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COMPARISON OF POST EXTRACTION HEALING IN DIABETIC PATIENTS WITH TWO DIFFERENT BLOOD GLUCOSE LEVELS-A CASE CONTROL STUDY

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Abstract

The aim of this study is to evaluate the abutment teeth selection in fixed partial denture (FPD) done by undergraduate students.For this, patient records of those who underwent replacement of missing teeth with fixed partial denture were collected. A total of 50 patient radiographs were evaluated. The data on the following parameters: gender and age of the patient, crown root ratio, pocket depth, mobility, axial alignment of the abutment tooth, existing caries and periapical lesion or pulpal involvement and alveolar ridge form were collected. The data was tabulated in excel sheet. After data collection descriptive statistical analysis was done in SPSS software. In the current study the most prevalent gender in the study population to undergo FPD treatment were males (66%) than females (34%). The most prevalent age group opting for FPD treatment was between 41-50 years(52%). 38% of the evaluated FPD abutments had a Crown root ratio of 1:1, 40% of the abutments chosen for FPD construction were detected to have caries. Periapical lesion was present in 13% of the abutment teeth evaluated. Axial alignment of the tooth showed mostly normal alignment representing (65%); pulpal involvement and root canal treatment were done in 17% of the evaluated abutments. The alveolar ridge form of the evaluated patients showed flat ridge (58%). The present study shows appropriate parameters that have to be evaluated by undergraduate students during abutment selection for treatment planning of FPD.

Keywords: *; Crownroot ratio; fixed partial denture; Probing depth*

Introduction

Diabetes mellitus is a metabolic disorder characterised by an inability of the body to regulate blood glucose level due to insulin deficiency or resistance[1]. Type I diabetes or insulin dependent diabetes is characterised by deficiency of insulin production and Type II diabetes or non insulin dependent diabetes is characterised by relative insulin deficiency and tissue insulin resistance[2]

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It is also characterised by abnormal carbohydrate, lipid and protein metabolism. As a result, this leads to hyperglycemia that causes microvascular complications and a variety of clinical neuropathic complications[3,4]. Studies have reported that half of the diabetic patients require surgery while the remaining two thirds of the patients who require surgery experience some complications relating to infection [5,6].

The most common dental complications experienced by diabetic patients are due to extraction, periodontal surgeries and ill fitting dentures[7,8]. Some well known oral surgical complications include poor regeneration of soft tissues and delay in osseous tissue healing[9,10]. Diabetes is associated with increased skeletal complications such as lowering the bone mineral density and increasing the risk of bone fracture [11]. There is high level risk for osteopenia, osteoporosis, poor osseous healing, and impaired bone regeneration[12]

Mozatti M. et al reported, a delay in wound healing of oral ulcers and extraction sockets in diabetic patients is due to inactive or static blood flow, low growth factors and antibodies production, questionable immunity,poor angiogenesis and psychological stress [13]. This study purely concentrates on diabietic patients with two different blood glucose levels i.e. patients with Blood Glucose Level <200mg/dl and patients with Blood Glucose Level >200mg/dl and the rate of healing of the extraction socket.

Therefore, management and treatment of diabetic patients undergoing oral surgical procedures are more difficult. Delayed angiogenesis, decrease in blood flow, compromised innate immunity, decrease in the production of growth factor and psychological stress have been reported as factors causing delay in the healing of oral ulcers [9,14]. In most cases, diabetes makes the patient susceptible to oral and dental problems and complications, including various soft tissue injuries and inflammatory conditions [15,16]. In this study, we are intended to compare the rate of healing of post extraction sockets among type 1 diabetes patients between two different blood glucose levels.

MATERIALS AND METHODS

Study setting

This study is a university setting, conducted in Saveetha Dental college, Predominantly, the pros of the study include flexibility and less time consumption. The cons of the study is limited to certain populations. 112 Diabetic patients were included in this study. Approval was obtained from the Institutional Ethical Committee [IEC]. The ethical approval number for the present study is SDC/SIHEC/2020/DIASDATA/0619-0320. Two examiners were involved in the study.

Sampling

The details of the 86,000 patient records were reviewed and analyzed, out of which 112 diabetic patients who had undergone extraction between June 2019 to March 2020 were included in this study. Cross verification of data for error was done by presence of additional reviewers and by photographic evaluation.Simple random sampling was done to minimise the sampling bias. It was generalised to the south Indian population.

