Determination of the extent of awareness of Nigerian General Population on the relationship between periodontal diseases and systemic illnesses.

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Abstract

Background: *Periodontal disease is known to have bidirectional associations with various systemic diseases but the knowledge of the general population on this association is largely unexplored. The aim of this study was to determine the extent ofknowledge of a general population of Nigerians about periodontal diseases and their awareness of the association of periodontal diseases with systemic diseases and medication use.*

Materials and Methods:*This was a cross sectional study involving 481 subjects resident in Lagos and Ogun state, Nigeria.Data collection was done using a validated interviewer-administered questionnaire after a written consent was obtained. Chi-square test was utilized to identify significant associations between categorical variables. Statistical significance was set at P < 0.05.*

Results: *The age range of the respondents was 18 -77years with a mean age of 38.94±13.55 years. A higher proportion of the study participants had good knowledge about periodontal disease (196; 40.8%) but poor knowledge about Periodontal Disease-Systemic link (318; 66.1%).The respondents with primary level of education also had a higher proportion with poor knowledge of the Periodontal Disease-Systemic link (26; 83.9%) while those from upper socioeconomic class had a significantly higher proportion of those with good knowledge of Periodontal disease (65; 56.0%; p=0.002) and Periodontal Disease-Systemic link (22; 19.0%; p=0.008).*

Conclusion: *There was a low awareness Periodontal Disease-Systemic link among general population of Nigerians and the awareness was significantly lower amongthose of low socio-economic status and who had low levels of educational attainment. Educating patients about the systemic consequences of periodontal disease and oral preventive practices has a potential to lead to early identification of these to reduce their burden in the populations through simple and cost-effective public health promotion interventions.*

Keywords: *Diabetes Mellitus, Gingivitis, Hypertension, Periodontal Disease, Systemic illness.*

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I.   Introduction

Periodontal disease ranks one of commonest inflammatory diseases in adults globally with almost 4 billion people affected[1]. It is considered to be a worldwide pandemic with sequelae such as speech and psychosocial defects and impairment of quality of life[1]. Periodontal disease is initiated by dental biofilm, initially it is predominantly gram-positive infection resulting in gingivitis, if left untreated progresses to periodontitis which is predominantly gram-negative and eventual tooth mobility and loss.[1,2,3]Periodontitis is a disease with multiple associated factors caused by bacteria-host interactions and as such it is a potential source of systemic release of pro-inflammatory mediators, toxins and enzymes.[1,2] Several studies have identified periodontal diseases as a risk factor for cerebrovascular, respiratory, cardiovascular and peripheral arterial diseases, insulin resistance, rheumatoid arthritis, alzheimers disease, obstructive sleep apnoea, obesity, osteoporosis; pregnancy complications and adverse birth outcomes; pyogenic liver abscess and colorectal cancer[1-7]. Periodontal disease is known to have bidirectional associations with various systemic diseases in many instances.[6,7,8]

Medications used in treating many of the systemic conditions have been reported to have causal relationship with some periodontal conditions. The physiological ability of oral tissues to undergo rapid turnover and remodelling can be influenced by the actions of some drugs[9]. Phenytoin, cyclosporin and calcium-channel blockers have been associated with drug induced gingival overgrowth (DIGO) with clinical features indistinguishable from each other, the male: female prevalence of DIGO was 3:1[9]. Desquamative gingivitis

presents as severe drug-induced lichenoid reaction to antidiabetogenic drugs like sulphonylureas and metformin; propanolol and atenolol indicated for hypertension and its complications[9,10]. Hormonal contraceptives increased gingival inflammation and also resulted in significantly more clinical attachment loss in a four year study comparing users with control group of non-users with similar plaque levels in a UK study[10]. Antiplatelet drugs such as aspirin and clopidogrel and anti-coagulant drugs carry the risk of gingival bleeding which may be spontaneous or associated with periodontal procedures. Cytotoxic drugs usually presents with neutropenia which may worsen a preexisting periodontal disease[9,10].

