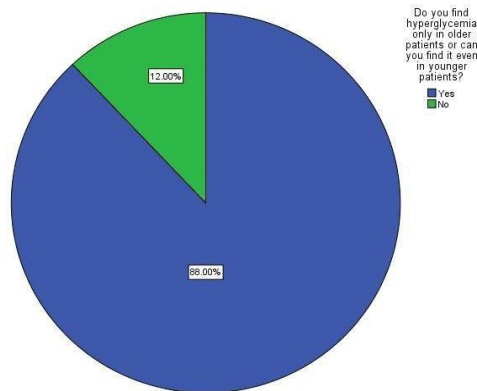


Figure 5: Pie chart representing the responses to the question: “Do you find hyperglycemia only in older patients or can you find it even in younger patients?” Blue represents people who agree that hyperglycemia is found in younger patients too and green represents people who think otherwise. 88% believed that hyperglycemia can be found in younger patients too. 12% believed otherwise.

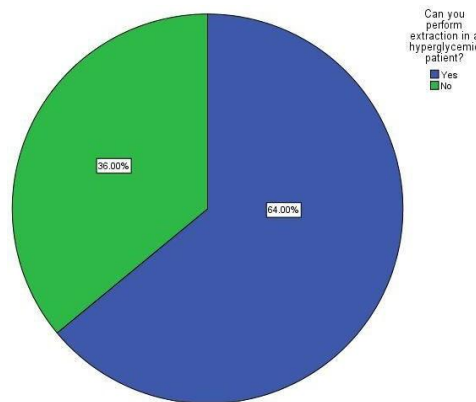


Figure 6: Pie chart representing the responses to the question: “Can you perform extraction in an hyperglycemic patient?” Blue represents people who think an extraction can be performed in a hyperglycemic patient and green represents people who think that an extraction cannot be performed in a hyperglycemic patient. Chi-square test was done to assess significance. p value was found to be $p=0.249$, which is not statistically significant . 64% believed that they could perform an extraction in a hyperglycemic patient while the remaining 36% disagreed with it.

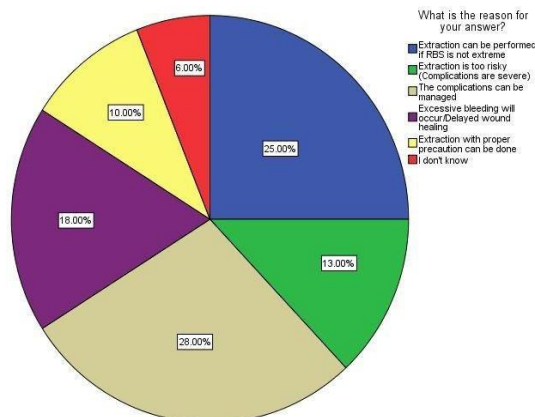


Figure 7: Pie chart representing the responses when asked for the reasoning of their answer for question: “Can you perform extraction in an hyperglycemic patient?” Blue represents people who think that extraction

can be performed if RBS is not extreme, green represents people who think that extraction is too risky, beige represents people who think that the complications can be managed, purple represents people who think excessive bleeding/delayed wound healing will occur during the extraction, yellow represents people who think extraction can be done with proper care and red represents people who did not have a reason for their answer. 28% said that the complications could be managed, 25% said that the extraction can be performed if RBS is not extreme, 18% said that excessive bleeding will complicate the procedure, 10% said that extraction, taking proper precautions can be done and The remaining 6% did not have a reason for their answer.