Data collection/ tabulation

Records of all patients who had diabetics and underwent extraction were collected from initial to last in the chronological order. The data verification was done based on age, sex, Blood Glucose Level, number of extraction sites and postop review of extracted site for healing were recorded and the data were tabulated. The data was entered in the excel sheet in a methodical manner and was imported to SPSS. Incomplete or censored data was excluded from the study.

Analysis

IBM SPSS 2.0 software, was used for data analysis Independent variables include age, gender and dependent variable include no of extraction, RBS analysis. Descriptive and inferential statistics were used. Descriptive statistics includes the frequency of distribution of age, sex and inferential statistics includes the chisquare test.

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RESULTS

On analysing the age group, 46 patients who were greater than 60 years had undergone extraction out of which 61.4% of them had satisfactory healing, 77.8% of the patients belonging to the age group of 51-60 years had satisfactory healing while 85.19 % of patients who come under 41-50 years have satisfactory healing. From this we can observe that healing occurs at a faster rate in younger diabetic patients when compared to older patients. It is observed that the rate of healing is slower as the age increases in diabetic patient group population. As we can see in the graph, as the age increases, the rate of healing decreases, the bar chart shows gradual increase in the number of unsatisfactory healing with increase in age, It is evident that there is no significant difference between age and rate of healing since there is only diminutive difference in the healing range and age groups.Not statistically significant as Chi square value is 3.530 and p value 0.317 [P>0.05] [Figure 1].

The relation between gender and healing of socket is given in [Figure 2]. Out of 63 males, 66.67% of them showed satisfactory healing likewise out of 42 females,85.17% showed satisfactory healing. From this we can contemplate that females have a higher healing rate than males. There is a significant difference observed in our study between gender and healing in diabetic patients as the finding is statistically significant p<0.05.

[Table 1] revealed correlation between number of extraction sites and rate of healing. There is no significant difference observed between the number of extraction sites and rate of healing because the finding is not statistically significant p value >0.050.

The relationship between the Blood Glucose Level and healing, 84.15% of patients whose Blood Glucose Level is less than 200 mg/dl had satisfactory healing while only 39% of patients with Blood Glucose level greater than 200 mg/dl showed satisfactory healing. There is a significant difference between healing and Blood Glucose Level observed in this study as the parameter observed is statistically significant [p<0.05] [Figure 3].

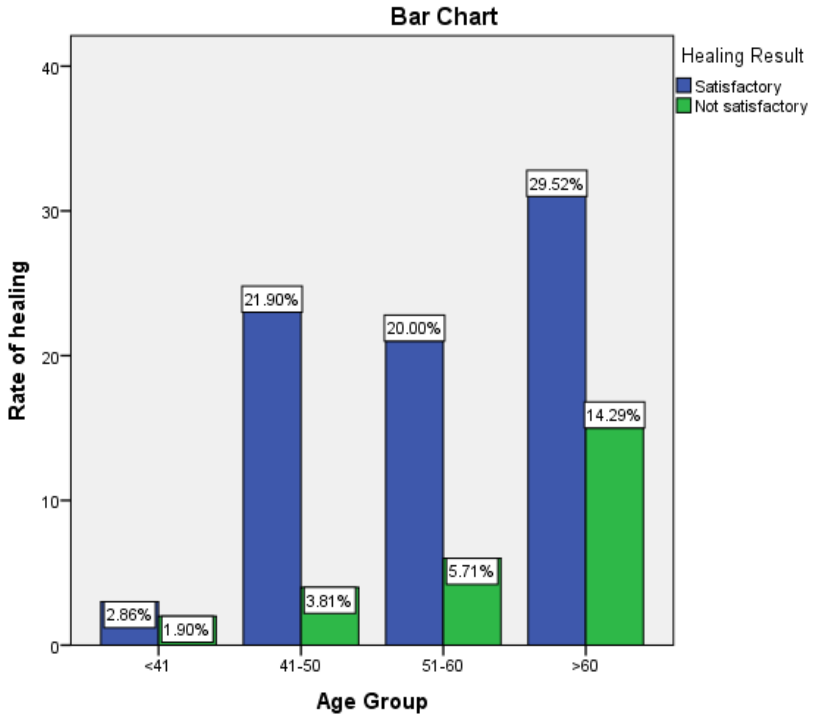

Figure 1: The bar chart showing association of age and healing of socket. (x axis ; age group, y axis : count/rate of healing).As we can see in the graph, patients aged greater than 60 years who had undergone extraction , 29.5% of them had satisfactory healing, 20 % of them belonging to the age group of 51-60 years had satisfactory healing while 21.9 % of patients who come under 41-50 years have satisfactory healing.It is evident that there is no significant difference between age and rate of healing since there is only diminutive difference in the healing range and age groups. Not statistically significant as Chi square value is 3.530 and p value 0.317 [P>0.05]

