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Research Article

DMFT Index of Type 2 Diabetic Patients Attending UNRWA Health Centers in Gaza Governorates -

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ABSTRACT

Background: Oral Health (OH) is an essential component of general health, oral diseases have a negative social impact and adverse consequences on the quality of life, while their treatment places a considerable economic burden on individuals, communities and countries. Oral diseases are related to a number of risk factors and determinants that are common to Diabetes Mellitus (DM) which have oral implications. This study aimed to know DMFT index among type 2 diabetic patients attending UNRWA health centers in Gaza Governorates.

Method: An analytical cross-sectional study of 406 patients with type 2 DM selected through systematic random sampling from 5 UNRWA health centers. The World Health Organization's basic methods tools were used to collect data and assess OH.

Results: The mean Decayed Missing Filled Teeth (DMFT) score was 18.6. No treatment was needed for 8.4%, while prompt treatment including scaling was needed for 70.1% of participants. DMFT index was a statistically significant associated (p = 0.001) with Age, educational level, employment status, frequency of teeth brushing, diabetic duration (p = 0.038), and Glycated Hemoglobin (HbA1c) (p = 0.002). DMFT index was higher among males participants and participants under the deep poverty line.

Conclusion: Within the limits of the present study, the results indicated that patients with type 2 DM have high DMFT index, and unaware of oral implications of diabetes, a new UNRWA strategy for oral health must be devised for non-communicable disease patients.

INTRODUCTION

As a basic human right, an essential component of general health and important determinant factor for quality of life, oral health provides clues of overall health and reflects well-being of people. Poor oral health is accompanied by poor general health, so oral health and general health are related to each other and should be integrated rather than separated from each other. However the impairment of the ability to breath, eat, swallow, speak, and smile will interfere with the ability to interact with others, attend school, and work. Furthermore, oral diseases have a negative social impact and adverse consequences on the quality of life of affected people, while their treatment places a considerable economic burden on individuals, communities and countries [1].

Study objective

The aim of this study is to know DMFT index of type 2 diabetic patients attending UNRWA health centers in Gaza Governorates.

Methodology

An analytical, cross-sectional design to assess the oral health of 381 type 2 diabetic patients from five UNRWA health centers were examined and interviewed. The World Health Organization's (WHO) basic methods 5th Edition were used [2]. A representative sample had taken from five health centers according to systematic random sampling from type 2 diabetic patients attending UNRWA primary health care centers (39448 type 2 DM) with active DM file during 2017.

RESULTS AND DISCUSSION

Socio-demographic characteristics

The total number of study participants was 406 type 2 DM patients. Among them; 59.9% were female and 40.1% were male. The mean age for participants was 54.6 years with a Standard Deviation (SD) 8.02, 24.6% of participants were of age group less than 50 years old, while 23.4% were of age group from 51-55 years old, 25.4% were of the age group 56-60 years, and 26.6% were of the age group more than 60 years which was the highest percentage among all group. This distribution was consistent with UNRWA field disease control report which showed that 26% of patients were more than 60 years [3], another report showing that 43.3% of all type 2 DM patients are more than 55 years old [4]. The discrepancies in percentages are attributed to the difference in the age group where UNRWA field disease control reports for all patients while the age group of this study is limited from 35-65 years only.

(Figure 1) showing that females represent 59.9% of study participants, UNRWA field disease control report showed that females percentage among DM type 2 is 51%, 61% among diabetes and hypertension and 60% among all NCD patients [3]. Gender differences arise from socio-cultural processes, such as different behaviors of women and men, exposition to specific influences of the environment, different forms of nutrition, life styles or stress, or attitudes towards treatments and prevention. Moreover, women show more dramatic changes in hormones and body due to reproductive factors during lifetime [5].

