

**COMPARISON OF POST-OBTURATION PAIN FOLLOWING  
SINGLE VISIT AND MULTI VISIT ROOT CANAL  
TREATMENT IN DIABETIC AND NON- DIABETIC PATIENTS  
WITH IRREVERSIBLE PULPITIS: IN VIVO STUDY**

*Dissertation submitted to*

**THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY**

*In partial fulfilment for the Degree of*



**MASTER OF DENTAL SURGERY**

**BRANCH IV**

**CONSERVATIVE DENTISTRY AND ENDODONTICS**

**MAY 2019**

## CERTIFICATE

This is to certify that this dissertation titled “**COMPARISON OF POST-OBTURATION PAIN FOLLOWING SINGLE VISIT AND MULTI VISIT ROOT CANAL TREATMENT IN DIABETIC AND NON- DIABETIC PATIENTS WITH IRREVERSIBLE PULPITIS: IN VIVO STUDY**” is a bonafide record of work done by **Dr. ANAGHA C.S.** under my guidance and to my satisfaction during his Post Graduation study period between 2016 – 2019. This dissertation is submitted to THE TAMILNADU Dr.M.G.R. MEDICAL UNIVERSITY, in partial fulfilment for the award of the degree of master of dental surgery in Conservative Dentistry and Endodontics, Branch IV. It has not been submitted (partial or full) for the award of any other degree or diploma.

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## DECLARATION

<b>Name of the Candidate</b>	<b>Dr. ANAGHA C.S.</b>
<b>Title of the Study</b>	<b>COMPARISON OF POST-OBTURATION PAIN FOLLOWING SINGLE VISIT AND MULTI VISIT ROOT CANAL TREATMENT IN DIABETIC AND NON- DIABETIC PATIENTS WITH IRREVERSIBLE PULPITIS: IN VIVO STUDY</b>
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<b>Duration of the Course</b>	<b>2016 – 2019</b>
<b>Name of the Guide</b>	<b>Dr. Minu Koshy</b>
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## ACKNOWLEDGEMENT

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I owe an immense debt of gratitude to **Dr. V. Prabhakar, MDS, Principal & Head of Department**, Department of Conservative Dentistry and Endodontics, Sri Ramakrishna Dental College and Hospital, for his unwavering guidance, immeasurable encouragement and constant support during my post graduate tenure.

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# INTRODUCTION



## INTRODUCTION

The success of Root Canal Treatment is characterized by the absence of symptoms and clinical signs in the affected tooth along with radiographic evidence of periapical healing. Even after meticulous endodontic therapy, occurrence of post treatment pain can distress both the patient and the dentist. The intensity of post-obturation pain could range from mild to severe and the duration of which extends from one day to many weeks. This is one of the major drawbacks for the patient following root canal treatment.

There are variety of factors which affects post-endodontic pain and these includes chemical or mechanical injury during clinical procedures, pre-operative condition of the pulp, number of appointments (single or two visits), type of the treatment (initial treatment or retreatment), and various systemic conditions of the patient. Patients with severe preoperative pain tend to have severe post endodontic pain than patients with mild or no preoperative pain<sup>1</sup>. Various studies have reported that a direct relationship existed between preoperative and postoperative pain in root canal treated teeth<sup>2,3</sup>. The incidence and intensity of post-obturation pain was found be more in root canal treated teeth with vital pulp when compared to teeth with necrotic pulp or retreated teeth<sup>4</sup>.

Many studies have shown a correlation between systemic diseases and the outcome of endodontic treatment. Diabetes and hypertension are systemic diseases that have been found to be significantly associated with reduced survival of endodontically treated teeth<sup>5</sup>. Several aspects of the immune system could be compromised and wound healing is impaired in Diabetes mellitus. Various soft tissue

abnormalities have also been reported to be associated with diabetes mellitus in the oral cavity. These complications include periodontal diseases, salivary dysfunction leading to a reduction in salivary flow and changes in saliva composition, and taste dysfunction. In patients with diabetes; oral, fungal and bacterial infections have also been reported<sup>6</sup>. Diabetes mellitus is reported to be significantly associated with reduced healing rate after endodontic treatment of teeth with preoperative infections, suggesting that diabetes may serve as a disease modifier in cases of endodontic infections<sup>7</sup>.

Multiple-visit root canal treatment is generally accepted as a safe treatment modality in diabetes mellitus patients. Studies have shown that when diabetes mellitus is under therapeutic control, periapical lesions heal as readily as in non-diabetic patients<sup>8</sup>. There are not many studies in the literature evaluating the association between controlled type II diabetes mellitus and occurrence of post-treatment pain after one visit root canal therapy. Hence this in vivo study is aimed to evaluate the prevalence and comparison of post obturation pain after single and multiple visit endodontic therapy in controlled type II diabetic and non-diabetic individuals.

## **AIM & OBJECTIVE**

## **AIM AND OBJECTIVES**

### **AIM:**

The Aim of this study is to evaluate and compare the pain following obturation in single visit and two-visit endodontic therapy in controlled Type II Diabetes Mellitus patients and Non-Diabetic individuals.

### **OBJECTIVE:**

To investigate the prevalence of post-obturation pain following single visit and two-visit root canal treatment in controlled type II Diabetic and Non-Diabetic patients.

To compare the post obturation pain following single visit and two-visit root canal treatment in controlled type II Diabetic and Non-Diabetic patients.

# **REVIEW OF LITERATURE**

## REVIEW OF LITERATURE

A study done by Roane et al<sup>9</sup> in the year of 1983, examined the occurrence of post-endodontic pain after one visit and multiple-visit root canal therapy to identify the relationship between pain experienced and the anatomic location, the pulp vitality as determined by hemorrhage and the number of treatment visits used in completing the case. They concluded that under the conditions observed, there was no significant difference in postoperative pain experienced for teeth in different anatomic groupings and pulp status and the time of treatment is unrelated to postoperative pain experience. They also found that one-visit endodontic treatments using the methods employed in this study resulted in a postoperative pain experience approximately one half as often as when multiple-entry treatments are used.

To determine the difference in the presence of post-endodontic pain after one-visit and multiple-visit endodontic therapy Albashaireh and Alnegrish<sup>10</sup> conducted a study in the year of 1998. They found a significant difference in incidence of post-endodontic pain in multiple-visit group on comparison to single-visit group within 1 day of obturation. They also found that the incidence of pain decreased thereafter. They concluded that there was comparatively no significant correlation between post-endodontic pain as well as any other factors, with the exception the teeth with non-vital pulp prior to commencement of treatment were associated with a greater significance of post obturation pain.

The post-endodontic pain after root canal treatment performed in single visit versus two visits in both vital and non-vital teeth using a modified Visual Analogue Scale was evaluated by Di Renzo et al(2004)<sup>11</sup>. They found that there was no statistically significant difference in post-obturation pain among patients treated in single visit and two visit groups, regardless of preoperative diagnosis or location of teeth. In both groups majority of patients reported absence of pain or only mild pain within 24 to 48 hours of root canal treatment.

A study was conducted by Oginni and Udoye(2004)<sup>12</sup> to evaluate the presence of post-obturation flare-ups following single visit as well as multiple visit endodontic procedure. They also tried to establish a relationship between pre-operative and post-operative pain in patients referred for root canal treatment in a Nigerian teaching Hospital. They reported that there was a higher incidence of post-treatment pain and flare-ups after one visit root canal treatment. They also found a correlation between pre-operative and post-operative pain ( $P = 0.002$ ,  $P = 0.0004$ ) after one visit and multiple visit endodontic procedures which were statistically significant. Teeth with vital pulps showed the lowest incidence of post-endodontic pain (48.8%), while teeth with non-vital pulps experienced the highest (50.3%),  $P = 0.9$ .

To find out the prevalence of post-treatment pain after endodontic therapy Ng et al (2004)<sup>13</sup> conducted a study with the help of visual analogue scale and they also evaluated the factors which affects the pain experience. They found that the prevalence of post obturation pain was high among all the groups (40.2%) and the important factors which determines of post-endodontic pain were female patients, molar teeth, size of periapical lesion, and history of pre-operative pain or swelling and single visit root canal therapy.

A study was done by Al-Negrish and Hababbeh (2005)<sup>14</sup> to determine the incidence of flare ups in root canal treated asymptomatic non vital upper central incisors performed in single visit and two-visits. No statistically significant difference in the incidence and degree of postoperative pain was found between one and two visit endodontic procedures. The rate of post obturation flare up in asymptomatic endodontically treated non vital maxillary central incisors was 11.6 and 3.6% after 2 and 7 days, respectively.

The effect of progression of diabetes mellitus on inflammatory and structural components of the dental pulp in rats were investigated by Catanzaro et al<sup>15</sup> in the year of 2006. Dental pulp tissue samples were taken from central incisors and molars of diabetic rats 30 and 90 days after injection of Streptozotocin and induction of diabetes was confirmed 24 hours later. Plasma glucose levels in diabetic rats were significantly increased when compared to controlled rats (<0.05). Nitrite and kallikrein levels in dental pulp tissue were higher in diabetic rats 30 days after STZ treatment than in controls, while only nitrite were decreased 90 after of STZ treatment. Myeloperoxidase activity showed changes 30 and 90 days after STZ injection when compared to controls. The activity of alkaline phosphatase showed significant changes 30 and 90 days after STZ treatment. On the other hand the concentration of collagen was decreased in diabetic rats 30 and 90 days after STZ injection. These results suggest that diabetes is a critical factor that has profound effects upon oral tissues, resulting in expression of inflammatory mediators and modifications of structural components of dental pulp.



A study conducted by Risso PA et al(2008)<sup>16</sup> evaluated the intensity and frequency of post obturation pain and the factors associated in adolescent patients undergoing one-visit and two-visit root canal therapy. They found that the frequencies of post obturation pain were 10.5% (6/57) in the single-visit group and 23.0% (14/61) in the two-visit group. The intensity of the pain was similar in both groups, particularly flare-ups, with a prevalence of 1.75% in the one-visit group and 1.65% in the two-visit group. Post obturation pain was significantly associated with the presence of preoperative pain ( $p=0.04$ ;  $OR=3.54$ ;  $CI\ 95\%=1.02-12.30$ ) and a positive culture at the time of obturation ( $p=0.00$ ;  $OR=9.43$ ;  $CI\ 95\%=2.93-30.35$ ). They suggested that effective microbial control and the presence of preoperative pain could be factors which influences the post obturation pain in adolescent patients.

