Prevalence of Dental Caries of *Streptococcus mutans* among Diabetic Patients Who are Attending Jimma University Specialized Hospital Dental Clinic, South-West, Jimma, Ethiopia

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Received Date: 21-11-2020; **Accepted Date:** 12-12-2020; **Published Date:** 20-12-2020

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Abstract

Background- Dental caries is a disease most commonly observed among diabetic patients. The main bacteria's found in the mouth cavity and mainly uses glucose as a diet and causes dental caries in diabetic patients is *Streptococcus mutans*. This study aimed to determine the prevalence of dental caries of *S. mutans* among diabetic patients attending at Jimma University Specialized Hospital Dental Clinic (JUSHDC).

Method:- Across-sectional study was conducted from February 21/2017 to October 15/2018 among diabetic patients visiting JUSHDC. A dental plaque was collected and *S. mutans* was isolated using mitis salivaris agar. Finally, data were analyzed by using SPSS software.

Results: In this study, the overall prevalence of *S. mutans* was 81(67.50%). From a total of 120 study population, 77(64.20%) were males of which 49(40.80%) were positive for dental caries and the rest 43(35.80%) were females of which 32(26.70%) were culture positive for *S. mutans*.

Conclusion: According to this study finding a high prevalence of dental caries was found in diabetic patients. This may lead to further caries and loss of teeth and also suffering the

population for economical loss, psychological effects, and other risks. So that appropriate measure in health education, preventive and curing activities must be taken.

Keywords

Dental Caries; *Streptococcus mutans*; Diabetic Patients

Abbreviation

CI: Caries Index; CPI: Community Periodontal Index; DM: Diabetes Mellitus; DMFT: Decayed, Missing and Filling Teeth; JUSH: Jimma University Specialized Hospital; LO: Loss of Attachment; WHO: World Health Organization

Introduction

Dental caries is one of the most prevalent health issues affecting a large proportion of the world population and is considered the most common form of chronic disease among school children. Dental caries is the single most prevalent and costly infectious disease worldwide, affecting more than 90% of the population in the USA [1]. Epidemiological surveys conducted by the British nutrition foundation on the effect of sugar substitutes indicate that frequent or high intake of sugary foods predisposes to dental decay. Different measurements of dental caries increments combined with multiple dietary histories are needed to clarify the association between caries and eating habits [2]. As many study finding shows a high intake of sugar as food increases the risk of certain chronic diseases, particularly dental caries and obesity [3].

Diabetes mellitus is a serious metabolic disease causing systemic disorders that are also noticeable in the oral cavity, as first described by Seifert in 1862 [4]. Manifestations in the oral cavity include abnormal development of the dentition, increased frequency, and intensity of caries, pathologies of the oral mucosa, salivary glands, and periodontium, as well as atrophic changes in alveolar processes [4,5].

Diabetes mellitus may increase the incidence of dental caries through different mechanisms that are still being debated. The increased proportion of *Streptococcus mutans* on the total cultivable aerobic microflora reported by some authors has not been validated by others who have reported the counts of *S. mutans* and lactobacilli to be the same in diabetics and non-diabetics [5]. The prevalence of diabetes is rapidly rising all over the globe [6].

Streptococci mutans are considered to be major dental caries etiologic agents. They are the most common pathogens isolated from human dental plaque and their prevalence has been reported in epidemiological studies [7-9].

Tewabe H | Volume 1; Issue 2 (2020) | JCIM-1(2)-012 | Research Article

Citation: Tewabe H, et al. Prevalence of Dental Caries of *Streptococcus mutans* among Diabetic Patients Who are Attending Jimma University Specialized Hospital Dental Clinic, South-West, Jimma, Ethiopia. J Clin Immunol Microbiol. 2020;1(2):1-14.

DOI: <http://dx.doi.org/10.46889/JCIM.2020.1205>

A survey was done in a sample of 105 patients, 45 females and 60 males, from October 1989 to January 1990, in the Diabetes Clinic of Mekane Hiwet Hospital, Asmara, Ethiopia, to assess the incidence of dental and periodontal problems among diabetic patients showed that dental caries was found in 79% with no significant relation to the age of patient or duration of diabetes. These findings show a high incidence of dental and periodontal problems among diabetic patients and are suggestive of the adverse influence of diabetes on dental health [8].