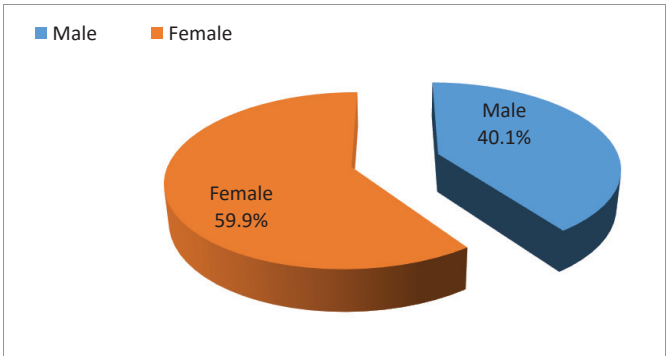

Figure 1: Distribution of participants by gender.

(Table 1) showing that approximately 90% of participants have formal schooling, only 9.1% have no formal schooling, 14.5% less than primary school, 14.0% primary school completed, 22.2% preparatory school completed, 19.0% secondary school completed, and 21.1% college/university completed and above.

The researcher noted that despite the majority of participants are less than 60 years old (73.4%), only 19.7% of participants were working and 80.3% were not working, moreover the mean of monthly income of participants was 959.55 NIS.

When the researcher categorized the participants according to deep poverty line: The poverty line and deep poverty line for the reference household (two adults and three children) stood at 2,290

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Table 1: Distribution of the study participants according to their Socio-demographic characteristics.

Items	No.	%
Age		
Less than 50 Years	100	24.6
From 51 to 55 years	95	23.4
From 56 to 60 years	103	25.4
More than 60 years	108	26.6
Total	**406**	**100.0**
Mean = 54.6 , MD = 56.00 , SD = 8.02		
Education		
No formal schooling	37	9.1
Less than primary school	59	14.5
Primary school completed	57	14.0
Preparatory school completed	90	22.2
Secondary school completed	77	19.0
College/University completed and above	86	21.1
Total	**406**	**100.0**
Work		
Yes	80	19.7
No	326	80.3
Total	**406**	**100.0**
Monthly Average Income		
Under Deep poverty line (1832 NIS)	347	87.2
Above Deep poverty line	51	12.8
Total	**398**	**100.0**
Mean = 959.55, MD = 600.00, SD = 839.25		

New Israeli Shekels (NIS) and 1,832 NIS respectively [6], the result was 12.8% of participants above deep poverty line and 87.2% under deep poverty line many of them their monthly income was zero and eight participants refused to declare their monthly income.

Most of participants were refugees living in poor and crowded refugee camps. This explains why the majority of them were not working and don't have sustainable sources of income, also this is in line with current conditions in the Gaza Strip due to the siege, unemployment and low wages [7].

The socio-demographic distribution of study participants is almost identical to the official statistics of Field Disease Control UNRWA, some differences emerged as a result of the inclusion criteria of the study; where age is limited from 35-65 years old.

Diabetes mellitus related characteristics

According to the annual report of UNRWA health department 2016; the number of patients with NCDs is increasing consistently by approximately 5.0% per year [8]. This is quite obvious when researcher note that the number of DM patients is almost doubled last 10 years, where participants had DM type 2 since less than 5 years were 33.0%, and those who had DM type 2 since 5-9 years were 26.8%, while 22.2% of them from 10-14 years, and 18.0% 15 years and more. The HbA1c test is an important blood test that gives a good indication of how well your diabetes is being controlled. Depending UNRWA categorization of participants according to their HbA1c, participants were divided into two major groups; controlled DM equal or less than 7% and uncontrolled more than 7%. The results showed that 21.4% of participants were controlled while 78.6% were uncontrolled (figure 2). This result is almost running with UNRWA reports where the percentage of controlled DM participants was 30% in 2016, and 27% in 2017 and they are targeting 30 % in 2018 [4], the difference between the result of the study and UNRWA reports is attributed to limited age group of the study.