The intensity and the frequency of post-obturation pain and factors which are associated with the same was investigated and studied by Risso et al(2009)<sup>5</sup> in adolescent patients undergoing two-visit root canal treatment. They got a result in which the frequency of postoperative pain was 32.8% (21/64), with intensities of VAS 1 and VAS 2 in 81%, VAS 3 in 14.3% and VAS 4 in 4.7% of the 21 cases in which it was experienced. Spontaneous preoperative pain (odds ratio (OR) = 6.60; 95% confidence interval (CI) = 1.61-26.97;  $P = 0.009$ ) and absence of apical periodontitis (OR = 5.65; 95% CI = 1.34-23.87;  $P = 0.01$ ) were associated with postoperative pain. They also found that the frequency of postoperative pain was high, but the intensity, in general, was low, including flare-ups and the presence of spontaneous preoperative pain and absence of apical periodontitis increase the probability of suffering from postoperative pain.

A study was conducted by Jabeen and Khurshiduzzaman (2009)<sup>17</sup> to evaluate the incidence of post-endodontic pain after single visit Root Canal Therapy in asymptomatic non-vital single rooted teeth which were treated by the standardized root canal preparation and lateral condensation technique. The frequency of post-endodontic pain was recorded like absence of pain, mild pain, moderate pain and severe pain. They evaluated the pain intensity at the day one and at seventh day after obturation of the tooth. There was a statistically significant difference in the occurrence and degree of post-endodontic pain between the two follow up days. The incidence of pain was reported to be more in 1st day after obturation and tended to decrease thereafter.

The duration, incidence and degree of postoperative pain in three hundred root canal treated teeth, with and without apical patency, in relation to some diagnostic factors (vitality, presence of preoperative pain, group, and mandible of treated tooth) was compared by Arias et al (2009)<sup>18</sup>. They found that there was less post-obturation pain in non-vital teeth when apical patency was maintained and if pain appeared, its duration was longer when apical patency was maintained in teeth with previous pain or located in the mandible. They concluded that maintenance of apical patency does not increase the incidence, degree, or duration of postoperative pain when considering all variables together.

A study done by Ince et al (2009)<sup>19</sup> investigated the incidence of post-endodontic pain after single-visit and multi-visit root canal therapy in teeth with vital and necrotic pulp. They found that the prevalence of post-obturation pain did not differ between the vital and non-vital teeth. They also found that post-obturation pain after any successful endodontic treatment is mainly connected with the preoperative

pain rather than the radiographic or clinical diagnosis. Majority of the patients in both groups reported absence of pain or only mild pain.

A study was conducted by Su et al (2010)<sup>20</sup> to compare the post obturation pain and healing rate after one visit and multiple visit endodontic therapy in infected root canals. They concluded that patients had less occurrence of short term post-endodontic pain after one visit root canal treatment when compared to multi-visit therapy. They also observed that there was no statistically significant difference in the healing rate between single visit versus multiple visit endodontic treatment after this study.

The incidence of post obturation pain was assessed by Farzana et al (2010)<sup>21</sup> after multiple visit endodontic therapy in vital teeth and in teeth with necrotic pulps. They found that there was no significant difference in post-operative pain between teeth with vital pulps and non-vital pulps. Mild to moderate pain was present in teeth with both vital and non-vital pulp but the result was not statistically significant.

The impact of systemic diseases on the risk of tooth extraction after Non-Surgical Root Canal Treatment was studied by Wang et al (2011)<sup>22</sup>. They found that Diabetes Mellitus, Hypertension, and Coronary Artery Disease are all significant risk factors for tooth extraction after Non-Surgical Root Canal Treatment in univariate analyses, and Diabetes Mellitus or Hypertension was an independent risk factor for tooth extraction 2 years after Non-Surgical Root Canal Treatment in multivariate analyses. Simultaneous possession of 2 diseases of Diabetes Mellitus, Hypertension, and Coronary Artery Disease were significantly associated with an elevated long-term risk of tooth extraction after Non-Surgical Root Canal Treatment.

A study done by Ali et al (2012)<sup>23</sup> investigated the incidence and prevalence of post-endodontic pain after one visit endodontic therapy with the help of visual analogue scale in three well-defined categories with specific time intervals (12 hours, 24 hour, and 48 hours). They also studied the influence of various factors which affects the pain experience. They concluded that post-endodontic pain is more likely to occur in first 24 hours of root canal treatment, which further reduced with time. They also analyzed the influence of patient's age, vitality of the tooth, gender, arch, and the presence of pre-operative pain, on comparing prevalence of the post-obturation pain. The results showed that post-obturation pain was higher in the old age group (group 2: 41-65 years), in mandibular teeth, in women and in those with presence of pre-operative pain. They also found that the vital condition of the teeth does not affect the intensity and frequency of post-endodontic pain.

The effect of variation present in the inter-appointment time period on the incidence and prevalence of post-endodontic pain after single-visit versus two-visit endodontic treatment in vital and non-vital teeth with the presence or absence of periapical radiolucency was investigated and studied by Bhagwat et al(2012)<sup>24</sup>. Two visit endodontic treatment was performed in three groups (Group 1 with the inter-appointment time period of 72 hours, Group 2 with inter-appointment time period of 48 hours and Group 3 with inter-appointment time period of 24 hours) and single visit endodontic treatment was performed in one group (Group 4).They concluded that the comparison of incidence of pain in different groups were not statistically significant. They also found that there was a greater tendency for incidence of post-endodontic pain in teeth treated with single-visit root canal therapy and those with an inter appointment period of 72 hours.

For analyzing the influence of various root canal instrumentation and obturation methods on intra-operative pain experienced by patients during endodontic therapy Martín-González et al(2012)<sup>25</sup> conducted a study and found patients feel more pain when RCT carried out on molar teeth. The root canal instrumentation and obturation techniques do not affect significantly the patient's pain during RCT and Gender, age, arch, previous NSAIDs or AB treatment and anesthetic type did not influence significantly the pain level.

In a study done by Singh and Garg(2012)<sup>26</sup>, they compared the intensity and frequency of post-endodontic pain following single visit or multi visit endodontic treatment on single rooted maxillary and mandibular teeth in a randomized controlled trial using a modified Heft Parker visual analog scale. They concluded that the intensity and incidence of post-endodontic pain experienced following single-visit or two-visit endodontic therapy on teeth with single root canal were not significantly different.

The incidence and severity of post-obturation pain subsequent to endodontic treatment in vital teeth and in teeth with necrotic pulps and after retreatment was assessed by Gotler et al (2012)<sup>4</sup>. They found that endodontic treatment in teeth with vital pulp experienced a significantly higher incidence and severity of post-obturation pain (63.8%;  $2.46 \pm 1.4$ , resp.) than root canal therapy of teeth with necrotic pulps (38.5%;  $1.78 \pm 1.2$ , resp.) or teeth which are re-treated (48.8%;  $1.89 \pm 1.1$ , resp.). No statistical relation was present between the type of pain experienced (spontaneous or stimulated) and condition of the pulp.

A study done by Tanalp et al (2012)<sup>27</sup> evaluated the general incidence of post-operative pain and flare-ups in patients who were endodontically treated by two root canal specialists using rotary instruments (Hero 642, Micro Mega, France) with the same treatment protocol. They found teeth with pre-operative pain were more prone to developing post-operative pain and discomfort with a statistically significant difference ( $p = 0.02$ ). While no significant correlation was determined between tooth vitality and pain and flare-ups ( $p = 0.5$ ), a statistically significant relationship existed between the presence of a periapical pathosis and postoperative pain and flare-ups. Cases with a periapical lesion had a higher risk of developing pain and flare-ups compared to those with no periapical involvement ( $p = 0.0001$ ).

Post-endodontic pain after single-visit endodontic treatment on vital teeth using three different obturation techniques (Thermafil obturation technique, cold lateral compaction of gutta-percha, and Backfill - Thermafil obturation technique) was compared and investigated by Alonso-Ezpeleta et al (2012)<sup>24</sup>. They were able to find that 87% of patients experienced mild pain or discomfort after root canal treatment between the first and the seventh day of obturation. They also found that post-endodontic pain was significantly associated with the different obturation technique used during the root canal therapy. Teeth filled with Thermafil obturators (TT technique) had a significantly higher levels of pain and discomfort than patients whose teeth were obturated with any of the other of the two techniques.

In a study done by Marotta et al(2012)<sup>28</sup>, the prevalence of apical periodontitis (AP) and endodontic treatment in type 2 diabetic individuals was compared with non-diabetics from an adult Brazilian population. They found that Apical Periodontitis was significantly more prevalent in untreated teeth from type 2 diabetics. This suggests that diabetes may serve as a disease modifier of Apical Periodontitis in the sense that

individuals with diabetes can be more prone to develop primary disease. However, findings do not confirm that diabetes may influence the response to root canal treatment because treated teeth had no increased prevalence of AP when compared with controls.

A study done by Rao et al (2013)<sup>29</sup> investigated and compared the post-endodontic pain after single-visit and two-visit root canal therapy in non-vital anterior teeth using modified visual analogue scale. They found that there was no significant difference in post-obturation pain between the patients treated in single appointment and those treated in two appointments. Most of the patients in both the groups reported absence of pain or only mild pain even after 7 days of root canal treatment.

The incidence of post-endodontic pain related to single visit root canal therapy in asymptomatic and non-vital single rooted teeth at the day one and 7 days after obturation was investigated and compared by Salma Jabeen et al (2013)<sup>17</sup>. They concluded that there was a statistically significant difference in the incidence and degree of post endodontic pain between two follow up days. The occurrence of pain was more in first day after obturation of teeth and decreased thereafter.