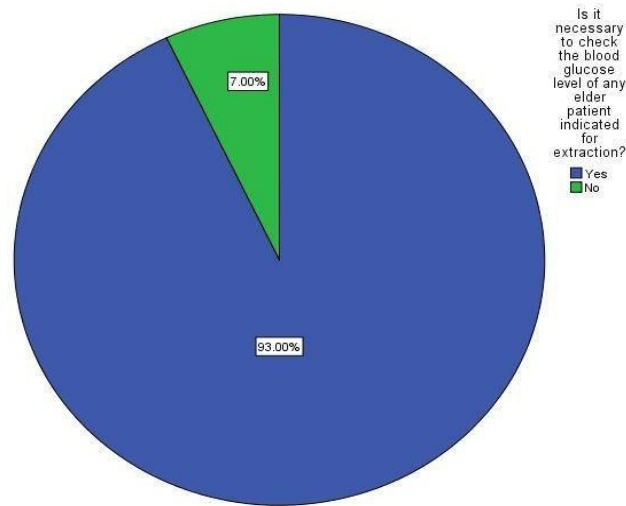


Figure 8: Pie chart representing the responses to the question: “Is it necessary to check the blood glucose level of any elder patient indicated for extraction?” Blue represents people who say that it is necessary to check the blood glucose level of any elder patient indicated for extraction and green represents people who say otherwise. 93% of participants responded by saying that it is necessary to check the blood glucose level of any elderly patient indicated for extraction. 7% did not find it necessary.

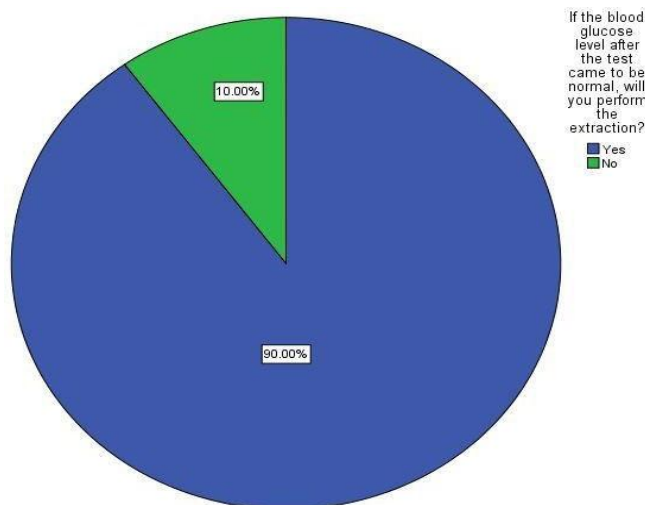


Figure 9: Pie chart representing the responses to the question: “If the blood glucose level after the test came to be normal, will you perform the extraction?” Blue represents people who would do the extraction if the test came normal and green represents people who would still not do the extraction. 90% of the participants said that they would do the extraction, 10 % said that they wouldn't.

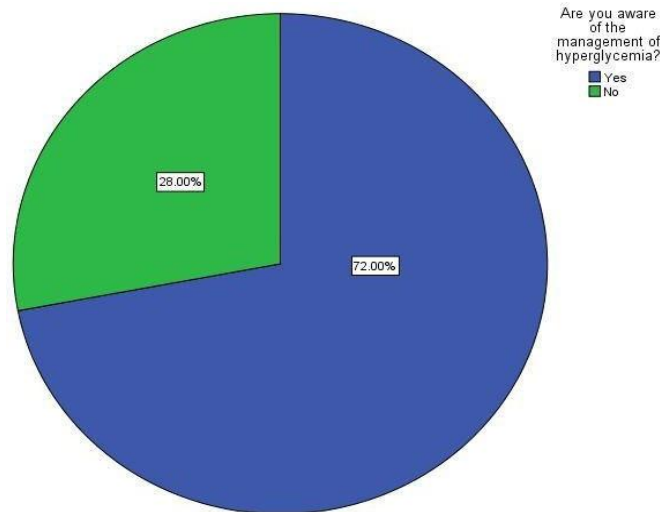


Figure 10: Pie chart representing the responses to the question: “Are you aware of the management of hyperglycemia?” Blue represents people who are aware if the management of hyperglycemia and green represents people who are not aware of the management of hyperglycemia. 72% were aware of the management and 28% were not.