A cross-sectional study of 369 patients with Type 2 Diabetes Mellitus (T2DM) from four Ministry of Health centers in 2016 showed the mean of HbA1c was 8.97 and one fifth of patients had good glycemic control (HbA1c < 7%) [9], the result is consistent with our study findings.

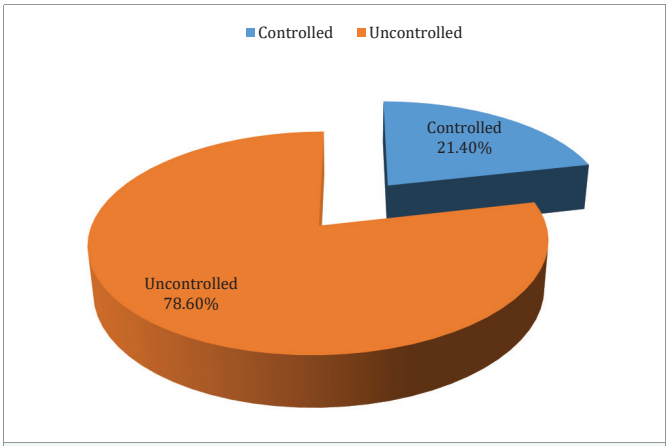

Figure 2: Distribution of participants by DM control status.

Dental status

The Decayed Missing Filled (DMF) index has been used for more than 70 years and is well established as the key measure of caries experience in dental epidemiology. The DMF Index is applied to the permanent dentition and is expressed as the total number of teeth or surfaces that are Decayed (D), Missing (M), or Filled (F) in an individual. When the index is applied to teeth specifically, it is called the DMFT index, and scores per individual can range from 0 to 32 [10]. (Table 3) showed that. The mean number of decayed teeth was high (6.1), while mean number of missed teeth was extraordinarily high (7.2 due to caries and 3.3 due to another reason but not from caries), whereas the mean number of filled teeth appear to be very low (1.6). These findings suggest that oral health care in Gaza Strip consist of radical treatment in term of tooth extraction, and reflects the lack of interest of participants in the treatment of teeth decayed.

(Figure 3) showed that, DMFT index for all participants is 18.6 teeth, which considered extraordinarily high, with mean of sound teeth 12.2 teeth, caries teeth 6.1 teeth, filled with caries 0.6 teeth filled without caries 1.6 teeth, missing because of caries 7.2 teeth, missing because of another reason but not from caries 3.3 teeth. The distribution of study participants according to their DMFT index clearly illustrates the positive relationship between age and DMFT index since the index increases with increased age.

According to The World Oral Health Report 2003, decayed missing filled permanent teeth of 35-44 years old worldwide very low (less than 5.0), low (5.0 -8.9), moderate (9.0-13.9), high (more than 13.9) [11]. Few published research investigated oral health

Table 2: Distribution of the study participants according to their DM related characteristics.

Items	No.	%
Diabetic duration		
Less than 5 Years	134	33.0
From 5 to 9 years	109	26.8
From 10 to 14 years	90	22.2
15 years and above	73	18.0
Total	**406**	**100.0**
Mean = 8.45, MD = 7.0, SD = 6.45		

Table 3: Distribution of the study participants according to dentition status by subject.

Items	Mean	MD	Std
Sound teeth	12.2	13.0	7.9
Carious teeth	6.1	5.0	5.3
Filled with caries teeth	0.6	0.0	1.3
Filled without caries teeth	1.6	0.0	3.3
Missing teeth due to caries	7.2	5.0	7.4
Missing teeth due to another reason but not from caries	3.3	0.0	8.0
Teeth protected by fissure sealants	0.0	0.0	0.1
Teeth with fixed dental prosthesis/crown abutment, veneer, implant	1.0	0.0	1.9
Un-erupted teeth	0.1	0.0	0.5
Unrecorded teeth	0.0	0.0	0.1