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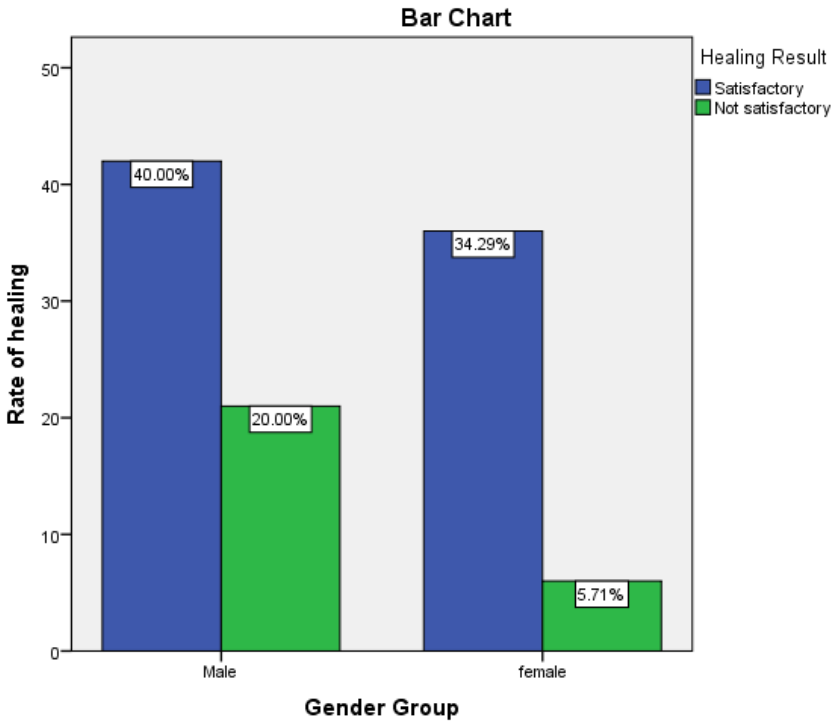

Figure 2: Bar chart showing association of gender and healing of the socket. X axis represents Gender group and Y axis represents the healing rate.Out of 60% of males,40% of them showed satisfactory healing and out of 40% of females 34.29% showed satisfactory healing. From this we can contemplate that females have a higher healing rate than males. There is a significant difference between gender and healing in diabetic patients which is also statistically significant. p Value 0.029. and chi square value was 4.786 [p<0.05]

No of ExtractionGroup	**Healing Result**		**Total**	**Chi square value**	**P value**
	Satisfactory	**Not satisfactory**			
<6	**68**	**21**	**89**	**1.896**	**0.594**
7-12	**6**	**4**	**10**		
13-18	**3**	**1**	**4**		
19-24	**1**	**1**	**2**		

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Total	**78**	**27**	**105**		

Table 1:The reveals correlation between number of extraction sites and rate of healing. There is no significant difference observed between these two parameters. This finding is not statistically significant as p value 0.594 [p >0.050].