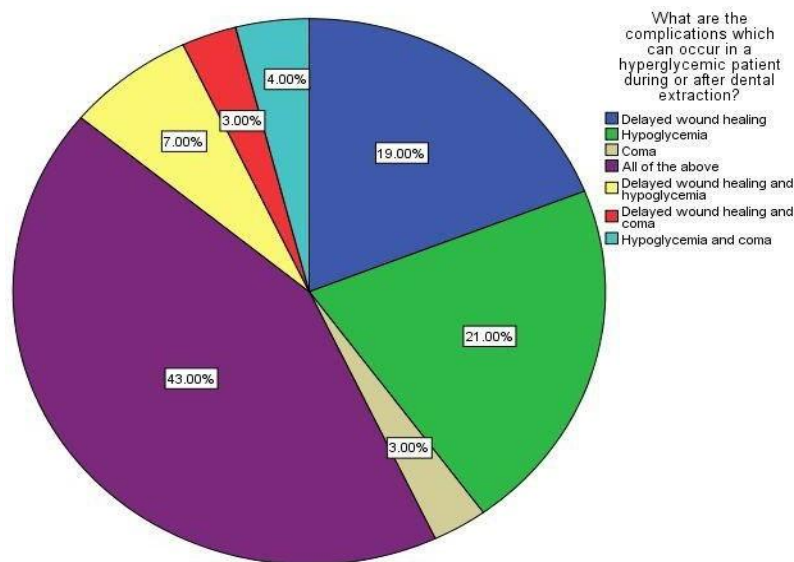


Figure 11: Pie chart representing the response to the question: “What are the complications which can occur in a hypertensive patient?” Blue represents people who said the complication which can occur in a hyperglycemic patient during an extraction is delayed wound healing, green represents people who said it is hypoglycemia, beige represents people who said it is coma, purple represents people who said it is all of the three, yellow represents people who said it is delayed wound healing and hypoglycemia, red represents people who said is it delayed wound healing and coma and cyan represents people who said it is hypoglycemia and coma. 43% believed the major complication to be delayed wound healing, hypoglycemia and coma. 21%, 19% and 7% said it was hypoglycemia, delayed wound healing and delayed wound healing with hypoglycemia respectively. 4% said that it was hypoglycemia with coma, 3% said that it was coma alone, and the remaining 3% were not aware.

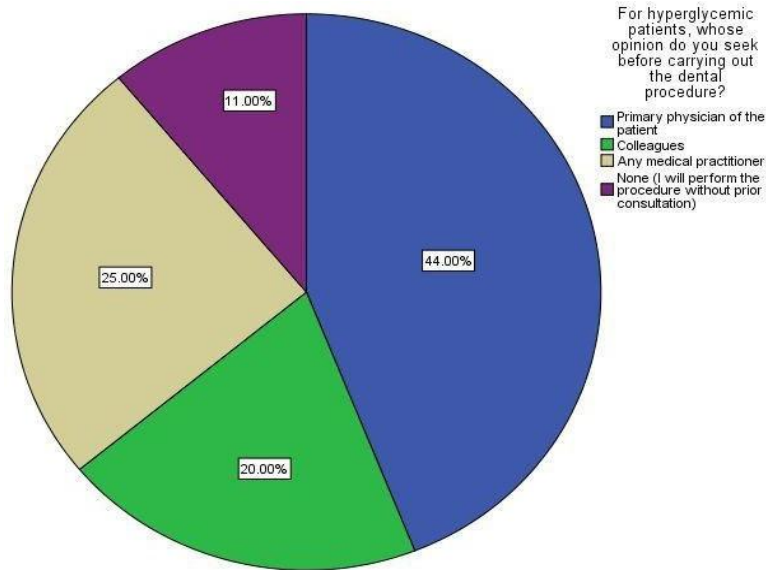


Figure 12: Pie chart representing the response to the question: For hyperglycemic patients, whose opinion do you seek before carrying out the dental procedure? Blue represents people who said they would consult the primary physician of the patient, green represents the people who said they would consult their colleagues, beige represents people who said they would consult any medical practitioner and purple represents people who said that they will not take any consultations. 44% would consult the primary physician of the patient, 25% would consult any medical practitioner, 20% would consult their colleagues and 11% would not take any consultation.