The interwoven influence of periodontal diseases, systemic diseases and associated medications has attracted research interests. Azodo and Umoh in a study of 151 public school teachers reported about one third of participants knew that plaque can cause periodontal disease and tooth loss. They also reported gingival bleeding 35.1% and swollen gingiva 20.5% as major presentation of periodontal disease[11].Umeizudike in a study involving 236 Nigerian medical doctors reported that 42.1% knew that dental biofilm is the cause of periodontal disease, while awareness of gingival bleeding as the initial sign was 16.5%. A large percentage knew that there is an association between periodontal disease and systemic diseases, chronic kidney disease 88.6% and diabetes 86.5% stroke 33.1%, poor glycemic control 25.4%, and adverse birth outcome 14.8%. Only a third of them assessed their patients' oral cavity regularly[12]. Ayanbadejo and others, in a pilot study of Nigeria endocrinologists reported that 44.7% carried out a form of intraoral examination for their patients while only 2.9% could assess tooth mobility as a risk indicator in diabetics[13]. In an Indian study, 56.7% of the medical professionals were aware of the bidirectional relationship between systemic and periodontal diseases, while 38.6% of them were aware of the relationship in one of the either directions only[14]. Another study reported that 71.6% of pregnant women knew that bacterial plaque is the initiator of gingival disease, 56% of them disagreed that increase in the frequency of teeth brushing is necessary, and 5.1% believed there is possibility of an association between gingival diseases and preterm births.88% knew that gingival bleeding indicated periodontal disease[15]. In an online Iraqi survey, 1,465 participants were studied, the participants showed significantly more awareness of periodontal disease than oral hygiene[16].

Most studies have been carried out among a group of professionals in Nigeria, this necessitates the aim of this study to assess the knowledge and awareness of general population of Nigerians about periodontal diseases and also to determine the level of awareness of the people about the association of periodontal diseases with systemic diseases and medication use.

II. Materials And Methods

This was a cross sectional study involving 481 subjects resident in Lagos and Ogun state Nigeria. Lagos, which is bounded by Ogun State and the Atlantic Ocean is a metropolitan and leading commercial hub in Nigeria and West Africa. The study design and survey questionnaire was approved by the Health Research and Ethics Committee of the Lagos State University Teaching Hospital.We included in this survey those aged 18 years and above, who have resided in the study area for a minimum of 6months and agreed to participate by signing an informed consent form. Those who are mentally compromised were excluded from participating in the study. Those with multiple tooth loss and those with underlying systemic diseases like diabetes mellitus, hypertension, malignancy, epilepsy as well as those with history of tobacco consumption, pregnant women or women taking contraceptives; those on medication that can worsen periodontal status like calcium channel blockers, immunosuppressants like cyclosporine and anti-convulsants like phenytoin were excluded from the study.

The Cochran formula[16] was used to calculate the minimum number of subjects required for this study; $n = Z^2 p(1-p) d^2$

where n = sample size, Z = standardized normal deviate (1.96), p = prevalence of knowledge about periodontal- systemic connection, d = precision. Prevalence of knowledge about periodontal- systemic connection from a reference study[17] (p = 80% or 0.8); Therefore, our minimum sample size was 246 participants.

The study questionnaire which was adapted from previously validated instruments was distributed amongst all the participants. Data collection was done using interviewer-administered questionnaire after a written consent was obtained. Biodata such as gender, age, marital status, education, occupation, income/month and local government of residence was collected. Structured questions were used to assess the knowledge and awareness of the respondents about periodontal disease, correct response scored 1 while incorrect scored 0 and the total attained was weighted as Poor=0-3, Moderate=4-6, Good=6-10. This was also carried out for the respondent's knowledge of the association between periodontal diseases and systemic diseases and/medications and weighted as Poor=0-4, Moderate=5-8, Good=9-16. A general assessment was also rated as Poor=0-7, Moderate=8-14, Good=15-26, this was arrived at by adding the scores for the knowledge and awareness of periodontal disease and the association with systemic diseases and medication use.

Statistical analysis: The data was analyzed using SPSS Version 25.0. Chi-square test was employed. P value <0.05 indicated a statistically significant association. The primary outcome variable was awareness of the association between periodontal diseases and systemic diseases. Frequencies and descriptive statistics were generated for all study variables. Results on continuous measurements are presented on mean ± standard deviation (min-max) and results on categorical measurements are presented in a number (%). Chi-square test was utilized to identify significant associations between categorical variables. Statistical significance was set at P < 0.05.