Control of oral health is the basic thing to general health and essential for wellbeing. The psychosocial impact of oral health problems significantly diminishes the quality of life by affecting eating, talking and other social and psychological areas of life. Oral health is mainly affected due to dental caries and periodontal disease. And if left untreated leads to progressive loss of the teeth. Psychosocial factors and certain pathological conditions such as diabetes and infection with human immunodeficiency virus were identified as the main risk factors for poor oral hygiene and tooth caries [1,9].

Most studies argued that people should limit the intake of sugar added to food to reduce disorders as caries that happened due to a high intake of sugar. As oral diseases and obesity are widespread all over the world and affect large numbers of people in terms of physical, economic, and social outcomes, the impact that reductions in sugar intake would have as an important preventative measure for it [3,10]. The current global patterns of oral disease largely reflect distinct risk profiles across global, which are related to living conditions, lifestyles, and the implementation of preventive oral health systems. Socio epidemiological studies have been carried out particularly concerning dental diseases to identify the main cause of this [11].

Therefore, this prevalence study of dental caries of *S. mutans* can serve as baseline information to develop effective community-based prevention and control programs and to those who are interested in further study in the same area.

The high prevalence of *S. mutans* is the most common public health problem and a major contributing factor for dental caries in the world including; both developing and developed countries. The problem of dental caries of *S. mutans* on diabetic patients becomes increasing rapidly in developing countries, especially sub-Saharan Africa [10,12]. However, there is only very little information on the prevalence of dental caries on diabetes patients in Ethiopia and particularly in the study area. And also there is a debate between the relationship between dental caries and diabetic mellitus. Therefore this study aimed to determine the prevalence of dental caries of *S. mutans* on DM patients who are visiting Jimma University specialized hospital Diabetic clinic [12-15].

Material and Method

Study Design, Setting and Period

A cross-sectional study was conducted on a total of 120 diabetic patients by using questionnaire method from February 21/2017 to October 15/2018 on diabetic patients attending in Jimma University Specialized Hospital (JUSH) Diabetic Clinic for their follow up and requested to give dental plaque for dental caries examination to JUSH Dental Clinic, Jimma, Ethiopia.

Sample Collection and Transportation Dental Plaque

Dental plaques from all patients were picked up through forceps by dental doctors and transferred into 2 ml of a tube containing sterile phosphate-buffered saline (pH 7.0) and processed immediately after collection in Jimma university microbiology laboratory [14].

Isolation and Identification of *Streptococcus mutans*

Gram stain was done from the dental plaque (to be sure that the species is streptococcus) and then a 100µl of the sample was spread onto Mitis-Salivarius agar (MS-agar) by using a sterile cotton swab and incubated in 5% CO₂ for 48 hours at 37°C after vortexes for 30 seconds. Next, a colony count is taken, and a count of more than 250 colonies (10⁴ cells/ml) was considered as culture positive. Gram-Positive cocci, produce puddles of glucan on Mitis Salivarius agar, catalase-negative, mannitol and lactose fermenters will be considered *S. mutans* [1,14,15].

Antimicrobial Susceptibility Testing

Antimicrobial susceptibility testing was done by using the disc diffusion method according to criteria set by the Clinical Laboratory Standard Institute (CLSI) [16]. The pure colony of *S. mutans* bacterial suspension from brain heart infusion broth which has turbidity matched with 0.5 McFarland standard was evenly spread onto Muller-Hinton agar supplemented with 5% sheep blood using a sterile cotton swab. Soon after, antibiotic discs selected based on recommendations from CLSI were placed on the inoculated plate. The following antimicrobial disks with respective concentration was used: penicillin (P, 1 unit), ceftriaxone CRO, 30 µg) and chloramphenicol (C, 30 µg) all from [Becton Dickinson BD, USA company], amoxicillin, (Aml, 25 µg), erythromycin (E, 15 µg) clindamycin (DA, 2 µg) tetracycline (TE, 30 µg) all from (Oxoid England) finally the plates were incubated at 35- 37°C in a candle jar Overnight. The interpretation of the results of the antimicrobial susceptibility was made based on the criteria as sensitive, intermediate, and resistant by measuring the zone diameter of inhibition [16-20].