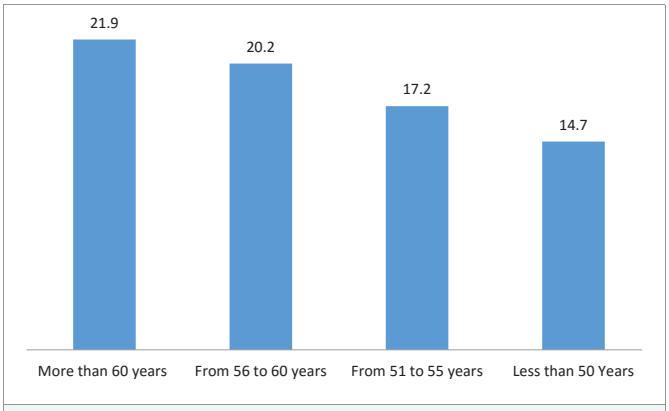

Figure 3: DMFT index of age groups.

among Palestinians and the available ones assessed dental caries experience among school children only. Dental caries experience data available for preschoolers and school children show high dental caries experience in both primary teeth (DMFT of 2.5) and permanent teeth (DMFT of 6.5). No data is available about oral health of Palestinian adults, study to assess dental and periodontal health status of a convenience sample of 370 subjects participated in an oral health awareness campaign in the center of the busiest cities in the West Bank, Palestine, (Mean age of the sample was 32 ± 12 year) showed that the mean DMFT score was 9 ± 5 [12]. Another study to measure the distribution of dental caries in a group of Palestinian adolescents, sample of 677 individuals of both sexes (411 were females and 266 were males) their ages ranged from 12 to 15 year old randomly selected from schools in northern west bank in Palestine, they study showed that, the prevalence of dental caries was higher in females with DMFT 5.39 ± 2.854 than males with DMFT 5.26 ± 2.891 [13], 119 Pregnant women visiting prenatal programs at Ministry of Health centers in Jerusalem governorates were screened using the Decayed, Missed and Filled Teeth (DMFT) index to quantify their dental caries experience, women were housewives with mean age 26 years, the result showed that the mean DFMT index is 14 [14]. A study Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health, Faculty of Graduate Studies, at An-Najah National University, Nablus Palestine, conducted by Baraa Naji Mustafa Sabha, in April 2007 to determine dental caries prevalence among representative sample of 12-year-old schoolchildren (357 children) in Northern West-Bank, Palestine, result showed that, mean DMFT for the overall of the sample was3.45 and only 16% of children were caries free.

The DMFT index values observed in this study (18.6 in 35-65 year old with type 2 DM) are higher than those found in more developed countries and almost same as developing countries. For example, in New Zealand, the mean DMFT in 35-44-year-old was 10.0 and 24.2 in 65-74-year-old adults. In the second National Survey of Oral Health in China (2002), the mean DMFT in 35-44-year-old adults was 2.1 and 12.4 in the 65-74-year-old group. In Spain, the national surveys in the 35-44-year old group made in 1984, 1993, 2000, and 2005 showed a DMFT of 11.6, 10.9, 8.4, and 9.6, respectively, whereas for 65-74-year-old adults, the 3 national surveys in 1993, 2000 and 2005 showed a mean DMFT of 21.16, 18.10, and 16.8, which shows a decrease in the caries experience. Only two South American countries have carried out surveys with national samples with oral exam in adults: Colombia (1999) with a DMFT of 15.00 in the 35-44-year-old group and 19.6 in the "older than 55" group and Brazil with a mean DMFT of 20.1 for 35-44-year-olds and 27.3 for the 65-74-year-old group in 2003 and a 16.3 and 27.0 DMFT for the 35-44 and the 65-74 adults, respectively, in 2010. In Chile, the mean DMFT was 15.06 and of 21.57 for the 35-44 and the 65-74 adults, respectively [15].