A study done by Sadaf and Ahmad (2014)<sup>30</sup> assessed postoperative pain in root canal therapy and its correlation with various clinical factors such as age of the patient, tooth type, and preoperative pain, length of obturation procedure, gender, pulpal status and sealer extrusion during treatment and post obturation pain was recorded using Visual analogue scale (VAS). They found that pain was present in 42.9% of patients and females experienced pain more frequently (65%) than males (35%). The study found that preoperative was associated with post-obturation pain ( $p$  value  $< 0.001$ ) with a significant difference but the length of obturation was not

found to be significantly associated with the post-endodontic pain ( $p$  value 1.0). Sealer extrusion was not significantly associated with post-obturation pain ( $P$  value 0.547).

The occurrence of post-obturation pain among one-visit and multiple-visit root canal therapy after one day and seven days was studied compared by Wong et al (2015)<sup>31</sup>. The study found that there was no difference in the occurrence of post-endodontic pain with single-visit or multiple-visits after one day and seven days of treatment. They also found that patients with less pre-operative pain with apical periodontitis experienced lower post-obturation pain after a day of endodontic therapy.

A study done by Fernando et al (2015)<sup>32</sup>, they evaluated the relation between the severity of preoperative pain and occurrence of post-obturation pain, considering the variables like gender, type of the tooth, pulpal status and arch type. The results showed that all the categories of the variables associated with higher preoperative pain intensity (being female, mandible and molar teeth) were significantly associated with higher levels of postoperative pain. The occurrence of preoperative pain is an important factor that influences the occurrence of postoperative pain. They concluded that the presence of pain before root canal treatment may help clinicians to inform their patients about probable postoperative pain and to prescribe them analgesics for use immediately after treatment.

Thomas Mathew (2015)<sup>33</sup> investigated the effect of factors like, gender, type of teeth, single or multi-visits, and presence of pre-operative pain on the incidence of post obturation pain. The study found that the variables which affects the post obturation pain can be categorized into type of teeth, gender, pulpal status of a



tooth, pre-operative pain, medications taken by patients, number of visits, various techniques of instrumentation and obturation. The review concluded that the factors were interrelated and directly interdependent.

A study was done by ÇIÇEK et al (2017)<sup>34</sup> to find out the influence of various instrumentation techniques on occurrence and intensity of post-obturation pain among one-visit root canal therapy. The patients were divided into three groups (group 1-modified step back technique, group 2-reciprocal technique and group 3-rotational technique) according to root canal techniques used. A 4-point pain intensity scale was used to assess the severity of postoperative pain. They concluded that all instrumentation techniques caused post-obturation pain. The study found that there was a lesser incidence of post obturation pain with modified step back technique when compared to the rotational and reciprocal techniques. There was no statistically significant difference in the occurrence of post-endodontic pain between the reciprocal and rotational techniques ( $p=0.868$ ). There was no statistically significant difference between the Postoperative pain in the first 12 hours ( $p=0.763$ ) and after 24 hours ( $p=0.147$ ). However there was a statistically significant difference in the post-operative pain after 48 hours among all the groups ( $p=0.040$ ).

To explore the relationship between the dental pulp and diabetes mellitus by histological analysis, Pradeep et al (2017)<sup>35</sup> conducted a pilot study on 20 patients which will widen the horizon of diagnosis and treatment planning of such conditions. 10 teeth were extracted from study group and the control group, employing intra-alveolar technique. Teeth were sectioned at apical third and subjected for histological procedure. The teeth were decalcified, processed and sections were stained and in the results, study group showed thickened basement membrane blood vessels (60%) and p (40%). They concluded that human dental pulp of type 2 diabetic patient revealed

impairment of vasculature, which in turn interferes with tissue nutrition, pulpal repair, and creates a micro-aerophilic state for anaerobic development.

A study done by Sen et al (2017)<sup>23</sup> aimed to compare the incidence of inter appointment flare-up during endodontic treatment in diabetics and non-diabetics patients using calcium hydroxide and chlorhexidine gel as intra canal medicament. The results showed a total of 10 of 60 patients developed inter appointment flare-up, of which 5 (16.6%) were diabetics and 2 (6%) were non-diabetic patients. The results comparing the inter appointment flare-ups between the groups were statistically non-significant ( $P = 0.2179$ ). They concluded that although the incidence of inter-appointment flare-up in diabetic patients is approximately twice than that seen in non-diabetic patients, these results are non-significant. This indicates that inter appointment flare-ups in diabetic patients with good glycemic control are essentially similar to healthy individual with no metabolic diseases.

The incidence of flare-ups and peri-apical healing after one-visit or two-visit root canal therapy in teeth with necrotic pulp and apical periodontitis after a control period of two-years was compared by Vieyra et al(2018)<sup>36</sup>. They found that the occurrence of a flare-up was positively associated only with the treatment of previously symptomatic teeth with peri-radicular lesions ( $p=0.05$ ). There was a significant difference regarding the occurrence of flare-ups when comparing treatment cases with retreatment cases ( $p=0.05$ ). There was also no difference regarding the incidence of postoperative pain between treatment and retreatment ( $p > 0.01$ ). Some level of postoperative pain occurred in 25.45% of the cases 23.76% of the treated teeth and 30% of the retreated teeth. Postoperative pain was significantly associated with previously symptomatic teeth and apical periodontitis. ( $p= 0.05$ ). Statistical analysis of the healing results did not show any significant difference between the

groups ( $p=0.05$ ). This study gave evidence that a meticulously instrumentation and irrigation performed in a single-visit root canal treatment can be as successful as a two visit treatment. There was a significantly higher incidence of flare-ups in teeth that needed retreatment than in primary treatment.

A study was done by Riaz et al (2018)<sup>2</sup> to determine the post-obturation pain after one visit versus multiple visit root canal therapy in teeth with necrotic pulps and infected root canals using visual analogue scale. They concluded that there was no significant difference in post obturatin pain between the single-visit and multiple-visit root canal treated groups. This indicates that single visit root canal treatment could be a viable treatment modality in routine endodontic practice. This reduces the number of appointments and can be considered as a procedure that supplements patient care. .

El Mubarak et al (2009)<sup>37</sup> evaluated and studied the postoperative pain after root canal treatment at the Department of Conservative Dentistry, Faculty of Dentistry, University of Khartoum, Sudan. In their study, conventional endodontic treatment was carried out in the included teeth by the undergraduate dental students in a single visit or multiple visits and the Postoperative pain was recorded by each patient by using visual analogue scale in well-defined categories at 2 time intervals, 12 hours and 24 hours. They found that the Postoperative pain developed in 15.9% of the patients with a history of preoperative pain, whereas 7.1% had postoperative pain among those without history of preoperative pain. There was no significant difference in postoperative pain between single-visit and multiple-visit root canal treatment. Within the limitations of the present study they concluded that there was a low incidence of postoperative pain after conventional RCT.

Diabetes mellitus (DM) is one of the most frequent pathologies that dentists encounter, due to its high prevalence worldwide and it is diagnosed by the repeated obtaining of fasting plasma glucose levels of 126 mg/ dl or higher, or glycosylated hemoglobin of 6'5% or higher. Álamo et al (2011)<sup>37</sup> did a study to investigate the relationship between Diabetes Mellitus and Oral infections. They suggested that for dental treatment, the type of diabetes suffered, the treatment given for the disease, and the glycemic control status (using the glycosylated hemoglobin test) should be known. They said that Periodontal disease is the main oral clinical manifestation in diabetic patients. Furthermore, burning mouth syndrome, the sensation of a dry mouth and and sialadenosis have been attributed to the disease. They concluded that well- controlled diabetics can be treated in the dental office similarly to nondiabetic patients, but morning appointments are preferable, and patients should be instructed not to fast, in order to reduce the risk of the occurrence of hypoglycemia.

# **MATERIAL AND METHODS**

## **MATERIALS AND METHODS**

Individuals seeking treatment for dental pain and attending the department of Oral Medicine of Sri Ramakrishna Dental College and Hospital, Coimbatore were included in this study. Controls were age and sex matched for diabetics and so that there were 2 non diabetics for each diabetic individual.

### **INCLUSION CRITERIA**

1. Patients with type II diabetes mellitus for a minimum of 5 years and who were under medication with (HbA1c <6.5%).
2. Teeth with irreversible pulpitis (type II Diabetic and Non-Diabetic patients).
3. Multi-rooted teeth (premolars and molars).

### **EXCLUSION CRITERIA**

1. Patients with complicating systemic diseases.
2. Patients having severe pain and /or apical abscess.
3. Patients under 18 years of age and above 60 years of age.
4. Patients having multiple teeth requiring treatment.
5. Patients with non-restorable periodontally compromised teeth.
6. Pregnant patients.
7. Teeth with calcified canals

The Hospital Scientific Committee and the Institution Ethical Committee approved the study, and all the patients gave written informed consent.

After initial screening 90 patients in the age group of 18-60 were included in this study. Among these 30 patients were diagnosed with diabetes for a minimum of 5 years and were under medication (group A) and 60 were non diabetic (group B). Each group were further subdivided into two subgroups; single visit (subgroup A) and two visit (subgroup B) by using a set of random numbers.

The standard procedure for both the groups during the first visit included administration of local anesthesia, rubber dam isolation, and standard access cavity preparation. Then orifice shapers were used for enlarging the coronal third of the canal. 15% EDTA with carbamide peroxide (Glyde file Prep -Dentsply) was used as a lubricant and 2.5% NaOCl and saline were used as irrigants. The working length of each canal was determined by an electronic apex locator (Dentsply Propex pixi) and radiographs. . Canals were prepared using hand files (K files, Mani) and ProTaper (DENTSPLY) rotary Nitti files using the hybrid technique. After instrumentation and final irrigation with saline canals were dried with paper points.

Teeth in single visit group were obturated in the initial appointment using gutta percha and ZOE sealer. Teeth in two visit group were sealed with a sterile dry cotton pellet and temporary filling material. The patients were recalled for the second appointment one week later and the teeth were obturated with the same methods and materials. All patients were prescribed Acecloren-P (Aceclofenac 100 mg + Paracetamol 500 mg) and instructed to be taken only if they experienced moderate pain. In such a case where the patients had to take analgesics they were excluded from the study. Any of the patients with unbearable pain were requested to visit the clinician for emergency treatment. The evaluation of post obturation pain was done with visual analogue scale (VAS) and converted to numerical rating scale.