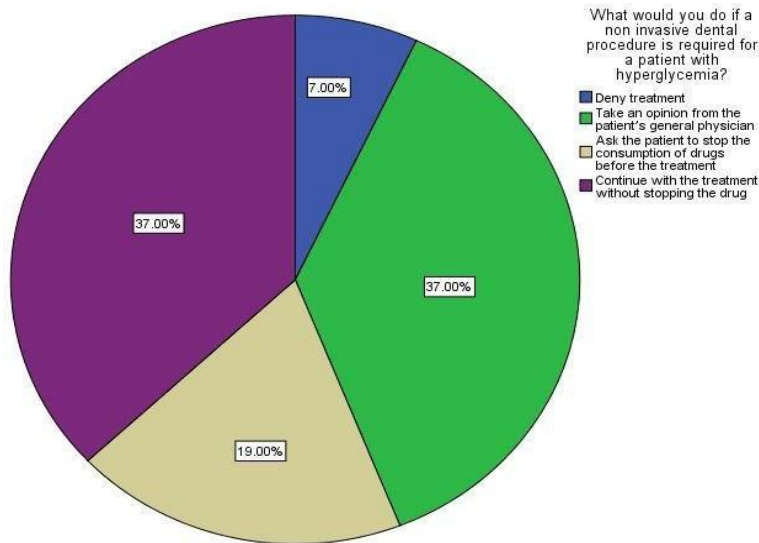


Figure 13: Pie chart representing the response to the question: What would you do if a non invasive dental procedure is required for a patient with hyperglycemia? Blue represents the people who said that they would deny the treatment, green represents people who said that they would take an opinion form the patient's general physician, beige represents people who said that they would ask the patient to stop the consumption of the drug before the treatment and purple represents people who said that they would continue with the procedure without stopping the drug. 19% responded that they would consult the primary physician of the patient, 37% would continue the treatment without any other precautions, 19% would ask the patient to stop the consumption of the drug and 7% would deny the treatment.

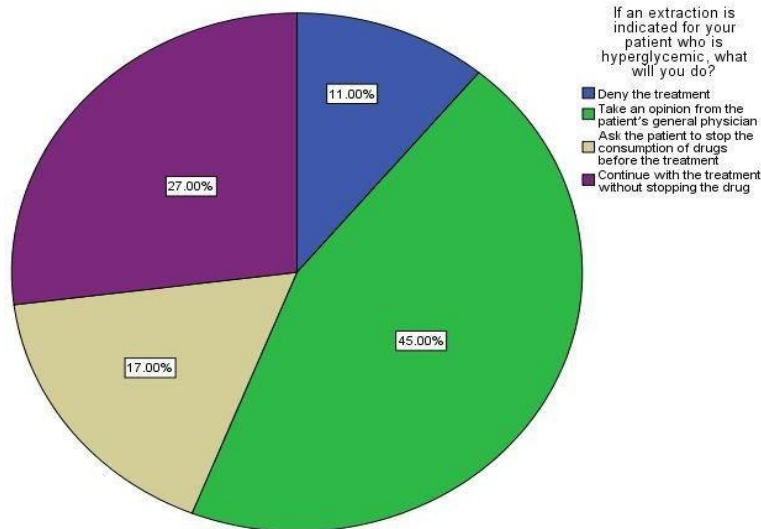


Figure 14: Pie chart representing the responses to the question: “If an extraction is indicated for your patient who is hyperglycemic, what would you do?” Blue represents the people who said that they would deny the treatment, green represents people who said that they would take an opinion from the patient's general physician, beige represents people who said that they would ask the patient to stop the consumption of the drug before the treatment and purple represents people who said that they would continue with the procedure without stopping the drug. 45% would consult the primary physician of the patient, 27% would continue the treatment without any other precautions, 11% would deny the treatment and 17% would ask the patient to stop the consumption of the drug.