In the light of the results of previous studies, and considering the age difference, and the oral effects of DM, the researcher believes that mean score of DMFT of the study participants which was 18.6 is acceptable.

Intervention urgency needs

Among the 406 participants, no treatment was needed for 34 (8.4%) participants while, 56 (13.8%) needed preventive or routine treatment, prompt treatment including scaling was needed for 284 (70.1%) participants and, immediate treatment (urgent treatment needed due to pain or infection of dental and or oral origin) was needed for 31 (7.7%) participants. These results correspond to the oral problems of participants where most of them suffering from caries, bleeding gums, periodontal pockets, dental trauma and dental erosion but immediate treatment percentage would be more if the interview performed at the dental station.

INFERENTIAL STATISTICS

Relationship between DMFT index and socio-demographic characteristics

The mean value of DMFT index was assessed for the whole study sample, it was 18.6 teeth. Considering the age structure of the study sample, it was found that DMFT index had the highest level (21.9) in the adults aged 60 years and over (Table 5). The index value was lower (20.2) in the age group of less than 56-60 year old, (17.2) in the age group of 51-55 years old, and it was the lowest in the

Table 4: Distribution of the study participants according to their intervention urgency needs.

Items	No.	%
Intervention urgency		
No treatment needed	34	8.4
Preventive or routine treatment needed	56	13.8
Prompt treatment (including scaling) needed	285	70.1
Immediate (urgent) treatment needed due to pain or infection of dental and/or oral origin	31	7.7
Total	**406**	**100.0**

Table 5: Distribution of DMFT of participants regarding their socio-demographic characteristics.

Items	N0.	DMF	DMFT	Test	Sig
Age					
Less than 50 Years	100	1468	14.7	F 3.189	0.001
From 51 to 55 years	95	1631	17.2		
From 56 to 60 years	103	2080	20.2		
More than 60 years	108	2369	21.9		
Total	**406**	7548	18.6		
Gender					
Male	163	3112	19.1	T 1.079	0.273
Female	243	4436	18.3		
Total	**406**	**7548**	**18.6**		
Education					
No formal schooling	37	815	22.0	F 2.016	0.001
Less than primary school	59	1334	22.6		
Primary school completed	57	1018	17.9		
Preparatory school completed	90	1610	17.9		
Secondary school completed	77	1293	16.8		
College/University completed and above	86	1478	17.2		
Total	**406**	**7548**	**18.6**		
Work					
Yes	80	1214	15.2	T -4.249	0.001
No	326	6334	19.4		
Total	**406**	**7548**	**18.6**		
Monthly Average Income					
Under Deep poverty line (1832 NIS)	347	6522	18.8	T 1480	0.140
Above Deep poverty line	51	875	17.2		
Total	**398**	**7397**	**18.6**		

youngest age group less than 50 year olds. The values of the DMFT index were statistically significantly associated with age ($p < 0.05$). Post hoc analysis was done using Scheffe Test (also called Scheffe's procedure or Scheffe's method) showed that the difference between the distribution of DMFT and their age in favor for participants their age more than 60 years old. Caries experience was highly prevalent in our sample. With the increase in age, there was an upward trend in caries prevalence and mean DMFT, this is in the line with many studies of adult non-diabetic populations [15-18].

There was no a statistically significant association between the value of DMFT index and the gender of the participants of the study sample ($p = 0.273$). Generally, females showed more decayed, missing and filled teeth than males but result showing mean value of DMFT index of males (19.1) was higher than mean value of DMFT index of females (18.3), this is not consistent with study of Boyko Bonev [17], where he found the DFMT index of females higher than males with a statistically significant association between DMFT index and gender. According to study of John R. Shaffer, Sex disparities in dental caries have been observed across many populations, with females typically exhibiting higher prevalence and more affected teeth [19]. The researcher believes that males have higher DMFT index than females because adult women utilize dental health care to a greater degree than men and males are more daring to extract teeth than females.

