

The difference between pulp chamber size of the mandibular first molar in patient with diabetes mellitus and non diabetes mellitus age 25-34 years using periapical radiography



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Abstract

Objective: The purpose of this study was to determine the differences size of mandibular molar pulp chamber in patients with diabetes mellitus and non-diabetes mellitus aged 25 to 34 years using periapical radiography.

Material and Methods: This study is analytically using the cross sectional observation. The population was patients who suffer from diabetes mellitus and non-diabetes mellitus at Tamamaung Health Center and at the Private General Practitioner Practice in Makassar. The samples was determined according to the inclusion and exclusion criteria in the study.

Results: The measurements of this study based on independent t test obtained p value (0.000) < α (0.01) which means there was a statistically significant difference of pulp chamber size of the mandibular first molar teeth patients with diabetes mellitus and non- diabetes mellitus using periapical radiography.

Conclusion: The presence of microvascular disorders and atheroma formation in the pulp causes the highest part of the pulp chamber of patients with diabetes mellitus experienced a reduction in size compared to the pulp chamber of non-diabetes mellitus.

Keyword: Diabetes Mellitus, Mandibular first Molar Teeth, Periapical radiography, Pulp chamber size

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Introduction

Diabetes mellitus is a chronic disease caused by metabolic abnormalities and is defined by an increase in persistent blood glucose levels which will lead to high risk and serious chronic microvascular disease, metabolic complications of type 1 diabetes (T1D) and macrovascular complications of type 2 diabetes (T2D).^{1,2} The global prevalence of diabetes in adults is 6.4% (285 million people) in 2010, and is expected to increase to 7.7% in 2030.¹ T2D, also called non-insulin-dependent diabetes mellitus (NIDDM) is a type the most common in adults and a major cause of morbidity and mortality worldwide.^{1,3} Unhealthy dietary habits, obesity, genetic factors and erratic lifestyles are known to be the main risk factors for the development of T2D.^{1,4} Globally, around 5.1 million people between the ages of 20 and 79 died of T2D in 2015.¹ Increased food energy consumption compared to low energy expenditure, which results in obesity and weight gain are major risk factors.^{1,2}

Uncontrolled diabetes mellitus will cause manifestations in the oral cavity, including dry mouth, burning mouth syndrome, tooth decay, candidiasis, bacterial infections, gingivitis, periodontitis and prolonged wound healing.⁵ In addition, blood vessels, especially capillaries, which interfere

with leukotactic responses and failure to provide humoral and cellular components of the immune system, and because the dental pulp does not have adequate blood circulation in the presence of diabetes, it will cause infection in the pulp to the periapical area. In addition, diabetes causes reduced blood plasma flow in the pulp, therefore it can affect the size of the pulp chamber.^{6,7}

Pulpal chamber measurements can using periapical radiography to determine diagnosis, treatment planning and evaluation.⁸ Measurements were made on mandibular first molars because these teeth appeared to be the clearest pulp chamber and the most frequently damaged.

There is a lack of research on differences between pulp chamber size in diabetes mellitus patients. Until now there has been no specific research based on age, in this study aged 25-34 years was carried out with consideration that dental pulp changes did not occur due to old age factors because the pulp is a connective tissue that will change according to the age.

The importance of knowing the distance of the pulp chamber is expected to reduce operator error in carrying out a treatment, especially in cavity treatment. The operator can estimate the extent of

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the cavity preparation to prevent perforation. In addition, a reduction of pulp chamber in adulthood can be suspected that maybe they have a systemic disease.

Material and Methods

This research was an analytic observational study with a cross sectional study design by doing observations on results of periapical radiographs of mandibular first molars in diabetic and nondiabetic patients which analyzed using an independent t-test.

The patients who were included in this study were men and women with age range from 25 to 34 years. These participants were recruited from the Tamamaung Public Health Center and Private General Practitioner Practice in Makassar who had been diagnosed T2D. As a control control group, the participants who were not diagnosed with type T2D, had good general and oral health. The participants were required to have vital mandibular first molar without caries lesion and restoration, and willing to sign inform consent. Pregnant women were not included in this study.

Participants with bruxism habit, gingival recession, and previous orthodontic treatment were also excluded.

Periapical radiographic was carried out in the radiology section of the Makassar Dental and Oral Health Service Center. The result of periapical radiographs were measured in the pulp chamber using calipers. Pulp space measurement was carried out by measuring the distance between the tip of the mesial pulp horns and mesial cusp [figure 1](#).

Results

Thirty subject were enrolled and completed the study. Thirteen (86.6%) participants were female in diabetes group and 11 (73.3%) female in control group, with an age range from 25 to 34 years [table 1](#).

In the current study, [table 2](#) showing that there is a statistically difference between the mean size of the pulp chamber of diabetes and non-diabetes patient were the p-value (0.000) < α (0.01).

The mean of the distance between the tip of mesial pulp and mesial cusp mandibular first molar showed bigger in diabetes mellitus patients (6.8333) than in non-diabetes mellitus patients (5.6000).