Statistical Analysis

The data was processed entered and analyzed by using the available computer software program (SPSS) version 20. Cross-tabulation and simple descriptive statics were used to show

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the statistical association between dental caries and associated risk factors mainly being diabetic.

Quality Assurance

To ensure the reliability and validity of the study result, all of the three phases of quality assurance was implemented. The pre-analytical phase was assured by using a dental professional for sample collection. And also reagents and types of equipment were checked for the reliability and reproducibility of the test. The analytical phase was ensured by using and implementing different SOPs throughout the study time. The final phase post-analytical phase was ensured by interpreting the result of each analysis by using different professionals depends on the area of study.

Exclusion and Inclusion Criteria

All diabetic patients requested to JUSH Dental Clinic for dental caries treatment were included in the study. Patients sent to the dental clinics from different OPDs other than the dental clinic, children who had been under the age of eight at the onset of DM, patients those with any mental or physical disorders not permitting oral examination, and patients who take drugs were not included in the study.

Dissemination of the Results

After data analysis has been completed appropriate recommendation was made and the result was disseminated to Jimma University student research program, medical laboratory science, pathology department and JUSH Dental Clinic and Diabetic Clinic Department.

Ethical Consideration

An ethical letter from Jimma University research program was obtained, administrator consent was also collected from JUSH administration before starting data collection. After explaining the purpose of the study written consent was obtained from the study participants and their clinical information was kept confidential. Finally, culture-positive patients were advised and treated accordingly in the JUSH Dental Clinic.

Results

A total of 120 study population were interviewed and their plaque grew in salivary mitis media and the growth of *S. mutans* was examined for the detection of variables that cause dental caries of tooth. Out of which 77 (64.20%) were males and 43 (35.80%) were females and the average age of the study population was in the interval 25-29 which accounted for 52 (43.33%). The

history of duration of documented diabetes ranged from 1 year up to 20 years with an average year 8 years.

As we have seen from Table 1 from a total of 120 diabetic participants 81 (67.50%) were positive to *S.mutans* culture growth. The study also tries to see the association of different socio-demographic parameters like residence, occupational status, educational status, and other with dental caries prevalence and we found no statistically significant relationship was observed between the above sociodemographic character and the rate of dental caries of *S. mutans* (P-value> 0.05).

Socio-demographic Variables		Result of Stool Examination				Total	
		Positive	%	Negative	%	T. No	%
Sex	Male	49	40.80	28	23.30	77	64.20
	Female	32	26.70	11	9.20	43	35.80
	Total	81	67.50	39	32.50	120	100.00
Residence	Urban	46	38.30	26	21.70	72	60.00
	Rural	35	29.20	13	10.80	48	40.00
	Total	81	67.50	39	32.50	120	100.00
Educational Status	Literate	58	48.30	29	24.20	87	72.50
	Illiterate	23	19.20	10	8.30	33	27.50

Table 1: Socio-demographic characteristics and culture growth result among diabetic patients who are attending in JUSH diabetic clinic for their follow up and requested to give dental plaque for dental caries examination at JUSH dental clinic Jimma, Ethiopia.

From the total 120 sample population, 98 (81.70%) were cleaning their teeth of which 70 (58.30%) were positive to culture growth of *S. mutans* and the rest 22(18.30%) were not clean their teeth and out of those 11 (9.20%) were positive to culture result of the bacteria *Streptococcus mutans*. Out of these 98 patients who clean their teeth, 78 (79.60%) were use Mefakiya (tooth stick), 9 (9.20%) were clean their teeth only by rinsing with water, 3 (3.10%) used charcoal and the left used others to clean their tooth. The study shows that 18 (18.40%) were clean their teeth by top to the bottom method, 37 (37.80%) by sideways (vertically), 2 (2, 00%) by the circular method, and the rest 41 clean their teeth by a mixed method. When we see the P-value, it is greater than 0.05 so that no statistically significant relationship was observed between the above variables and dental caries of *S. mutans* (Table 2).