Obvious statically significant association between educational level and DMFT index ($p = 0.001$). The values of the DMFT index were statistically significantly associated with educational level ($p < 0.05$). Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their educational level in favor for participants with education level "College/University completed and above". DMFT index is inversely proportional to the educational level, this is consistent with many studies, a study conducted by Mohammed Taqi, et al. showed that people with low levels of education have less knowledge toward oral health and have a higher DMFT index [20]. Clinical study was conducted in Turkey to assess the oral and dental health status of Hemodialysis (HD) and Peritoneal Dialysis (PD) patients on the basis of educational status, showed that patients who were found to be in a higher educational level, are more caring of for their oral health [21]. The researcher believes that educational level, as a traditional SES variable, affects the type of job and income, and thus access to preventive measures such as tooth cleaning habits, health service use and a low-carbohydrate diet. In this study, an educational level higher than primary school was a protective factor against dental caries, and the higher the educational level, the stronger was the protective effect.

Another statistically significant association between DMFT index with employment status had accrued ($p = 0.001$) while there was no statistically significant association between DMFT index and income of participants ($p = 0.140$). The researcher believes that, the big gap between both groups (1832 NIS) could be the reason for non-statistically significance, this is not the line with a study by Linyan Wang, et al. showed that participants with a higher educational level and family income, had the lower severity of DMFT [22]. Schwendicke, et al. found that lower SES is significantly associated with a greater risk of caries lesions. This relationship was partly mediated by oral health-related behaviours and health awareness [23]. Generally, income has a direct effect on material resources and may subsequently affect clinical decisions and the ability to pay for services, and the deep poverty line which was 1875 created large gaps between participants.

Relationship between DMFT index and diabetic characteristics

There was statistically significant association between DMFT index value and diabetic duration ($p = 0.038$). The values of the DMFT index were statistically significantly associated with Diabetic duration ($p < 0.05$). Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their diabetic duration in favor for participants had diabetic duration less than 5 years.

(Table 6) showing increasing DMFT index with increasing diabetic duration, 16.7 teeth for participants diagnosed as diabetes less than 5 years, 18.1 teeth from 5-9 years, 20.1 from 10 -14 years and 20.9 teeth for 15 years and above. A clear and statistically significant association ($p = 0.002$) occurred between the DMFT index value and HbA1c level, where participants with control DM and their

HbA1c equal and less than 7%, showing lower DMFT index value than participants with uncontrolled DM with HbA1c more than 7% , DMFT index for control group was 16.3 teeth and for uncontrolled group was 19.2 teeth. The results revealed that poor glycaemic control and the early onset of DM may increase the risk of dental caries, which is consistent with most available studies where, duration of DM might play an important role when the relation between DM and oral diseases is investigated, The level of caries was significantly higher in the long- compared to the short duration. This relation is reasonable because, like other complications of diabetes, the risk of caries tends to increases over time. This relation is in agreement with the normal pathogenesis of dental caries as "time" is an important factor for the development of the disease [24]. A study conducted by Rafatjou, et al. showed that gingival index and DMFT index increased significantly with duration of diabetes [25], this conclusion is in agreement with a Sudanese study which showed that those with long duration of T2DM to have high Decayed, Missed And Filled Teeth (DMFT) values [26]. According to Malvania, et al., the mean DT and MT were significantly increased as the duration of disease increased, whereas mean FT was significantly higher among people having diabetes less than 2 years. Mean DMFT component was higher among people having diabetes more than 5 years but it did not show any statistically significant difference [27]. Many studies are consistent with the result of the study which concluded that DMFT index increasing with duration of DM [28,29], while other studies are inconsistent with the result of the study which reported that there was no relationship between the duration of diabetes and caries experience [30-32].