The patients carried the visual analogue scale form home with them and were told to mark the level of pain at 6 hour, 12 hour, 24 hour, 42 hour, 72 hour and after 1 week.

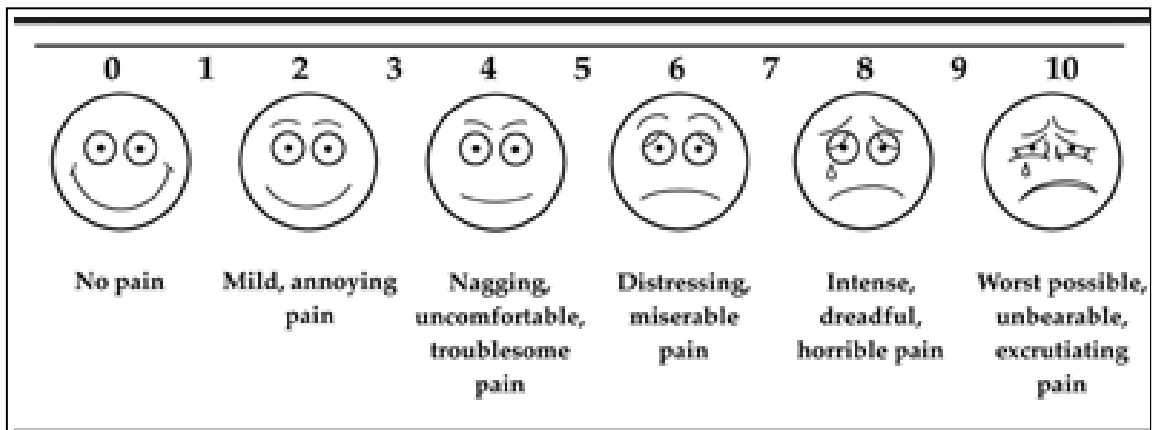


Figure 1: Visual Analogue Scale

Patients were instructed to point to the position on the line between the faces to indicate how much pain they are currently feeling. The far left end indicates "no pain" and the far right end indicates "worst pain ever."

Patients who underwent single-visit root canal treatment were asked to return for clinical examination and pain evaluation and those who underwent two-visit treatment were recalled for obturation after one week.

The post-obturation evaluation was recorded as

- 0- No pain
- 1- Slight pain/discomfort
- 2- Moderate pain relieved by analgesics
- 3- Moderate to severe pain not completely relieved by analgesics



4- Severe pain/swelling not relieved by analgesics and required unscheduled visit.

Patients were asked to return for clinical examination one week after the completion of root canal treatment. The results were statistically analyzed using chi-square test and when the probabilities were equal to or less than 0.05, the differences were considered significant.

## CONSENT FORM

I (Name of the patient) \_\_\_\_\_ age/sex \_\_\_\_\_ hereby agree to participate in the root canal treatment carried out by \_\_\_\_\_ in Sri Ramakrishna Dental College and Hospital, Coimbatore. I have been explained about the Treatment procedure to be done to me in its entirety to my satisfaction. I have clarified all my doubts regarding the same. I have been explained of all the sequela and complications and am solely responsible for opting this treatment with all my conscious without shifting any blame or complain towards the Doctor/ Staff/ Students/Institution/ Management.

Signature of the patient \_\_\_\_\_

Phone Number: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

## ஒப்புதல்படிவம்

நான் (நோயாளியின் பெயர்) \_\_\_\_\_ வயது / பாலினம் \_\_\_\_\_ கோயம்புத்தூர் ஸ்ரீ ராமகிருஷ்ணா பல்மருத்துவ கல்லூரி மற்றும் மருத்துவமனையில் \_\_\_\_\_ மேற்கொள்ளப்படும் மருத்துவ ஆய்வுகளில் பங்கேற்க ஒப்புக்கொள்கிறேன், என் திருப்திக்கு முழுமையாக என்மீது செய்யப்படும் நடைமுறை பற்றி நான் விளக்கப்பட்டுள்ளேன். நான் அனைத்து தொடர்ச்சியான நிகழ்வுகள் மற்றும் சிக்கல்களைபற்றி விளக்கப்பட்டுள்ளேன் மற்றும் இந்த மருத்துவ ஆராய்ச்சியில் பங்கேற்பதற்கு முழு பொறுப்பாளியாக இருக்கிறேன். டாக்டர் / ஊழியர்கள்/மாணவர்கள்/ நிறுவனம் / மேலாண்மை / நிர்வாகத்தின்மீது நான் எந்தபுகாரும் அல்லது குற்றம் சாட்ட மாட்டேன்.

நோயாளிகையொப்பம் \_\_\_\_\_

தொலைபேசிஎண்: \_\_\_\_\_

முகவரி: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

## ARMAMENTARIUM



FIGURE 2: ARMAMENTARIUM



FIGURE 3: ACCESS OPENING

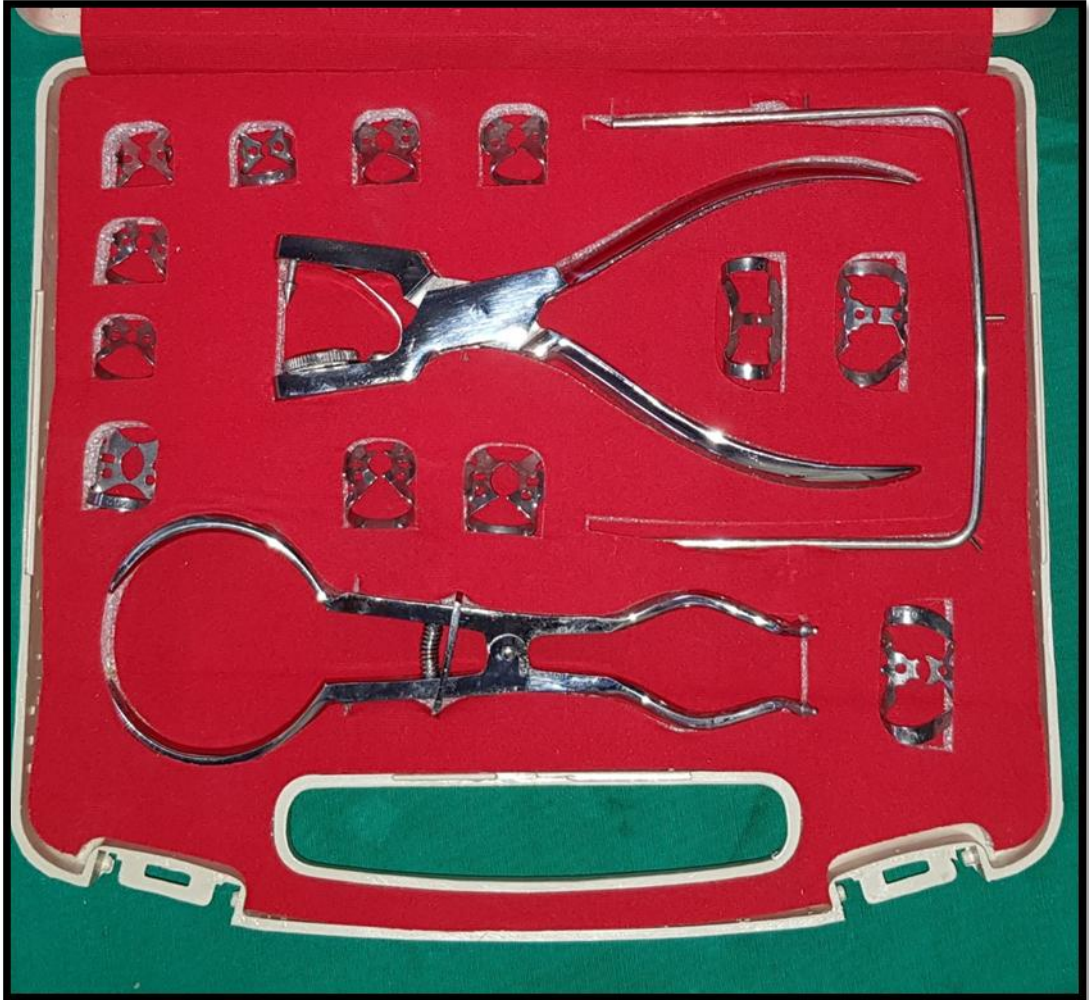


FIGURE 4: RUBBER DAM KIT



FIGURE 5: GLUCOMETER

**SRI RAMAKRISHNA DENTAL COLLEGE & HOSPITAL**  
 (Educational Service : M/s. S.N.R. Sons Charitable Trust)  
 SNR COLLEGE ROAD, COIMBATORE - 641 006  
 Ph : 0422 - 2560381

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Name : XXXXXXXXXX      Age : 47      Sex : M  
 Date : 1.11.18      Hospital No. : 24684      Ward : 5635

**BIO CHEMISTRY REPORT**

INVESTIGATIONS	VALUES	NORMAL VALUES
<b>BLOOD</b>		
FASTING SUGAR	: / Mg/dl	(80-100)
POST PRANDIAL SUGAR	: / Mg/dl	120-140)
RANDOM SUGAR	: / Mg/dl	(Up to 160)
UREA	: / Mg/dl	(14-40)
CREATININE	: / Mg/dl	(0.6 - 1.2)
CHOLESTEROL	: / Mg/dl	(150-250)
HbA1C	: 6.4 %	(4.4 - 6.7 Non Diabetic) (6.7 - 7.3 Goal) (7.3 - 9.1 good control) (>9.1 (Action suggested)
MBG	: 136.9 Mg/dl	
OTHERS :		

Lab Technician

FIGURE 6: HbA1c TEST RESULT

## **RESULTS**

## RESULTS

The data collected were compiled and statistical analysis was done by using 20 SPSS software. Descriptive statistics and inferential statistics have been applied. Kolmogorov-Smirnov test and Shapiro-Wilk tests were used for testing the normalcy and the statistical analysis was completed with chi-square test.