Knowledge and Practical Questions On Tooth		Result of Sputum Examination		Total	P-value
		Positive to Caries	Negative to Caries	Total	
Cleaning teeth	Yes	70 (58.30)	28 (23.30%)	98 (81.70%)	0.052
	No	11 (9.20)	11 (9.20 %)	22 (18.30%)	
What do you use to clean your teeth?	Mefakiya (tooth stick)	58 (59.20%)	20 (20.40%)	78 (79.60%)	0.105
	Charcoal	3 (3.10%)	0 (0%)	3 (3.10%)	
	Tooth brushing with only rinsing with water	6 (6.10%)	3 (3.10%)	9 (9.2%)	
	Other	3 (3.10%)	5 (5.10%)	8 (8.20%)	
Frequency of cleaning teeth	Once a day	19 (19.40%)	8 (8.20%)	27 (27.6%)	0.284
	After meal	3 (3.10%)	4 (4.10%)	7 (7.1%)	
	Before and after meal	3 (3.10%)	0 (0%)	3 (3.10%)	
	More than once a day	7 (7.10%)	1 (1.00%)	8 (8.20%)	
	Irregular	38 (38.80%)	15 (15.30%)	53 (54.10%)	
How do you brush your teeth	Top to bottom (vertical)	10 (10.20%)	8 (8.20%)	18 (18.40%)	0.279
	Sideways (horizontal)	30 (30.60%)	7 (7.10%)	37 (37.80%)	
	Circular	2 (2.00%)	0 (0%)	2 (2.00%)	
	Mixed	28 (28.60%)	13 (13.30%)	41 (41.80%)	
When do you brush your teeth?	Morning only	12 (12.20%)	2 (2.00%)	14 (14.30%)	0.317
	After meal	23 (23.50%)	8 (8.20%)	31 (31.60%)	
	Before meal	3 (3.10%)	4 (4.10%)	7 (7.10%)	
	Before going to bed	3 (3.10%)	0 (0%)	3 (3.10%)	
	Moring and before going to bed	7 (7.10%)	3 (3.10%)	10 (1.20%)	
	Irregular (no fixed time)	22 (22.40%)	11 (11.20%)	33 (33.70%)	

Table 2: Relation of culture growth results with the knowledge of teeth cleaning habit among diabetic patients who are attending in JUSH diabetic clinic for their follow up and requested to give dental plaque for dental caries examination at JUSH dental clinic Jimma, Ethiopia.

Tewabe H | Volume 1; Issue 2 (2020) | JCIM-1(2)-012 | Research Article

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DOI: <http://dx.doi.org/10.46889/JCIM.2020.1205>

The study was done on the sweet intake habit and shows that from the total 120 sample population 47 (39.20%) have this habit of which 32 (68.09%) are positive to culture result of *S. mutans* and, 73 (60.80%) have no the habit of sweet intakes of which 49 (67.12%) was positive. Also here; the culture result of *S. mutans* and the relationship between behavioral and other risk factors to tooth decay are not statistically associated (P-value >0.05) (Table 3).