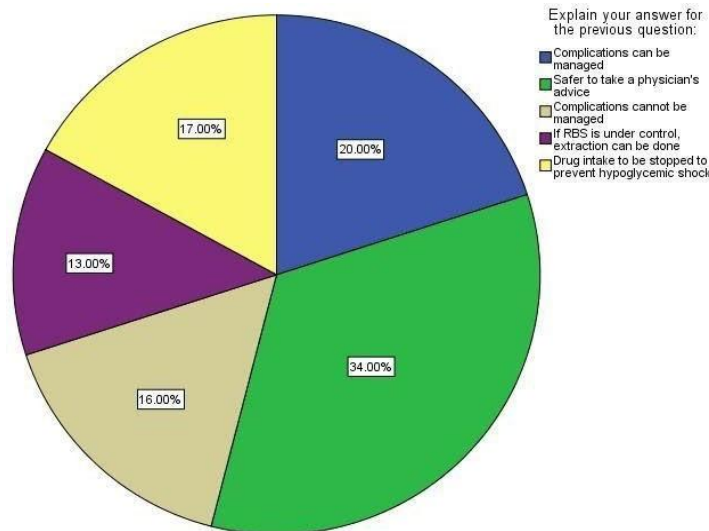


Figure 15: Pie chart representing the responses when asked for the reasoning of their answer for question: If an extraction is indicated for your patient who is hyperglycemic, what would you do? Blue represents people who said that the complications can be managed, green represents the people who said that it is safer to take the advice of the physician, beige represents the people who said that the complications cannot be managed, purple represents the people who said that if RBS is under control, extraction can be performed for that patient and yellow represents people who said that the drug intake has to be stopped to prevent hypoglycemic shock. 34% said it was safer to take a physician's advice, 20% said that the complications could be managed, 17% said that the drug intake would prevent the hypoglycemic shock and 13% said that if the RBS is under control, the extraction can be performed.

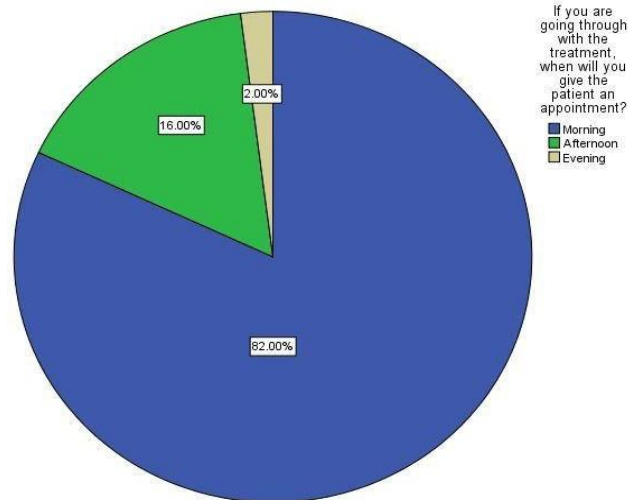


Figure 16: Pie chart representing the responses to the question: If you are going through the treatment, when will you give the patient an appointment? Blue represents people who said that they would give a morning appointment, green represents people who said that they would give an afternoon appointment and beige represents people who said that they would give an evening appointment. 82% would give the appointment in the morning, 16% in the afternoon and 2% in the evening.

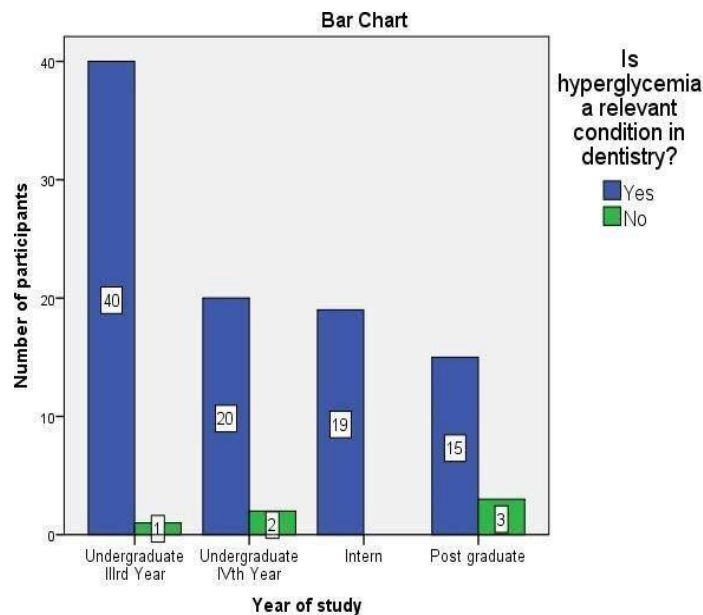


Figure 17: Bar graph representing association between the year of study and the population who thinks hyperglycemia is a relevant condition in dentistry. X axis represents the year of study and the Y axis represents the count of the responses. Blue represents people who answered yes to the question and green represents people who answered no to the question. 97.5% of undergraduate third years, 90.9% of undergraduate fourth years, 100% of interns and 83.3% of post graduates agreed with the fact that hyperglycemia was a relevant condition in dentistry. It was seen that Undergraduate IIIrd years were more positive in considering hyperglycemia as a relevant condition in dentistry. Chi-square test was done to assess significance. p value was found to be $p=0.105$, which is not statistically significant.