30 type II diabetic and 60 non-diabetic patients were evaluated for post obturation pain in this study. In controlled diabetic group (Group A), 15 patients underwent single visit root canal treatment and remaining 15 underwent two visit root canal treatment. In non-diabetic group (group B), 30 patients underwent single visit root canal therapy and remaining 30 patients underwent two-visit treatment. Among the 15 controlled diabetic patients who underwent single-visit root canal treatment 8 were male (53.4%) and 7 were female (46.6%) and among the remaining 15 controlled diabetic patients who underwent two-visit root canal treatment 9 were male (60%) and 6 were female (40%). In the non-diabetic group, 30 patients underwent single-visit endodontic therapy (13 males- 43.4% and 17 females - 56.6%) and 30 patients underwent multi-visit endodontic therapy (21 males-70% and 9 females-30%).

None of the patients experienced severe pain in our study. Only one patient had moderate pain in the single visit controlled diabetic group. In single visit group after 1 hour, mild pain was experienced by 3.3% of non-diabetic patients and 6.6% of controlled diabetic patients. Similarly after 6 hours, 3.3% of non-diabetic patients had mild pain whereas 13.3% of controlled diabetic patients had mild pain and after 12

hours 20% of controlled diabetic patients had pain whereas only 10% of non-diabetic patients experienced pain (Table : 1 and graph: 1).

In the single visit group after 24 hours, 16.7% of non-diabetic patients experienced pain whereas 13.3% of controlled diabetic patients experienced pain. Similarly after 48 hours, 16.7% of non-diabetic patients and 6.7 % of controlled diabetic patients had mild pain. After 72 hours none of the controlled diabetic patients experienced pain whereas 3.3% of patients in the non-diabetic group experienced pain. After one week regardless of being diabetic or non-diabetic none of the patients experienced pain (Table 1 and graph 1).

In multi-visit group after 1 hour of first visit, both controlled diabetic and non-diabetic patients did not report any incidence of pain. After 6 hours 3.3% of non-diabetic patients had pain whereas controlled diabetic patients experienced no pain. After 12 hours the incidence of pain in both controlled diabetic and non-diabetic individuals were same (20%). After 24 hours none of the controlled diabetic patients had pain but 23.3% of non-diabetic patients showed pain. After 72 hours and one week none of the non-diabetic patients experienced pain but among the controlled diabetic group after 72 hours 13.3% of the patients had pain and after one week 6.7% of the patients had pain (Table 1 and graph 2).

Following obturation in the second visit during two-visit endodontic therapy, none of the patients in both controlled diabetic and non-diabetic group experienced pain regardless of the time period (Table 1).

In single visit group the incidence of pain was more among males in both controlled diabetic and non- diabetic group. Similarly, in two visit group males had



more incidence of pain when compared to females. After second visit in two-visit group none of the patients had pain (both diabetic and non-diabetic) (Table-2).

In non-diabetic group after 12 hours, 24 hours and 48 hours there was a significant difference in pain between single visit and two-visit group ( $p < 0.05$ ) (Table 3) and the incidence of pain was more in two visit group (graph 1). In controlled diabetic group, there was no significant difference between single visit and two-visit group (Table 3) and the incidence of pain was more in single visit group in the first day which gradually reduced (Graph 3).

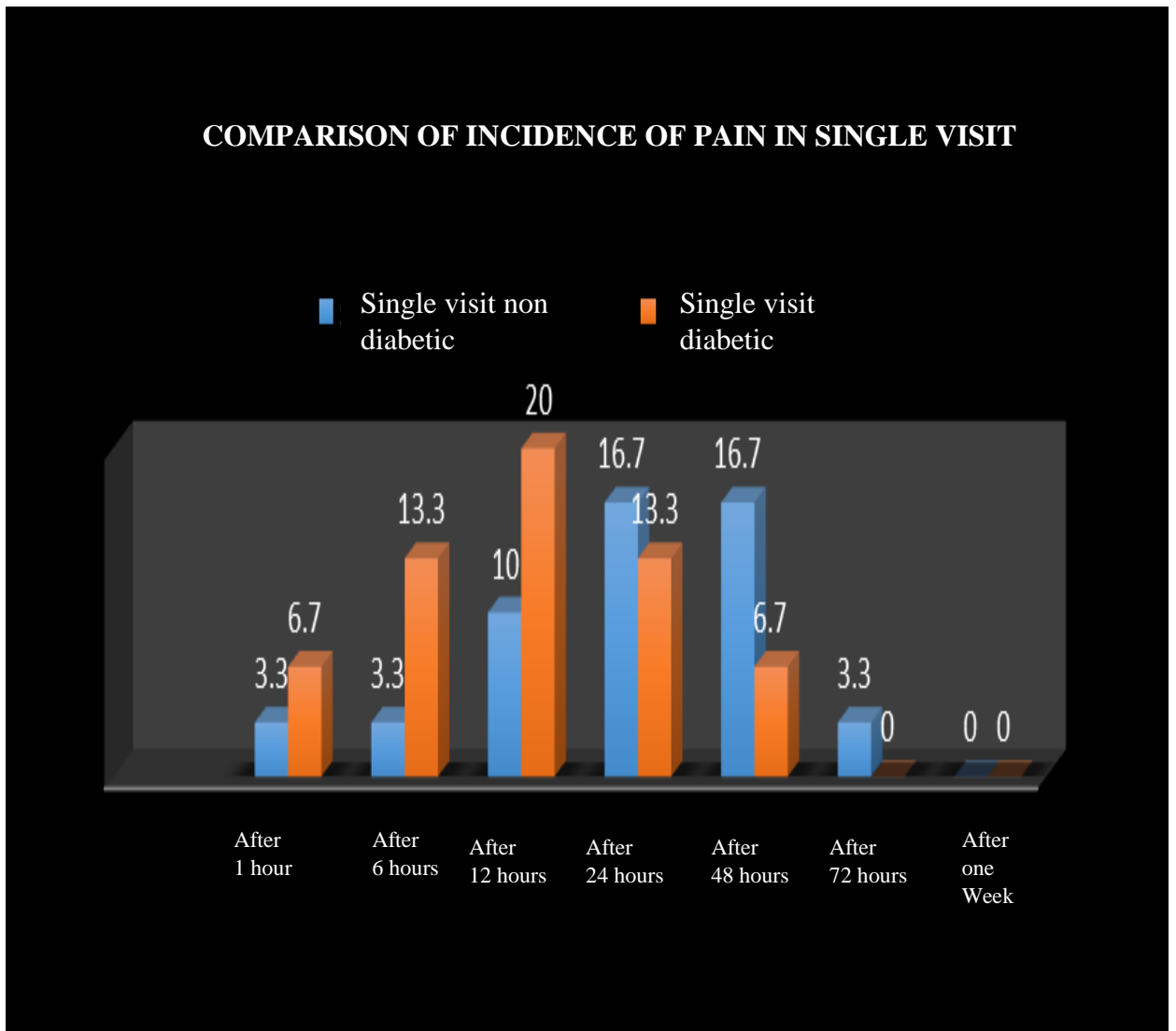
In controlled diabetic group, there was no significant difference in pain at any time interval between single visit and two-visit groups (Table 3) but the incidence of pain was high in single visit group in the first 24 hours which gradually reduced. After first visit in the two visit group, higher incidence of pain was present at the time interval of 48 hours and 72 when compared to single visit group (Graph 4)

Overall comparison of pain among diabetic and non-diabetic individuals following one-visit and two visit root canal therapy at various time intervals shows no significant difference (Table 4-9).

TABLE 01: Incidence of Pain among Diabetes and Non Diabetes in Various Groups and Intervals.

Group		After 1 hour	Six hour	Twelve hour	Twenty four hour	Forty eight hours	Seventy two hours	One week
Single visit	Non diabetic	3.3	3.3	10	16.7	16.7	3.3	0
	Diabetic	6.7	13.3	20	13.3	6.7	0	0
First visit in two visit	Non diabetic	0	3.3	20	23.3	20	0	0
	Diabetic	0	0	20	0	13.3	13.3	6.7
Second visit in two visit	Non diabetic	0	0	0	0	0	0	0
	Diabetic	0	0	0	0	0	0	0