Behavioral and Other Risk Factors to Teeth Decay		Result of Sputum Examination				Total		P-value
		Positive	%	Negative	%	Absolute	%	
Drinking Alcohol	Regularly	1	0.83	0	0	1	0.83	0.475
	Sometimes	4	3.3	3	2.5	7	5.83	
	Rarely	2	1.6	2	1.6	4	3.33	
	Not at all	74	61.7	34	28.3	108	90	
	Total	81	67.5	39	32.5	120	100	
Smoking Cigarette	Regularly	2	1.6	0	0	2	1.6	0.755
	Sometimes	1	0.83	1	0.83	2	1.6	
	Rarely	2	1.6	2	1.6	4	3.33	
	Not at all	76	63.3	36	30	112	93.3	
	Total	81	67.5	39	32.5	120	100	
Chewing Chat	Regularly	7	5.83	1	0.83	8	6.67	0.589
	Sometimes	5	4.17	2	1.6	7	5.83	
	Rarely	6	5	4	3.33	10	8.33	
	Not at all	63	52.5	32	26.7	95	79.2	
	Total	81	67.5	39	32.5	1200	100	
Sweet Intakes	Yes	32	26.7	15	12.5	47	39.2	1
	No	49	40.8	24	20	73	60.8	
	Total	81	67.5	39	32.5	120	100	
Kind of Sweet Intakes	Chocolate	1	2.1	0	0	1	2.1	0.85
	Candy	4	8.5	2	4.3	6	12.8	
	Sugar cane	3	6.4	2	4.3	5	10.6	
	Sugared coffee	2	4.3	2	4.3	4	8.5	
	Sugared tea	1	2.1	0	0	1	2.1	
	Others	21	44.6	9	19.3	30	63.7	
Intake of Soft Drinks	Regularly	1	0.83	1	0.83	2	1.6	0.789
	Sometimes	11	9.17	6	5	17	14.17	
	Rarely	11	9.17	5	4.17	16	13.33	
	Not at all	58	48.3	27	22.5	85	70.8	

Xerostomia	Yes	10	8.3	5	4.2	15	12.5	
	No	71	59.2	34	28.3	105	87.5	

Table 3: Prevalence of *S.mutans* relation to behavioral and other risk factors on diabetic patients attending in JUSH diabetic clinic for their follow up and requested to give dental plaque for dental caries examination at JUSH dental clinic Jimma, Ethiopia.

From the sample population, 20 (16.70%) have gum bleeding risks to their teeth of which 18 (15.00%) were positive to culture growth of *S. mutans* and 100 (83.30%) have no this risk but out of this 63 (52.50%) were positive to culture growth of *S. mutans*. According to our study finding was a statistically significant between the rate of dental caries of *S. mutans* and gum bleeding (P-value=0.0019). But no statically significant association is seen between the rate of dental caries and tooth decay and the type of tooth decayed (P-value>0.05) (Table 4).

Clinical Variables on Oral Health		Result of Sputum Examination						P-value
		Positive	%	Negative	%	Total No	%	
Gum Bleeding	Yes	18	15	2	1.7	20	16.7	0.0019
	No	63	52.5	37	30.8	100	83.3	
	Total	81	67.5	39	32.5	120	100	
Previous Tooth Decay	Yes	31	25.8	19	15.8	50	41.7	0.277
	No	50	41.7	20	16.7	70	58.3	
	Total	81	67.5	39	32.5	120	100	
Type of Tooth Decayed	Class I	9	18	3	6	12	24	0.246
	Class II	17	34	7	14	24	48	
	Class III	2	4	2	4	4	8	
	Class IV	1	2	2	4	3	6	
	Class V	2	4	4	8	6	12	
	Class IV and V	0	0	1	2	1	2	
	Total	31	62	19	38	50	100	

Table 4: Prevalence of *S.mutans* with gum bleeding and tooth decay on diabetic patients attending in JUSH diabetic clinic for their follow up and requested to give dental plaque for dental caries examination at JUSH dental clinic Jimma, Ethiopia.

From a total of 120 participants, 49 (40.80%) have no debris or stains on their oral area, 64 (53.30%) have soft debris covering not more than one-third of the teeth, 4 (3.30%) have soft debris covering more than one-third of the teeth, 3 (2.50%) have soft debris covering more than two-thirds of the tooth surface. Based on the study finding statically significant association is observed in between culture result of *S. mutans* for dental caries with oral debris (P-value=0.003) (Table 5).