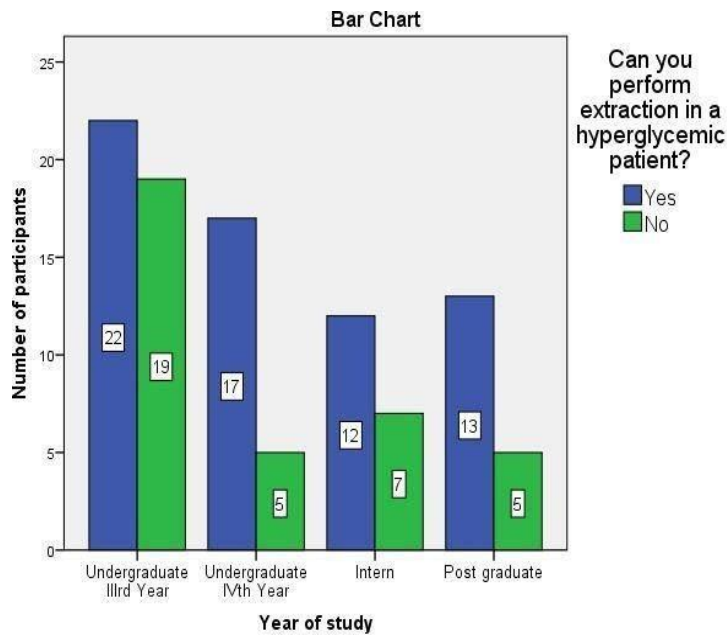


Figure 18: Bar graph representing association between the years of study and the population who think that an extraction can be performed in a hyperglycemic patient. X axis represents the year of study and the Y axis represents the count of the responses. Blue represents people who answered yes to the question and green represents people who answered no to the question.

53.6% of undergraduate third years, 77.2% of undergraduate fourth years, 63.1% of interns and 72.2% of post graduates agreed that an extraction can be performed in hyperglycemic patients. It was seen that Undergraduate IVth years, Interns and Post graduates were more in agreement with considering extraction in a hyperglycemic patient. Chi-square test was done to assess significance. p value was found to be $p=0.249$, which is not statistically significant .