GRAPH 1



GRAPH 2

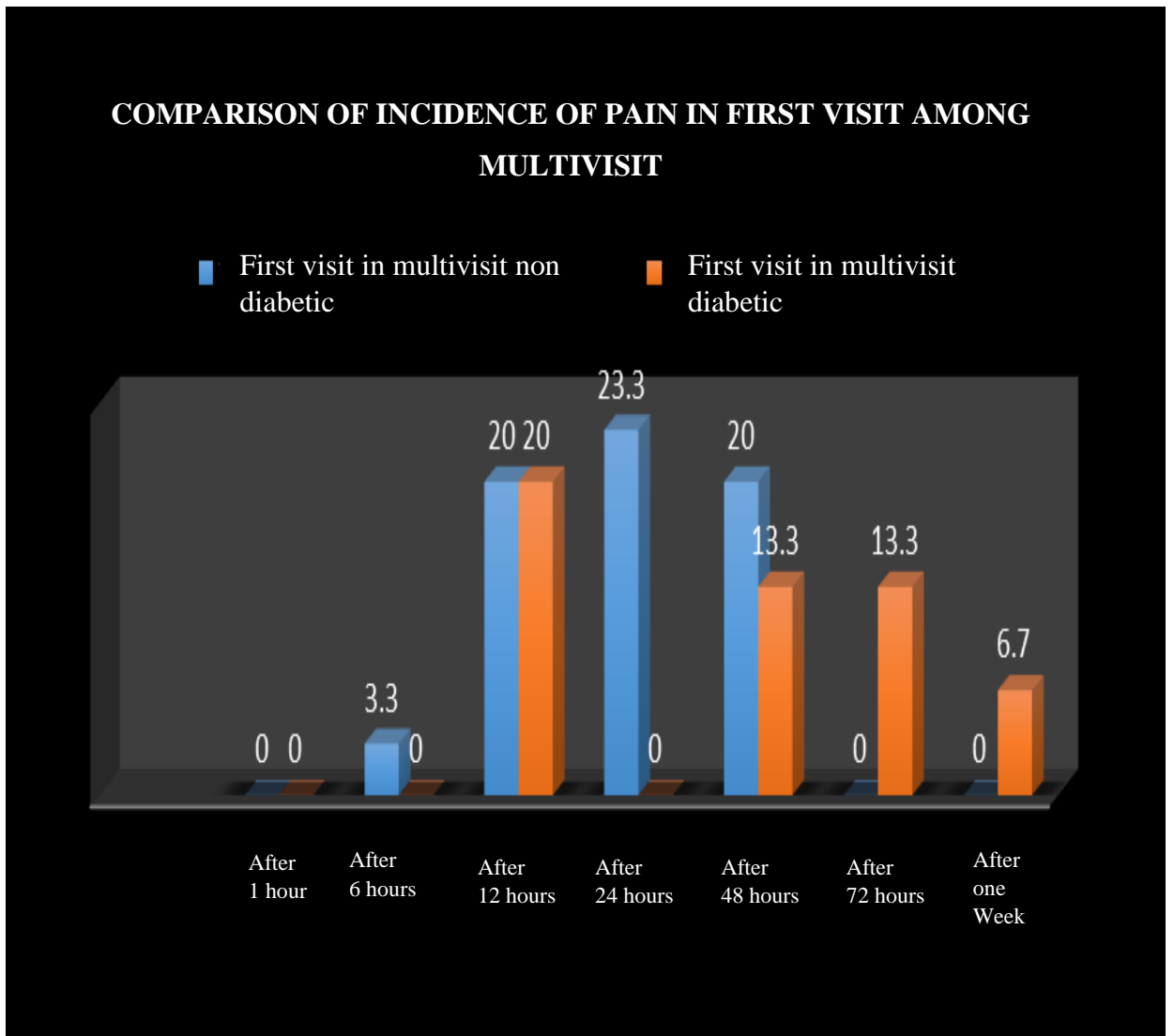


TABLE 02: Incidence of Pain among Male and Female and Diabetes and Non Diabetes in Various Groups at various Intervals.

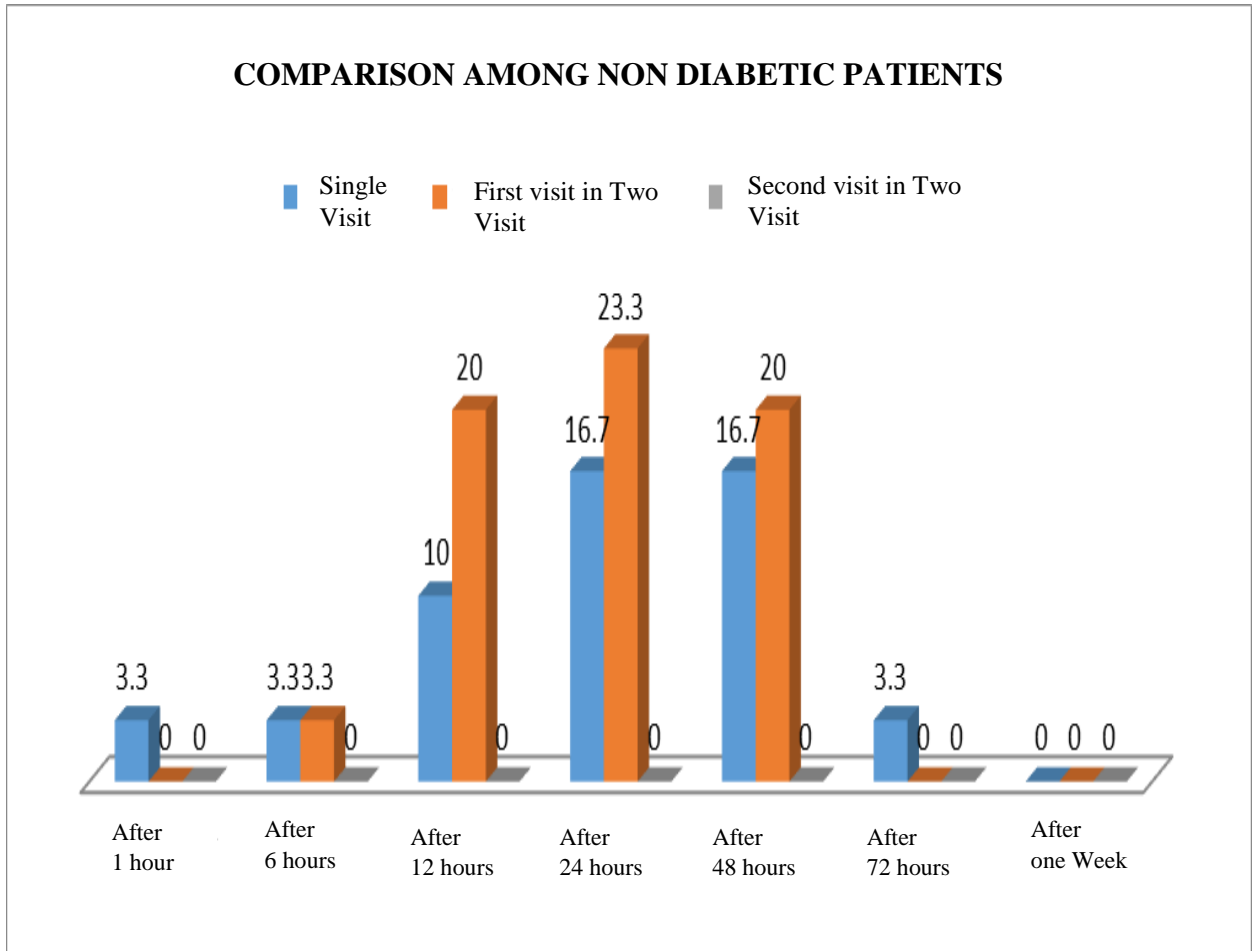
Group			After 1hour	Six hour	Twelve hour	Twenty four hour	Forty eight hours	Seventy two hours	One week
Single visit	Non diabetic	Male	7.1	7.1	14.3	28.6	14.3	7.1	0
		Female	0	0	6.3	6.3	18.8	0	0
	Diabetic	Male	12.5	12.5	37.5	25	12.5	0	0
		Female	0	14.3	0	0	0	0	0
First visit in multi-visit	Non diabetic	Male	0	4.8	23.8	28.6	23.8	0	0
		Female	0	0	11.1	11.1	11.1	0	0
	Diabetic	Male	0	0	33.3	0	22.2	22.2	11.1
		Female	0	0	0	0	0	0	0
Second visit in multi visit	Non diabetic	Male	0	0	0	0	0	0	0
		Female	0	0	0	0	0	0	0
	Diabetic	Male	0	0	0	0	0	0	0
		Female	0	0	0	0	0	0	0

TABLE 03: Comparison Based on Diabetic and Non-Diabetic Patients between the Group Using Median Test at Various Intervals of Time.

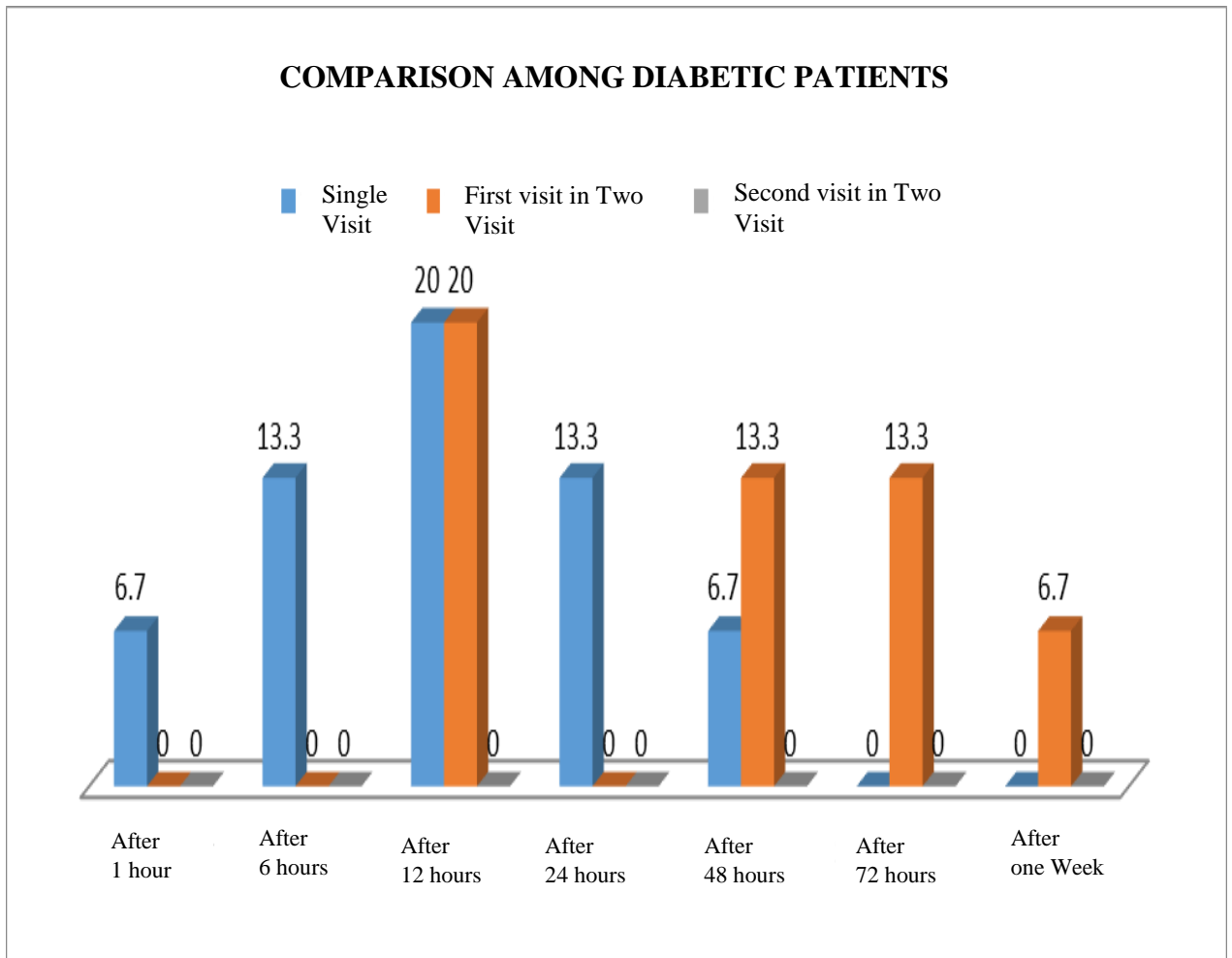
	median value		Non Diabetic			Chi square value	p value	Diabetic			Chi square value	p value
			Single Visit	First visit in multi-visit	Second visit in multi visit			Single visit	First visit in multi-visit	Second visit in multi visit		
After 1hour	0	> Median	1	0	0	2.022	0.364	1	0	0	2.045	0.36
		<= Median	29	30	30			14	15	15		
Six hour	0	> Median	1	1	0	1.023	0.6	2	0	0	4.186	0.123
		<= Median	29	29	30			13	15	15		
Twelve hour	0	> Median	3	6	0	6.667	0.036*	3	3	0	3.462	0.177
		<= Median	27	24	30			12	12	15		
Twenty hour	0	> Median	5	7	0	7.5	0.024*	2	0	0	4.186	0.123
		<= Median	25	23	30			13	15	15		
Forty eight hours	0	> Median	5	6	0	6.421	0.04*	1	2	0	2.143	0.343
		<= Median	25	24	30			14	13	15		
Seventy two hours	0	> Median	1	0	0	2.022	0.364	0	2	0	4.186	0.123
		<= Median	29	30	30			15	13	15		
One week	0	> Median	0	0	0	1	1	0	1	0	2.045	0.36
		<= Median	30	30	30			15	14	15		