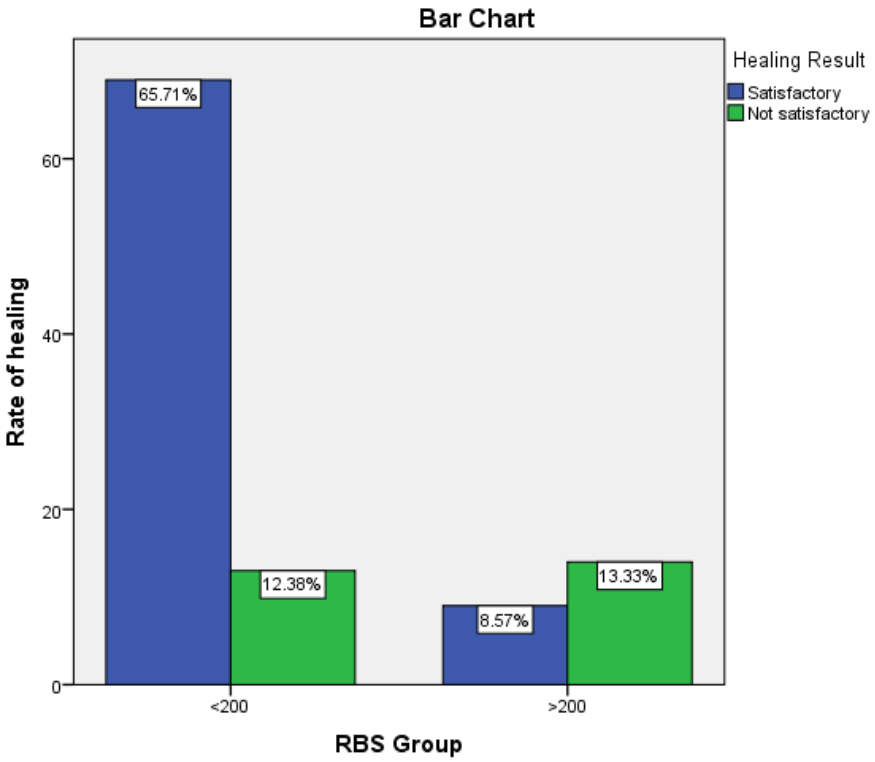

Figure 3**:** Bar chart represents association between random blood sugar and healing of extraction, we can observe that RBS < 200 mg/dl had comparatively higher healing than RBS > 200mg/dl.X axis represents the RBS level group and Y axis rate of healing count. 65.71% of patients whose Blood Glucose Level is less than 200 mg/dl had satisfactory healing while only 8.57% of patients with Blood Glucose level greater than 200 mg/dl showed satisfactory healing.There is a significant difference between healing of extraction socket and Blood Glucose Level observed in this study as the parameters observed were statistically significant p=0.000 and chi square was 19.05 [p<0.05].

DISCUSSION

The hyperglycemia in diabetic patients can pave way to reduce leukocyte count and have deleterious effects on vascular epithelium and healing potential [3].Stratton et al , reported each 1% decrease in HbA1C level leads to 37% decrease in micro vascular complications [P<0.001][17].Because of micro vascular and macro vascular changes and immune deficiency in diabetes, risk of infection will increase.

In this study, we can contemplate that there is significant association between the blood glucose level and the rate of healing of extraction socket P value[<0.05]. Also it is observed that females had a higher healing rate compared to males and the rate of healing decreases with increase in age.

Infections is the major risk factor for uncontrolled diabetic patients [18,19], the underlying cause of uncontrollable diabetes is still not clear. There are few possible explanations that can resolve these doubts.

a) Insufficient insulin levels can slower the rate of healing [20,21]

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b) Healing of tooth sockets requires repair and regeneration of tissues, this is controlled and regulated by specific molecules like TGF- B, VEGF, BMP, PGF [9].Uncontrollable diabetes, the healing is prolonged due to delayed onset of cell proliferation and osteoblastic differentiation [22,23].

c) Poor blood circulation is commonly seen in uncontrollable diabetic patients. This leads to delay in delivery of nutrients and oxygenated blood to the surgical site resulting in slower healing rate [24,25].

d) When fasting blood glucose level > 240 mg/dl, the body starts metabolizing fat at a higher rate, converting fatty acids to ketone [26,27]. High ketone levels cause diabetic ketoacidosis leading the blood to become acidic. These ketone bodies interfere in the healing process inhibiting the secretion of nitric oxide and macrophages [28–30].

Our present study showed that diabetic patients had normal healing in both different blood group levels but the healing occurs at a slower pace in patients with Blood Glucose Level>200 mg/dl compared to patients with Blood Glucose Level<200 mg/dl. This result is in consistent with the study conducted by Huang et al, where he determined differences in wound healing in Type II diabetic patients and reported that healing is normal after the tooth extraction.[1]

The study conducted by Jarbassiet al, have also reported that diabetic patients with high Blood Glucose Level showed lack of healing at the end of 7th day, however there was no abnormalities or complications seen in the patients [3].However we cannot completely neglect the risk of complications of post extraction in diabetic patients.Devlin et al ,reported that blood clot in uncontrolled diabetic patients are weaker leading to more chance of alveolar destruction [31,32]

CONCLUSION

In this study we can contemplate that healing of the extraction socket occurs at a slower pace in patients with Blood Glucose Level>200mg/dl compared to patients with Blood Glucose Level <200mg/dl. However there were no complications in post extractions were noted.However a surgeon needs to always be aware of postoperative complications in extraction sockets healing such as alveolar osteitis [dry socket] ,cellulitis, gangrenous osteitis ,suppurative osteitis and osteomyelitis and more importantly mucormycosis which may be fatal if not intervened immediately. .