III.   Results

A total of 481 (200 males and 281 females) respondents participated in the study. The age range of the respondents was 16-77 with a mean age of 38.94±13.55 years. The highest proportion of the respondents were < 35yrs years of age (203; 42.2%), had tertiary level of education (321; 66.7%) and were resident in Lagos State (311; 64.7%). A significant proportion of the respondents were from the middle socio-economic class (249; 51.8% [p=0.004])- **Table l.**

A higher proportion of the study participants had good knowledge about periodontal disease (196; 40.8%) but poor knowledge about Periodontal Disease-Systemic link (318; 66.1%) and the general knowledge of periodontal disease (202; 42.0%). Respondents with a tertiary level of education had significantly higher proportion with good knowledge of Periodontal disease (210; 65.4%; p=0,000) while those with a primary level of education had a higher proportion of poor general knowledge of periodontal disease (21; 67.7%; p=0.001). The respondents with primary level of education also had a higher proportion with poor knowledge of the Periodontal Disease-Systemic link (26; 83.9%) even though the association was not significant. Respondents from the upper socioeconomic class had a significantly higher proportion of those with good knowledge of Periodontal disease (65; 56.0%; p=0.002), Periodontal Disease-Systemic link (22; 19.0%; p=0.008) and general knowledge of periodontal disease (25; 21.6%; p=0.013) respectively. -**Table 2**

There was a significant association between the level of awareness for many questions that assessed knowledge of periodontal disease and different educational strata. Tertiary educated respondents had a significant higher proportion of those that knew that Periodontal disease is same as gum disease (138; 75.8%), that plaque is the main/primary cause of gum disease (74; 71.9%) that there is an association between gum disease and Diabetes Mellitus (114; 70.3%); that there is there an association between gum disease and HIV/AIDS (70; 72.9%) and that treating gum disease can relieve manifestations of systemic diseases (134; 74.1%) (p<0.05). -**Table 3**

There was a significant association between the level of awareness for many of the questions that assessed knowledge of periodontal disease and different socio-economic strata. Middle class respondents had a significant higher proportion of those that knew that Periodontal disease is same as gum disease (92; 50.5%), that bleeding gums is a sign of gum disease (74; 48.7%) that gum diseases is preventable (178; 50.4%); that there is there an association between gum disease and HIV/AIDS (42; 43.8%) and that treating gum disease can relieve manifestations of systemic diseases (82; 45.3%) (p<0.05). -**Table 4**

IV.   Discussion

The Global Burden of Disease Study in 2015 identified that periodontal diseases was responsible for 3.5 million years lived with disease or disability worldwide.[18] In addition to uncomfortable symptoms such as gingival bleeding, halitosis and pain, severe periodontitis can also result in tooth mobility and ultimately exfoliation.[19] Periodontal disease also impacts on the patients' quality of life, affecting masticatory function, aesthetics, speech, self-esteem and social interactions.[20,21] The global financial impact of lost productivity from severe periodontitis is about 54 billion USD/year, which accounts for a significant part of direct and indirect cost incurred from oral diseases in 2010.[22]

Females represented a higher proportion of the respondents who participated in the present study and a significant proportion of them were from the middle socio-economic class. Recently, there has been a considerable interest in the link between oral and systemic health among dental and medical providers. Even though some of the participants in the present study had good knowledge about what periodontal disease is, majority of them had poor knowledge about the Periodontal Disease-Systemic linkand knowledge of specific aspects of periodontal disease. Sandberg et al.[23]in their study observed that 85% of the participants in their study had never received any information about the association between periodontal disease and systemic diseases such as diabetes mellitus. Present estimates demonstrate that more than 100 systemic diseases and about 500 medications have oral manifestations, which are typically more prevalent among older patients. Contemporary researches have demonstrated that periodontal disease is linked with an increased risk for cardiovascular diseases, diabetes mellitus, community and hospital acquired respiratory infections, and adverse pregnancy outcomes.[24-29] This is plausible because eighty percent of patients with periodontal disease have one or more risk factors that increases their susceptibility to the infectious process and subsequent tissue damage.[30]

In this study, respondents with a tertiary level of education had significantly higher proportion with good knowledge of Periodontal disease (65.4%) while those with a primary level of education had a higher proportion with poor general knowledge about periodontal disease (67.7%). The respondents with primary level of education also had a higher proportion with poor knowledge of the Periodontal Disease-Systemic link (83.9%) even though the association was not significant. Furthermore, those from the upper socioeconomic class had a significantly higher proportion of those with good knowledge of periodontal disease, periodontal disease-systemic link and general knowledge of periodontal disease respectively. Previous studies have demonstrated that socioeconomic status, formal education and health literacy are positively correlated not only with knowledge about periodontal diseases but also with care seeking behavior for oral health as well as access to oral health care services.[31-33] Thus our findings confirm the association between educational level and level of knowledge about periodontal diseases and its potential impact on systemic health as reported by previous surveys.[33] Periodontitis is a chronic non-communicable disease (NCD) that has similar social determinants of health and risk factors with many non-communicable diseases such as cardiovascular diseases, diabetes mellitus and chronic respiratory diseases, that are responsible for a significant proportion of global mortality.[34-35]