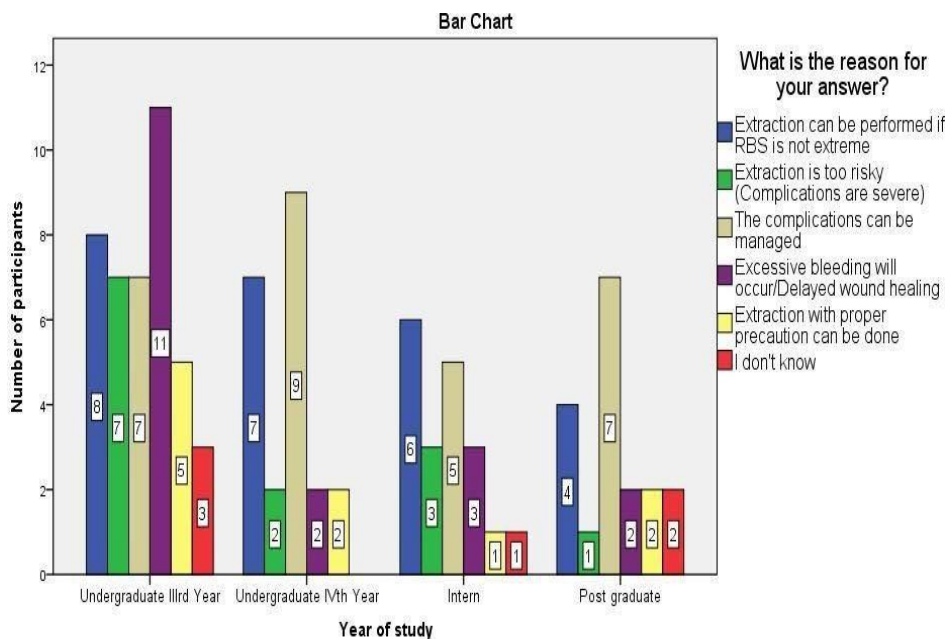


Figure 19: Bar graph representing association between the years of study and the population who explain their reasoning on whether an extraction can be performed in a hyperglycemic patient or not. X axis represents the year of study and the Y axis represents the count of the responses. Blue represents the response: Extraction can be performed if RBS is not extreme, green represents the response: Extraction is

too risky(Complications are severe), beige represents the response: The complications can be managed, Purple represents the response: Excessive bleeding will occur/Delayed wound healing, yellow represents the response: Extraction with proper precaution can be done and red represents the response: I don't know.

Undergraduate IIIrd years answered “excessive bleeding will occur/delayed wound healing” in a iger frequency than all the other participants. Chi-square test was done to assess significance. p value was found to be $p=0.605(p>0.05)$, which is not statistically significant.

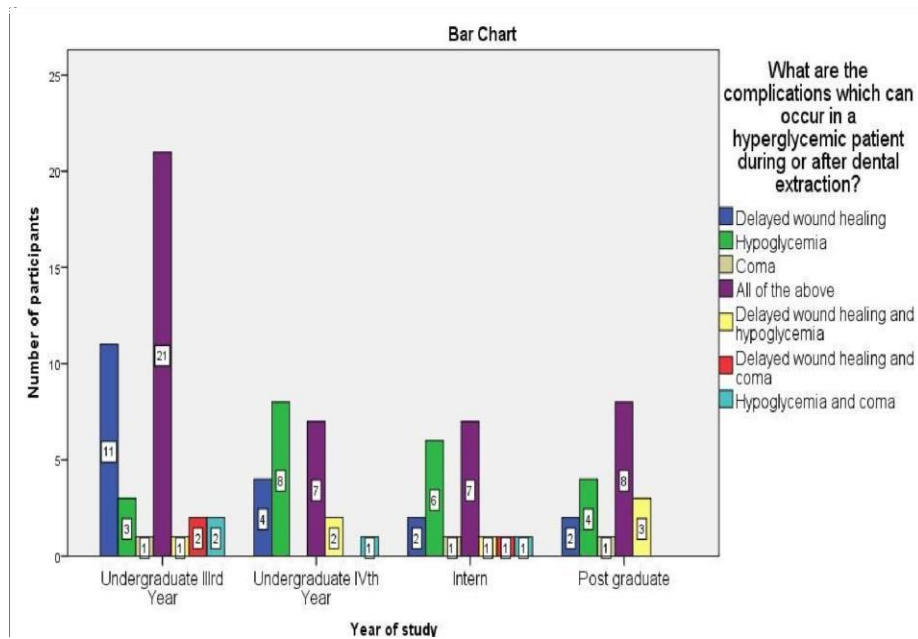


Figure 20: Bar graph representing association between the years of study and the population explaining what they think are the complications which can occur in a hyperglycemic patient. X axis represents the year of study and the Y axis represents the count of the responses. Blue represents the response: Delayed wound healing, green represents the response: Hypoglycemia, beige represents the response: Coma, purple represents the response: All of the above, yellow represents the response: Delayed wound healing and hypoglycemia, red represents the response: Delayed wound healing and coma and cyan represents the response: Hypoglycemia and coma. 37.5% of the undergraduates third year said that delayed wound healing, hypoglycemia and coma all together are the complications that can occur in a hyperglycemic patient during or after extraction, 36.3% of the undergraduates fourth year said that hypoglycemia is the complication, 36.8% of the interns said that delayed wound healing, hypoglycemia and coma all together are the complications and 44.4% of the post graduates said that delayed wound healing, hypoglycemia and coma are the complications in a hyperglycemic patient. Undergraduate IIIrd years answer the option “All of the above” higher than any other group. Chi-square test was done to assess significance. p value was found to be $p=0.242(p>0.05)$, which is not statistically significant .