AUTHOR CONTRIBUTIONS

All the authors contributed equally to the research.

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CONFLICT OF INTEREST

Nil

REFERENCE

1. Huang S, Dang H, Huynh W, Sambrook PJ, Goss AN. The healing of dental extraction sockets in patients with Type 2 diabetes on oral hypoglycemics: a prospective cohort. Aust Dent J. 2013 Mar;58[1]:89–93.

2. Gupta B. Assessment of post operative wound healing in diabetic patients after extraction [Internet]. Vol. 3, International Journal of Advances in Scientific Research. 2017. p. 77. Available from: http://dx.doi.org/10.7439/ijasr.v3i7.4210

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3. Akhavan Karbassi MH, Salehi R, Kheirollahi K, Ghaffari Targhi M, Jalili Sadrabad M, Yousefipour B. The Relationship between Socket Blood Sugar and Post-Extraction Complications in Type II Diabetic and Non-Diabetic Patients. Iranian Journal of Diabetes and Obesity. 2015;7[1]:12–9.

4. Jesudasan JS, Wahab PUA, Sekhar MRM. Effectiveness of 0.2% chlorhexidine gel and a eugenol-based paste on postoperative alveolar osteitis in patients having third molars extracted: a randomised controlled clinical trial. Br J Oral Maxillofac Surg. 2015 Nov 1;53[9]:826–30.

5. Babineau TJ, Bothe A Jr. General surgery considerations in the diabetic patient. Infect Dis Clin North Am. 1995 Mar;9[1]:183–93.

6. Mp SK, Rahman R. Knowledge, awareness, and practices regarding biomedical waste management among undergraduate dental students. Asian J Pharm Clin Res [Internet]. 2017;https://innovareacademics.org/journals/index.php/ajpcr/article/download/19101/12066

7. Aronovich S, Skope LW, Kelly JPW, Kyriakides TC. The relationship of glycemic control to the outcomes of dental extractions. J Oral Maxillofac Surg. 2010 Dec;68[12]:2955–61.

8. Christabel A, Anantanarayanan P, Subash P, Soh CL, Ramanathan M, Muthusekhar MR, et al. Comparison of pterygomaxillary dysjunction with tuberosity separation in isolated Le Fort I osteotomies: a prospective, multi-centre, triple-blind, randomized controlled trial. Int J Oral Maxillofac Surg. 2016 Feb 1;45[2]:180–5.

9. Al-Maskari AY, Al-Maskari MY. Oral manifestations and complications of diabetes mellitus: a review. Sultan Qaboos Univ Med J [Internet]. 2011; Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3121021/

10. Marimuthu M, Andiappan M, Wahab A, Muthusekhar MR, Balakrishnan A, Shanmugam S. Canonical Wnt pathway gene expression and their clinical correlation in oral squamous cell carcinoma. Indian J Dent Res. 2018 May;29[3]:291–7.

11. Vestergaard P. Discrepancies in bone mineral density and fracture risk in patients with type 1 and type 2 diabetes—a meta-analysis. Osteoporos Int. 2007 Apr 1;18[4]:427–44.

12. Retzepi M, Lewis MP, Donos N. Effect of diabetes and metabolic control on de novo bone formation following guided bone regeneration. Clin Oral Implants Res. 2010 Jan;21[1]:71–9.

13. Mozzati M, Gallesio G, di Romana S. Efficacy of plasma-rich growth factor in the healing of postextraction sockets in patients affected by insulin-dependent diabetes mellitus. Journal of Oral and [Internet]. 2014; Available from: https://www.sciencedirect.com/science/article/pii/S0278239113013220

14. Packiri S, Gurunathan D, Selvarasu K. Management of Paediatric Oral Ranula: A Systematic Review. J Clin Diagn Res. 2017 Sep;11[9]:ZE06–9.

15. Mohsin SF, Ahmed SA, Fawwad A, Basit A. Prevalence of oral mucosal alterations in type 2 diabetes mellitus patients attending a diabetic center. Pak J Med Sci Q. 2014 Jul;30[4]:716–9.

16. Mp SK. Relationship between dental anxiety and pain experience during dental extractions. Asian J Pharm Clin Res [Internet]. 2017; Available from: https://pdfs.semanticscholar.org/f024/7b95077e4a0bb861eb9b8b815893f19758d6.pdf

17. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes [UKPDS 35]: prospective observational study. BMJ. 2000 Aug 12;321[7258]:405–12.