P < 0.05 = significant  
P > 0.05 = non significant

GRAPH 03: Comparison of Incidence of Pain in Non-Diabetic Group

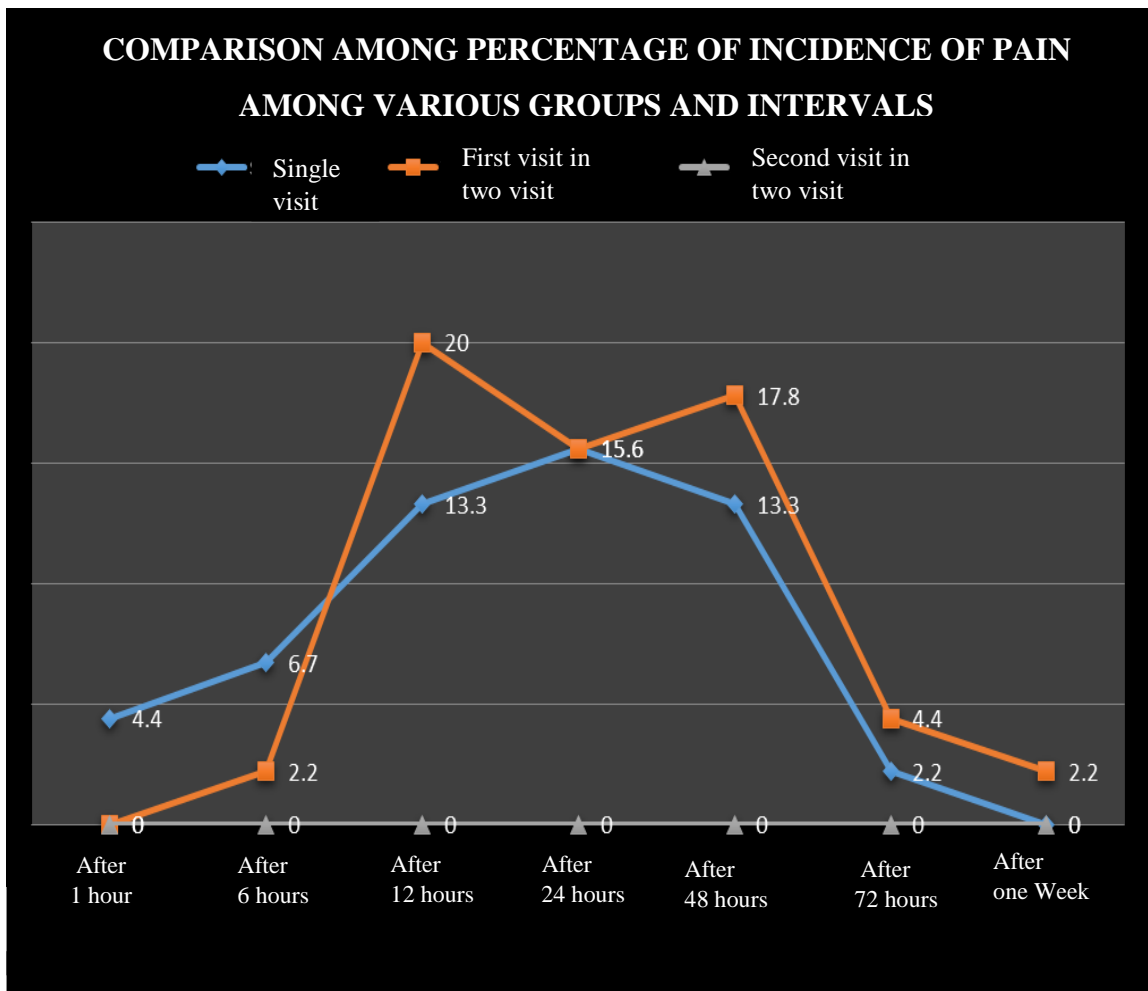


GRAPH 04: Comparison of Incidence of Pain in Diabetic Group





GRAPH 5: Overall Comparison of Pain Between One Visit and Two Visit Groups



Overall comparison of pain among Diabetic and Non-Diabetic individuals following one-visit and two visit Root Canal Therapy at various time intervals.

TABLE: 4

After One Hour		Non Diabetic	Diabetic	Total	Chi square	p value
Single visit	No pain	29	14	43	0.26	0.678
	Slight pain/discomfort	1	1	2		
	Total	30	15	45		
First visit in Two-visit	No pain	30	15	45	0	1
	Total	30	15	45		
Second visit in Two visit	No pain	30	15	45	0	1
	Total	30	15	45		

TABLE: 5

After Six Hours		Non diabetic	Diabetic	Total	Chi square	p value
Single visit	No pain	29	13	42	1.607	0.2
	Slight pain/discomfort	1	2	3		
	Total	30	15	45		
First visit in Two-visit	No pain	29	15	44	0.511	0.475
	Slight pain/discomfort	1	0	1		
	Total	30	15	45		
Second visit in Two visit	No pain	30	15	45	0	1
	Total	30	15	45		

TABLE -6

After Twelve Hours		Non diabetic	Diabetic	Total	Chi square	p value
Single visit	No pain	27	12	39	0.865	0.352
	Slight pain/discomfort	3	3	6		
	Total	30	15	45		
First visit in two visit	No pain	24	12	36	0	1
	Slight pain/discomfort	6	3	9		
	Total	30	15	45		
Second visit in two visit	No pain	30	15	45	0	1
	Total	30	15	45		

TABLE -7

Twenty-four hour		non diabetic	diabetic	Total	chi square	p value
Single visit	No pain	25	13	38	0.086	0.771
	Slight pain/discomfort	5	2	7		
	Total	30	15	45		
First visit in Two visit	No pain	23	15	38	4.14	0.042
	Slight pain/discomfort	7	0	7		
	Total	30	15	45		
Second visit in Two visit	No pain	30	15	45	0	1
	Total	30	15	45		

TABLE-8

Forty eight hours		Non diabetic	Diabetic	Total	Chi square	p value
Single visit	No pain	25	14	39	0.86	0.352
	Slight pain/discomfort	5	1	6		
	Total	30	15	45		
first visit in Two visit	No pain	24	13	37	0.304	0.581
	Slight pain/discomfort	6	2	8		
	Total	30	15	45		
second visit in Two visit	No pain	30	15	45	0	1
	Total	30	15	45		

TABLE-9

After Seventy Two Hours		Non diabetic	Diabetic	Total	Chi square	p value
Single visit	No pain	29	15	44	0.511	0.475
	Slight pain/discomfort	1	0	1		
	Total	30	15	45		
First visit in Two visit	No pain	30	13	43	4.186	0.041
	Slight pain/discomfort	0	2	2		
	Total	30	15	45		
Second visit in Two visit	No pain	30	15	45	0	1
	Total	30	15	45		

## **DISCUSSION**

## DISCUSSION

Single-versus multiple-visit root canal treatment has been the subject of long-standing debate in the endodontic community<sup>38</sup>. One visit root canal treatment is more attractive to the patient because it saves time and would seemingly reduce the cost and appointments of the procedure<sup>39</sup>. In addition, one visit treatment would be expected to be less stressful to the anxious patient. The most important advantage is that it prevents the contamination of root canal and/or bacterial regrowth that can occur when the treatment is prolonged over an extended period<sup>40</sup>. However, single visit root canal treatment comes with its own drawbacks and is not advisable for certain conditions like painful necrotic teeth with no sinus track or drainage, teeth with severe anatomic anomalies or cases with procedural difficulties, asymptomatic non-vital teeth with periapical pathology, teeth with limited access, acute alveolar abscess cases with pus discharge, most of the retreatment cases and patients who are unable to keep their mouth open for long duration in certain conditions such as TMJ disorders<sup>29</sup>.

The possible connection between chronic apical periodontitis and systemic health is one of the most interesting aspects encountered by the scientific community<sup>41</sup>. In the last few decades several epidemiological studies have investigated the association between systemic health and Periodontal Diseases. In a study done by Rudranaik et al 2016<sup>42</sup>, they suggested that a multi visit root canal treatment is a safe method for diabetes mellitus patients with apical periodontitis.

There are not many studies in the literature comparing the post-endodontic pain after single visit and multi visit root canal treatment in controlled type II Diabetic individuals with irreversible pulpitis. Hence the aim of this randomized controlled

trial was to compare post-endodontic pain after single visit and multi visit root canal treatment in controlled type II Diabetes mellitus patients and non-Diabetic individuals who were diagnosed with irreversible pulpitis.

The subjects included in this study were adult patients undergoing dental service in our dental college for the first time. Both men and women were included in the present study. In order to avoid bias all the patients were treated by a single operator and the pain assessment was carried out by two other doctors who were blinded about the single and multi-visit treatment.