Variables		Result of Sputum Examination			P-value
		Positive	Negative	Total .No	
Oral Debris	No debris or stain	29 (24.20 %)	20 (16.70%)	49 (40.8%)	0.003
	Soft debris covering not more than one-third of the teeth	49 (40.80%)	15 (12.50%)	64 (53.3%)	
	Soft debris covering more than one-third of the teeth	0 (0.00%)	4 (3.30%)	4 (3.3 %)	
	Soft debris covering more than two- third of the teeth	3 (2.50%)	0 (0%)	3 (2.5%)	
	Total	81 (67.50%)	39 (32.50%)	120 (100%)	

Table 5: Prevalence of dental caries of *S.mutans* relative with the occurrence of oral debris on the tooth surface on diabetic patients attending in JUSH diabetic clinic Jimma, Ethiopia.

No statistically significant relationship is observed in the association between the culture result of *S. mutans* for dental caries with a calculus index (P-value=0.116) (Table 6).

Variables		Result of Sputum Examination			P-value
		Positive	Negative	Total	
Plaque Index	No plaque in the gingival area	35 (29.20 %)	15 (12.5 %)	50 (41.70%)	0.418
	Plaque adheres to the free gingival margin which cannot be seen with the naked eye	38 (31.70 %)	23 (19.20%)	61 (50.80%)	
	Moderate accumulation of deposits in the free gingival margin which can be seen with the naked eye	7 (5.8 %)	1 (0.80%)	8 (6.70%)	
	Abundance of soft mater on the tooth and gingival margin	1 (0.80 %)	0 (0.00%)	1 (0.80%)	
	Total	81 (67.50 %)	39 (32.50%)	120 (100 %)	

Table 6: Prevalence of dental caries of *S.mutans* on diabetic patients attending in JUSH diabetic clinic Jimma, Ethiopia.

From a total of 120 participants, 50 (41.70%) have a normal gingival index, 50 (41.70%) have mild inflammation, 18 (15.00%) have moderate inflammation, 2 (1.70%) have excessive inflammation. No statistically significant relationship is observed in the association between the culture results of *S. mutans* for dental caries with the gingival index. (P-value=0.311, >0.05) (Table 7).

Variables		Result of Sputum Examination				Total		P-value
		Positive		Negative		Total no		
		Absolute	%	Absolute	%	Absolut	%	
Gingival Index	Normal gingival	32	26.7	18	15	50	41.7	0.311
	Mild inflammation	32	26.7	18	15	50	41.7	
	Moderate inflammation	15	12.5	3	2.5	18	15	
	Excessive inflammation	2	1.7	0	0	2	1.7	
	Total	81	67.5	39	32.5	120	100	

Table 7: Prevalence of dental caries of *S. mutans* with characteristics of a gingival index on diabetic patients attending in JUSH diabetic clinic Jimma, Ethiopia.

From a total of 120 DM patients, 31 (25.80%) was no show calculus index, 61 (50.80%) have mild supra gingival index, 19 (15.80%) have moderate supra and subgingival calculus and the rest 9 (7.50%) have excessive supra and subgingival index. No statistically significant relationship is observed in the association between the culture result of *S. mutans* for dental caries with a calculus index (P-value=0.116) (Table 8).

Variables		Result of Sputum Examination						P-value
		Positive		Negative		Total		
		Absolute	%	Absolute	%	Absolute	%	
Calculus Index	No calculus	18	15	13	10.8	31	25.8	0.116
	Mild supra gingival calculus	39	32.5	22	18.3	61	50.8	
	Moderate supra and sub-gingival calculus	16	13.3	3	2.5	19	15.8	
	Excessive supra and sub gingival calculus	8	6.7	1	0.8	9	7.5	

	Total	81	67.5	39	32.5	120	100	
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Table 8: Prevalence of dental caries of *S. mutans* concerning characteristics of calculus index on diabetic patients attending in JUSH diabetic clinic Jimma, Ethiopia.

Discussion

According to this study finding out of 120 total diabetic patients, 81 (67.50%) were positive to the culture growth result of *S. mutans* and showed that there is a strong statistically significant association between dental caries and being diabetic (p-value= 0.002).