There was also a significant association between the level of awareness on the association between specific systemic illnesses and periodontal diseases based on educational attainment. Tertiary educated respondents had a significant higher proportion of those that knew that plaque is primary cause of periodontal disease (71.9%) and that there was an association between periodontal disease and diabetes mellitus (70.3%). When Schillinger et al.,[36] conducted a descriptive analysis of 408 patients with type 2 diabetes mellitus, examining the relationship between their health literacy and diabetic outcomes, they observed that poor knowledge was related to poorer glycemic control which further increases the burden of diabetes-related complications. This observation is notable because risk of periodontitis in diabetic patients is two to three fold compared to that in normo-glycaemic patients.[37] Consequently, effective treatment of periodontitis in patients with diabetes has been shown to reduce average blood– glucose levels (HbA1c) significantly after 6 months.[38] This has been compared to having an additional second-line medication in the management of diabetes, which in addition to obvious health benefits, contributes significant financial savings for the health system.

Tertiary educated respondents also had a significantly higher awareness that there was an association between periodontal disease and HIV/AIDS (72.9%) and that treating periodontal disease can relieve the manifestations of systemic diseases. (74.1%) People living with HIV/AIDS have a range of potentially painful and health-compromising oral conditions with studies around the world indicating that oral lesions occurs in 50%–70% of HIV/AIDS patients.[39] Oral manifestations seen in HIV/AIDS include linear gingival erythema, necrotizing periodontal diseases, necrotizing ulcerative gingivitis, necrotizing ulcerative periodontitis, necrotizing stomatitis and chronic periodontitis. Thus, an awareness of this bidirectional relationship between periodontitis and HIV/AIDS can have a positive impact on the care delivered by the physician and received by the patient.

Consequently, periodontal diseases, in addition to reducing oral health related quality of life by reducing chewing function, impairing aesthetics, and inducing tooth loss,[40] has significant impacts on systemic health. Inflammatory mediators are released from the inflammed periodontium, stimulating local bone resorption, and also initiating systemic inflammation, platelet aggregation, and endothelial cell activation.[41] A possible pathogenic pathway is the transport of oral bacteria into the blood stream through diseased and ulcerated gingival pockets and the ability of these organisms to adhere to non-oral sites, resulting in systemic diseases.[42] The high levels of pro-inflammatory cytokines released has been associated with systemic diseases such as atherosclerotic vascular diseases, gastrointestinal ulcers, diabetes mellitus and some malignancies.

In developing countries, access to clinical care and preventive services for the control of periodontal diseases are often inaccessible and unaffordable. Educating patients about the systemic consequences of periodontal disease and oral preventive practices has a potential to lead not only to early identification of these diseases by using the health of the periodontium as a proxy measure of systemic health but also to reduce the burden of these diseases on populations around the world through simple and cost-effective public health promotion interventions.[42]

V.   Conclusion:

There was a low awareness of Periodontal Disease-Systemic link among general population of Nigerians and this awareness was significantly lower amongthose of low socio-economic status and those who had low levels of educational attainment. Educating patients about the systemic consequences of periodontal disease and oral preventive practices has a potential to lead to early identification of these to reduce their burden in the populations through simple and cost-effective public health promotion interventions.

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RESULTS

Table 1: Sociodemographic characteristics of study participants.