Tabel 1 Characteristic of the participant included of this study

Characteristic	Number of participant (%)
Age (years)	
25	1 (3.3)
27	1 (3.3)
28	5 (16.7)
29	1 (3.3)
30	3 (10.0)
31	1 (3.3)
32	4 (13.3)
33	4 (13.3)
34	10 (33.3)
History of diseases	
Male (Diabetes Mellitus)	2 (13.3)
Female (Diabetes Mellitus)	13 (86.6)
Male (Non-diabetes Mellitus)	4 (26.6)
Female (Non-diabetes Mellitus)	11 (73.3)

Tabel 2 The mean, standar deviation (SD), median values, and result of Independent t-test for the measurement of the distance between the tip of mesial pulp and mesial cusp mandibular first molar in Diabetes and Non-diabetes patient

	Mean (SD)	Median	p-value
Non-Diabetes Mellitus	5.6000 (0.50709)	6.0000	0.000*
Diabetes Mellitus	6.8333 (0.24398)	7.0000	

*: Significant at $p < 0.01$

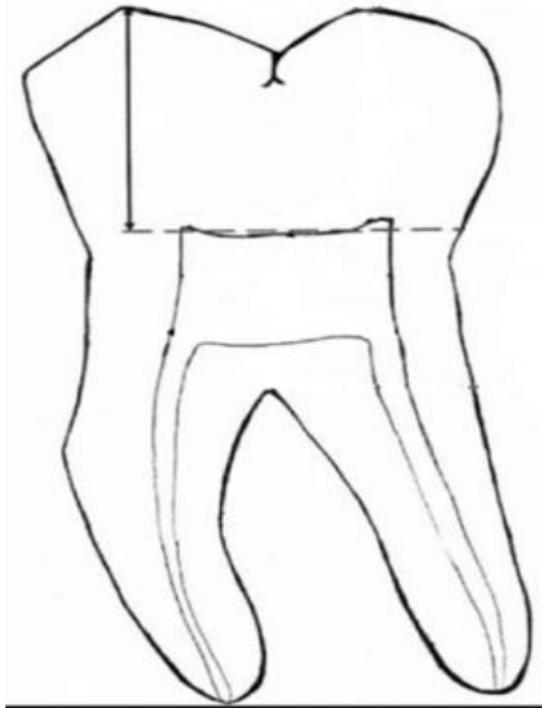


Figure 1 Illustration of pulp chamber measurement

Discussion

The existence of significant p-value in the current study shows that there is a significant difference in the size of the mandibular pulp molars in patients with diabetes mellitus and non-diabetes mellitus aged 25-34 years. This shows that the pulp chamber in the group of diabetes mellitus sufferers decreased at the height of the pulp chamber compared with the results of a non-diabetes mellitus photograph sample of mandibular first molars.

The narrowing of the pulp chamber is related to vascularity of the blood vessels in the pulp. Diabetes mellitus affects to the entire size of blood vessels in the body from the aorta to the smallest capillaries and venules. The blood vessels are damaged due to a buildup of atheroma deposits (hardened cholesterol deposits) in the tissues within the lumen of the arteries.⁶ The state of hyperglycemia can increase cholesterol levels in the blood because the lack of insulin can inhibit the action of lipases that play a role to destroy fat in the blood so that in diabetics who lack insulin can form plaque in blood vessels.^{6,9} In addition, Vascular disorders in the pulp cause a revascularization response that triggers the formation of hard tissue in the form of secondary dentin at the edge of the pulp in response to pulp inflammation. Obliteration of the root canal will be seen by using radiograph.¹⁰

The same results were shown by study that conducted by Nindha C.¹¹ which showed a narrowing of the pulp chamber in people with diabetes mellitus from the periapical radiograph,¹¹ but in the current study, the age of the participants included in this study was 25 - 34 years where the prevalence of T2D increases at this age.^{12,13} Another consideration is that the causes of pulp chamber narrowing at this age due to aging can be avoided and not to cause the results to be biased.

The study that conducted by Ilguy D et al.¹⁴ showed that T1D does not cause any changes in dental pulp size from the periapical radiograph.¹⁴ In the current study, the participants were type 2 diabetes mellitus sufferers. Plasma fibrinogen generally increases in T2D. Fibrinogen is the main protein for blood coagulation with fibrin precursors which are important factors in blood viscosity and platelet aggregation. Increased plasma viscosity due to increased fibrinogen concentration plays a role in increasing blood viscosity in diabetes mellitus. Hyperviscosity is an important component of micro disorders and microcirculation.^{15,16} Dhawale S et al also reported the results of his study in a group of T2D patients that showed elevated serum fibrinogen levels in T2D patients with higher macrovascular complications.¹⁶

The relationship between the narrowing of the pulp chamber in diabetics due to the pulp revascularization response and the formation of atheroma in the pulmonary arteries allows uncontrolled diabetes mellitus patients and prolonged hyperglycemia tend to cause vitality problems that can actually occur first in the dental pulp.¹¹

Conclusion

Based on the results obtained in this study, it can be concluded that there is a reduction in the size of the pulp chamber in patients with diabetes mellitus compared to non-diabetes mellitus through observations made on periapical radiographs.

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Conflict of Interest

The authors report no conflict of interest.

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