In the previous study, the association of diabetes with dental caries was not identified which makes this study different from most previous studies [12,13,15]. Some studies try to show that diabetic Mellitus has some association with dental caries, such as studies conducted in Thailand in 2006 on 105 patients with type 2 DM and studies conducted in Mekane hiwot hospital, Asmara, Ethiopia on diabetic patients show that DM has statistically association with dental caries which makes these similar to this study [15,8]. In this study, the positivity rate of growth of *S. mutans* on culture selective media was 67.50% which is less than the study done in Latin America and Asia (75%) by WHO on school children and greater than the finding of the study conducted in British in 2010 on 259 adolescent with type 1 DM and study conducted in Mekane hiwot hospital Asmara, Ethiopia to assess the incidence of dental caries on diabetic patients (79%) [1]. This is due to the difference in the different lifestyles of people and different habits of the use of sugary foods which are the main cause of dental caries. A study conducted in private hospitals in Bangalore, India 2014 on 400 subjects showed that there was a statistically significant association between age and root caries (elders are riskier than younger) in contrast in this study these two variables do not have a statistically significant association with dental caries [21].

The finding of this study shows that gum bleeding and oral hygiene have a statistically significant association with dental caries (P-value 0.019 and 0.003 respectively). Here the study shows that the two independent variables have a high risk to dental caries which is not identified in any other previous studies. But the other independent variables have no statistically significant association with root caries in this study which makes it different from other studies. This difference between studies may be due to the different attitudes of the study population towards those two dependent variables.

The other predisposing factors like socio-demographic factors (sex, age, educational status, occupation, place of residence), knowledge and practical questions on tooth cleaning (like a habit of cleaning teeth, what do you use to clean teeth, when and how do you clean teeth, tooth brushing), behavioral and other risk factors to teeth decay (like cigarette smoking, chewing chat, alcohol drinking, sweet intakes, soft drinking, xerostomia) and clinical data's on oral health (like access to fluoridation, previous tooth decay, type of tooth decayed plaque index, calculus index, gingival index, type of medication for DM and duration of DM) have no

statistically significant association with dental caries ($P\text{-value} > 0.05$) even if some of these factors have an association in the other previous studies. This main variation between studies may be due to a special attitude of the study population to those independent variables and due to variation of lifestyle among study participants in different study areas and periods.

Conclusion and Recommendation

In this study, a high prevalence rate of dental caries of *S. mutans* was found and the finding shows that a statistically significant association is seen between the rate of dental caries and factors like oral debris and bleeding. This may lead to further caries of a tooth which causes the total loss of tooth parts which causes to suffer economic loss, psychological infect, and other risks to the patients.

Depend on this study finding indication we recommend that to decrease the prevalence of dental caries due to *S. mutans* appropriate prevention, control and curative activities must be developed in the population. This technique can be addressed to the target group by different mechanisms especially by giving health education that focuses on oral health and the way of cleaning and washing teeth to prevent dental caries. Based on the finding, the gap is mainly seen in the factors like how to keep oral health, how to clean teeth, system of cleaning and curing of teeth mechanisms must be addressed by health education and tooth washing dental clinics must be easily available. Also, special health information and preventive action must be given to different factors especially gum bleeding and oral debris.

Declarations

Ethics approval and consent to participate were taken from the study participants. This study was approved by the Ethics Committee of Jimma University, College of Health Science, Department of Medical laboratory Science.

Acknowledgment

We would like to acknowledge Jimma University, College of health science, Medical laboratory Department, and Jimma University specialized hospital laboratory department, and dental clinic department health professionals. Our acknowledgment is also extended to Dr. Melaku who helps me in the collection of this sample. The study participants also high acknowledge this study for their voluntarism participation in this study.

References

Tewabe H | Volume 1; Issue 2 (2020) | JCIM-1(2)-012 | Research Article

Citation: Tewabe H, et al. Prevalence of Dental Caries of *Streptococcus mutans* among Diabetic Patients Who are Attending Jimma University Specialized Hospital Dental Clinic, South-West, Jimma, Ethiopia. J Clin Immunol Microbiol. 2020;1(2):1-14.

DOI: <http://dx.doi.org/10.46889/JCIM.2020.1205>

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