18. Saeb ATM, Al-Rubeaan KA, Aldosary K, Udaya Raja GK, Mani B, Abouelhoda M, et al. Relative reduction of biological and phylogenetic diversity of the oral microbiota of diabetes and pre-diabetes patients. Microb Pathog. 2019 Mar;128:215–29.

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19. Patil SB, Durairaj D, Suresh Kumar G, Karthikeyan D, Pradeep D. Comparison of Extended Nasolabial Flap Versus Buccal Fat Pad Graft in the Surgical Management of Oral Submucous Fibrosis: A Prospective Pilot Study [Internet]. Vol. 16, Journal of Maxillofacial and Oral Surgery. 2017. p. 312–21. Available from: http://dx.doi.org/10.1007/s12663-016-0975-6

20. Zhang Z, Fang P, Yu M, Wang Y, Li Y, Shi M, et al. Serum Galanin Concentration is Increased in Subjects with Impaired Glucose Tolerance. Can J Diabetes. 2017 Dec;41[6]:563–6.

21. Abhinav RP, Selvarasu K, Maheswari GU, Taltia AA. The Patterns and Etiology of Maxillofacial Trauma in South India. Ann Maxillofac Surg. 2019 Jan;9[1]:114–7.

22. Younis WH, Al-Rawi NH, Mohamed MA-H, Yaseen NY. Molecular events on tooth socket healing in diabetic rabbits. Br J Oral Maxillofac Surg. 2013 Dec;51[8]:932–6.

23. Kumar S, Sneha S. Knowledge and awareness regarding antibiotic prophylaxis for infective endocarditis among undergraduate dental students. Asian J Pharm Clin Res. 2016;9:154–9.

24. Arda E, Ay A, Akdere H, Akdeniz E. The association of Intron 4 VNTR and Glu298Asp polymorphisms of the nitric oxide synthetase 3 gene and vasculogenic erectile dysfunction in Turkish men. Syst Biol Reprod Med. 2019 Oct;65[5]:383–9.

25. Mp SK. The emerging role of botulinum toxin in the treatment of orofacial disorders: Literature update. Asian J Pharm Clin Res [Internet]. 2017; Available from: https://innovareacademics.org/journals/index.php/ajpcr/article/download/16914/12228

26. Bailey TS, Grunberger G, Bode BW. American College of Endocrinology 2016 outpatient glucose monitoring consensus statement. Endocr Pract. 2016;22[2]:231–61.

27. Rahman R, Mp SK. KNOWLEDGE, ATTITUDE, AND AWARENESS OF DENTAL UNDERGRADUATE STUDENTS REGARDING HUMAN IMMUNODEFICIENCY VIRUS/ACQUIRED …. Asian J Pharm Clin Res [Internet]. 2017; Available from: https://innovareacademics.org/journals/index.php/ajpcr/article/download/17277/10802

28. Noh HS, Kim DW, Cho GJ, Choi WS, Kang SS. Increased nitric oxide caused by the ketogenic diet reduces the onset time of kainic acid-induced seizures in ICR mice. Brain Res. 2006 Feb 23;1075[1]:193–200.

29. Sweta VR, Abhinav RP, Ramesh A. Role of Virtual Reality in Pain Perception of Patients Following the Administration of Local Anesthesia. Ann Maxillofac Surg. 2019 Jan;9[1]:110–3.

30. Patturaja K, Pradeep D. Awareness of Basic Dental Procedure among General Population. J Pharm Res [Internet]. 2016; Available from: http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=9&issue=9&article=010

31. Devlin H, Garland H, Sloan P. Healing of tooth extraction sockets in experimental diabetes mellitus. J Oral Maxillofac Surg. 1996 Sep;54[9]:1087–91.\

32. Farhat Yaasmeen Sadique Basha , Rajeshkumar S , Lakshmi T ,Anti-inflammatory activity of Myristica fragrans extract . Int. J. Res. Pharm. Sci., 2019 ;10(4), 3118-3120 DOI: https://doi.org/10.26452/ijrps.v10i4.1607

33. Vijayakumar Jain S, Muthusekhar MR, Baig MF, Senthilnathan P, Loganathan S, Abdul Wahab PU, et al. Evaluation of Three-Dimensional Changes in Pharyngeal Airway Following Isolated Lefort One Osteotomy for the Correction of Vertical Maxillary Excess: A Prospective Study. J Maxillofac Oral Surg. 2019 Mar;18[1]:139–46

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