A study done by Marshall et al 1993<sup>1</sup> reported that a direct relationship existed between preoperative and postoperative endodontic pain levels. Another study done by Gotler et al (2012)<sup>4</sup> found that root canal treatment of teeth with vital pulp experienced a significantly higher intensity of post endodontic pain compared to teeth with necrotic pulp or retreated teeth. Therefore in this present study we have included only vital teeth (irreversible pulpitis) for comparing the post-endodontic pain after single visit and two-visit root canal therapy in both diabetic and non-diabetic groups. Those who needed root canal therapy for multiple teeth were excluded from the study in an attempt to avoid possible bias. The pulp status of each tooth was determined as vital only when the tooth responded immediately to cold stimuli before treatment or there was evidence of bleeding on opening the pulp chamber during root canal treatment.

Visual analogue scale was used for evaluating the post obturation pain as in previous studies done by Patil et al (2016)<sup>43</sup>, Rao et al (2013)<sup>29</sup>. In this study multi-rooted posterior teeth were included (premolars and molars) irrespective of the number of roots present.

Based on the review by Priyanka et al (2013)<sup>44</sup>, presence of systemic diseases like diabetes mellitus contributes to the severity of endodontic infections and the response of the teeth to treatment. In a study done by Fouad et al (2003)<sup>45</sup> based on the outcome of endodontic treatment in diabetic and non-diabetic patients, patients diagnosed with peri-radicular lesions and diabetic patients on insulin tend to have an increased incidence of peri-radicular pain compared to non-diabetics. They also had twice the rate of flare-ups compared to non-diabetics however; this difference was not statistically significant.

In this present study we evaluated patients without peri-apical radiolucency and teeth with vital pulp. In the development of the chronic inflammation, metabolic disorders and dental infections share common fundamental mechanism, like the function of macrophages and macrophage-derived mediators are well-investigated in both metabolically triggered and infection-stimulated inflammation (Sasaki et al 2016)<sup>46</sup>. The pulpal infection is polymicrobial, with predominantly gram-negative anaerobes. Once bacteria invade and colonize the dentin, their removal is very difficult. Although pulpal infection initiates an immune response in the dental pulp, the immune response is insufficient in eradicating the pathogens, because immune cells and molecules cannot reach into the dentin effectively. In addition, the dental pulp is uniquely situated in a low-compliance environment surrounded by dentin and lacks a collateral vascular supply. The dental pulp receives its blood supply from blood vessels entering/exiting through periapical foramen. When the pulpal vascular system becomes dysfunctional or damaged, the pulpal infection typically progresses to cause total pulpal necrosis and infection in the root canal.



In diabetic patients, the circadian rhythm of pulp sensibility is altered than that of healthy elderly<sup>47</sup>. The compromised circulation within pulp due to endarteritis obliterans and lack of collateral circulation along with altered polymorphonuclear activity in diabetics are considered to result in an increased risk for infection or pulp necrosis<sup>48</sup>. Therefore, systemic conditions and disorders may have an influence in the healing outcome of endodontically treated teeth rather than just acting as a causative etiologic factor in endodontic infections.

In a study done by Ali et al(2012)<sup>3</sup> for comparing the post obturation pain after one visit and multi-visit root canal treatment, the pain intensity was found to be highest on the first day of treatment and dropped afterwards. . The results of similar studies also concluded that the incidence of post-endodontic pain was common after one day of root canal treatment (29 %) but that it mostly found to be subsided after seven days of the treatment ( Pak et al 2016)<sup>49</sup>.

In our study, patients under non-diabetic group experienced significant difference in pain between single visit and two-visit group ( $p < 0.05$ ) after 12 hours, 24 hours and 48 hours and the incidence of pain was more in two- visit group. In controlled diabetic group, there was no significant difference between single visit and two-visit group and the incidence of pain was more in single visit group in the first day which gradually reduced.

Factors which affect pain in root canal treatment could be the vitality of the tooth, presence of pre-operative pain, patient's age, gender, arch etc. Microbial causes (persistence of pathogenic bacteria), host resistance, apical extrusion of debris and inflammatory events (Ali et al 2012)<sup>3</sup>. In this present study; controlled diabetic

patients, even though there was no significant difference in pain between single and two visit group, the incidence of pain was more among single visit group. In two-visit group, after 1 hour and 6 hour none of the patients had pain but after 24 hours diabetic patients experienced significantly high amount of pain when compared to non-diabetic patients. After 72 hours and one week of two visit treatment controlled diabetic patients exhibited more pain than non-diabetic individuals. The Inter-appointment pain could be mostly due to the development of acute inflammation at the peri-radicular tissues. Following injury to the peri-radicular tissues, a myriad of chemical substances are released or activated, which will mediate characteristic events of inflammation, such as vasodilatation, increase in vascular permeability, and chemotaxis of inflammatory cells. The chemical mediators of inflammation include vasoactive amines, prostaglandins, leukotrienes, cytokines, neuropeptides, lysosomal enzymes, nitric oxide, oxygen-derived free radicals, and plasma-derived factors which causes pain.<sup>50</sup>.

A study done by Sen et al 2017<sup>23</sup>, found that controlled diabetic patients had more inter-appointment flare-ups when compared to non-diabetic patients. Similarly in another study done by Fouad et al<sup>45</sup> the incidence of flare-up during endodontic treatment was 8.6% for diabetics and 2.3.% for non-diabetics. In their study the authors have stated that though statistically not significant, the diabetics had twice as many flare-ups than non-diabetics.

The reason for increased pain levels in diabetic individuals in single visit group could be due to high glucose levels which can inhibit macrophage function (chemotaxis, phagocytosis and bacterial death) resulting in an inflammatory state that impairs host cellular proliferation and wound healing. Therefore, these patients are

more susceptible to infection processes, especially anaerobic ones, due to reduced oxygen diffusion through the capillary wall, and increase in the formation of irreversibly glycated proteins forming advanced glycation end products<sup>7</sup>.

A study done by Ali et al<sup>3</sup> showed post-obturation pain is related to the gender. They found a statistically significant difference between the genders and found that more number of women experienced severe pain as compared to men, at all the three-time intervals of time (12 hours, 24 hours and 48 hours). In the present study, there was no equal distribution of male and female patients among the diabetic and non-diabetic groups. More number of male patients were there in both diabetic and non-diabetic group. Hence the results showing more pain among male patients cannot be considered as significant

The lack of control in diabetic mellitus could delay healing of periapical lesions and increase their size despite receiving the root canal treatment. In our study we determined the metabolic control of the Diabetes Mellitus by measuring glycated hemoglobin levels (HbA1c) (Figure-7) and who were under medication (HbA1c <6.5%) with vital pulp without any periapical radiolucency were included.

<b>Result</b>	<b>A1C</b>
<b>Normal</b>	less than 5.7%
<b>Prediabetes</b>	5.7% to 6.4%
<b>Diabetes</b>	6.5% or higher

FIGURE 7: American Diabetes Association 2018 guideline for HbA1c

Even though there were no significant difference in the pain sensation between single visit and multi visit root canal treatment, diabetic patients experienced more amount of pain in the first day after treatment in single visit group. This could be because the altered inflammatory response in diabetic patients. The mechanism of wound healing will be altered even in controlled diabetic patients (Montoya-Carraleo et al )(2012)<sup>51</sup>.

In the present study, Diabetic patients in two visit group experienced comparatively less pain in the first few hours after treatment. Therefore controlled type II Diabetes mellitus can be considered as one of the parameters which can affect the post obturation pain in irreversible pulpitis in single visit endodontics. According to the results of this study devoid of being diabetic or non-diabetic no difference in pain perception was seen between single and multiple visit endodontics suggesting that single visit endodontic treatment can be done in controlled diabetic patients.

There are a few limitations in this study. Both premolars and molars were included irrespective of the number of roots. As molars have more number of roots when compared to premolars, the incidence of pain could vary. Hence further studies are required to compare pain perception between premolars and molars for more accurate results. In our study there was no equal distribution between male and female patients, hence pain comparison among different sexes may vary. In this study, post obturation pain was compared in diabetic and non-diabetic individuals after single visit and two-visit root canal treatment. As an extension of this study periapical healing could also be assessed this would throw light on healing ability in controlled diabetic patients after single and two-visit root canal treatment.

## **SUMMARY AND CONCLUSION**

## SUMMARY AND CONCLUSION

The aim of this randomized controlled trial was to compare the post-endodontic pain between type II controlled Diabetes Mellitus patients and non-diabetic individuals with irreversible pulpitis after single visit and two-visit root canal treatment. 30 controlled diabetics and 60 non-diabetics with ages ranging from 15 to 60 who were attending the Department of Conservative Dentistry and Endodontics for the treatment of irreversible pulpitis, were included in this study. All the subjects underwent Random blood sugar (RBS) test to pick undiagnosed type II Diabetes Mellitus and Glycated hemoglobin (HbA1c) levels were measured in diabetics to assess their glycemic control. Teeth categorized in single visit group were obturated in the first appointment and teeth in two visit group were sealed with a dry and sterile cotton pellet and temporary restorative material. The patients were recalled for the next appointment of root canal treatment one week later and the teeth were obturated with the same materials and methods. Two observers who were blinded about the single visit and two-visit group, assessed the pain intensity with the help of Visual Analogue Scale.

The data were statistically analyzed to evaluate the significant difference in pain between both the groups and subgroups. Kolmogorov-Smirnov test and Shapiro-Wilk tests were used for testing the normalcy and the statistical analysis was completed with chi-square test.

Within the limitations of the study, it can be concluded that type II controlled diabetic patients with irreversible pulpitis experienced more pain after single visit root canal treatment in the first 12 hours when compared to non-diabetic patients. Though

the incidence of pain was more in diabetic group after single visit root canal treatment, there was no statistical significant difference in overall pain experienced by single visit and two-visit in diabetic group. To conclusively derive that whether diabetes can act as a disease modifier and affect the post obturation pain in irreversible pulpitis after single visit root canal treatment in controlled type II Diabetes, further studies to be carried out on a larger sample size.



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