Regarding DM control status, results of the study are consistent with many studies, one of these studies conducted by Malvania, et al. concluded that the severity of dental caries increased with increase in the blood glucose level with positive correlation, and dental caries prevalence was significantly higher in metabolically uncontrolled patients compared to metabolically well-controlled patients [27]. The results are in agreement with the studies reported by Chavez, et al. [33] and not in agreement with the studies reported by Hawraa [30], Arreita Blannco [31], and Sandberg, et al. [34]. Another study in Japan revealed a significant association between HbA1c levels and dental caries, the severity of dental caries increased with increase in the blood glucose level [35].

Relationship between DMFT index and frequency of tooth cleaning

A statistically significant association between DMFT index value and frequency of teeth cleaning or brushing (p 0.001), the values of the DMFT index were statistically significantly associated with frequency of teeth-brushing ($p < 0.05$). Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their frequency of teeth-brushing in favor for participants who never clean the teeth.

(Table 7) showed that the highest DMFT index value (21.2) among participants who never brush their teeth, while participants used to brush their teeth daily either once, or twice or more showed the lowest DMFT index value among all which was respectively 14.4 and 15.7. The relationship is inverse, the increase in the frequency of teeth-brushing decreasing the DMFT index value.

The obtained result is consistent with, and confirmed by many studies, according to Chestnutt, et al. study, caries experience was inversely related to tooth-brushing frequency, tooth-brushing frequency and rinsing method after brushing were found to be strongly correlated with caries experience and caries increment [36]. Clinical and interview data were obtained by Matti, et al. from 212 males, showed that the values of caries prevalence indicator were consistently higher for sporadic tooth-brushers. It was concluded that the current study provides evidence in favor of a positive association between tooth-brushing and low caries prevalence [37]. Regular tooth-brushing is important for the maintenance of oral health and the prevention of caries and periodontal disease. Brushing effectively twice a day with a fluoridated toothpaste has been a key recommendation from dental organizations for many years. Individuals who state that they brush their teeth infrequently are at greater risk for the incidence or increment of new carious lesions than those brushing more frequently [38].

Table 6: Distribution of DMFT of participants regarding their diabetic characteristics.

Diabetic duration	No.	DMF	DMFT	Test	Sig.
Less than 5 Years	134	2243	16.7	F 56.752	0.038
From 5 to 9 years	109	1968	18.1		
From 10 to 14 years	90	1808	20.1		
15 years and above	73	1529	20.9		
Total	**406**	**7548**	18.6		
HbA1c reading	**No.**	**DMF**	**DMFT**		
Controlled equal or less than7%	87	1421	16.3	T -3.168	0.002
Uncontrolled more than 7%	319	6127	19.2		
Total	**406**	**7548**	18.6		

Table 7: Distribution of DMFT index regarding frequency of teeth cleaning.

How often do you clean your teeth	No.	DMF	DMFT	Test	Sig.
Never	136	2842	21.2	2.321	0.001
Once a month	4	53	13.3		
2-3 times a month	7	94	13.4		
Once a week	39	655	16.8		
2-6 times a week	30	494	16.5		
Once a day	93	1327	14.4		
Twice or more a day	62	975	15.7		
Total	371	6440	17.5		

CONCLUSION

The results showed a high DMFT index. DMFT index value was significantly associated with age, educational level, employment status but not with gender and monthly income of participants, the researcher believes that males have higher DMFT index than females because adult women utilize dental health care to a greater degree than men and males are more daring to extract teeth than females. There is a statistically significant relationship between DMFT and diabetic duration (0.038), A clear and statistically significant association (p = 0.002) occurred between the DMFT index value and HbA1c level, where participants with control DM showing lower DMFT index value than participants with uncontrolled DM. Contrary to expectations, there was neither a clear relationship nor statistically significant association between periodontal status(gingival bleeding and periodontal pockets), and diabetic duration, and control status of DM, Participants used to brush their teeth daily either once, or twice or more showed the lowest DMFT index value, the current study provides evidence in favor of a positive association between tooth-brushing and low caries prevalence.

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