Age(yrs) Range: Mean:	18 – 77 38.94±13.55			
	Gender			
< 35yrs	**Male**	**Female**	**Total**	***P*-value**
35yrs - 50yrs	91 (44.8%)	112 (55.2%)	203 (42.2%)	
> 50yrs	71 (42.0%)	98 (58.0%)	169 (35.1%)	
Total	38 (34.9%)	71 (65.1%)	109 (22.7%	0.232
	200 (41.6%)	281 (58.4%)	481(100%)	
Educational Status				
None	5 (71.4%)	2 (28.6%)	7 (1.5%)	
Primary	6 (25.0%)	18 (75.0%)	24 (5.0%)	0.137
Secondary	52 (40.3%)	77 (59.7%)	129 (26.8%)	
Tertiary	137 (42.7%)	184 (57.3%)	321 (66.7%)	
Socioeconomic class				
Upper	59 (50.9%)	57 (49.1%)	116 (24.1%)	0.004*
Middle	86 (34.5%)	163 (65.5%)	249 (51.8%)	
Lower	55 (47.4%)	61 (52.6%)	116 (24.1%)	
State of residence				
Lagos	136 (42.7%	175 (56.3%)	311 (64.7%)	0.196
Ogun	64 (37.6%)	106 (62.4%	170 (35.3%)	

*Statistically significant

Table 2: Association between different variables and level of knowledge

Parameters	Level of knowledge								
	Periodontal disease(PD)			**PD-Systemic link**			**PD-General knowledge**		
	Poor	**Fair**	**Good**	**Poor**	**Fair**	**Good**	**Poor**	**Fair**	**Good**
Total	93; 19.3%	192; 39.9%	196; 40.8%	318; 66.1%	94; 19.5%	69 14.4%	202; 42.0%	202; 42.0%	77, 16.0%
Gender Male Female	44; 22.0% 49; 17.4%	74; 37.0% 118; 42.0%	82, 41.0% 114; 40.6%	132; 66.0% 186; 66.2%	38; 19.0% 56; 19.9%	30; 15.0% 39; 13.9%	86; 43.0% 116; 41.3%	84; 42.0% 118; 42.0%	30; 15.0% 47; 16.7%
p-value	0.369			0.926			0.861		
Age Group < 35yrs 35yrs - 50yrs > 50yrs	45; 22.2% 30; 17.8% 18; 16.5%	80; 39.4% 77; 45.6% 35; 32.1%	78; 38.4% 62; 36.6% 56; 51.4%	131; 64.5% 111; 65.7% 76; 69.7%	38; 18.7% 36; 21.3% 20; 18.3%	34; 16.8% 22; 13.1% 13; 12.0%	92; 45.3% 72; 42.6% 38; 34.9%	77; 37.9% 72; 42.6% 53; 48.6%	34; 16.8%25; 14.8% 18; 16.5%
p-value	0.075			0.702			0.397		
Educational Level Primary Secondary Tertiary	7; 22.6% 38; 29.5% 48; 15.0%	17; 54.8% 53; 41.0% 122; 38.0%	7; 22.6% 38; 29.5% 151; 47.0%	26; 83.9% 82; 63.6% 210; 65.4%	4; 12.9% 25; 19.4% 65; 20.2%	1; 3.2% 22; 17.0% 46; 14.4%	21; 67.7% 63; 48.8% 118; 36.8%	9; 29.1% 42; 32.6% 151; 47.0%	1; 3.2% 24; 18.6% 52; 16.2%
p-value	0.000*			0.219			0.001*		
Socioecono	14; 12.1%	37; 31.9%	65; 56.0%	61; 52.6%	33; 28.4%	22; 19.0%	34; 29.3%	57; 49.1%	

mic Status Upper class	51; 20.5% 28; 24.1%	104; 41.8% 51; 44.0%	94; 37.7% 37; 31.9%	179; 71.9% 78; 67.2%	41; 16.5% 20; 17.2%	29; 11.6% 18; 15.6%	111, 44.6% 57; 49.1%	105; 42.2% 40; 34.5%	25; 21.6% 33; 13.2% 19; 16.4%
Middle class									
Lower class	0.002*			0.008*			0.013*		
p-value									
State of residence Lagos	66; 21.2% 27; 15.9%	25, 40.2% 67; 39.4%	120; 38.6% 76; 44.7%	198; 63.7% 120; 70.6%	61, 19.6% 33; 19.4%	52; 16.7% 17; 10.0%	134; 40.1% 68; 40.0%	122; 39.2% 80; 47.1%	55; 17.7% 22; 12.9%
Ogun									
p-value	0.266			0.119			0.183		

*Statistically significant

Table 3: Level of awareness per question for different educational strata.

Question (Correct Responses)	Educational level			p-value
	Primary	**Secondary**	**Tertiary**	
Periodontal disease is same as gum disease	8;4.4%	36;19.8%	138; 75.8%	0.004*
Plaque is the main/primary cause of gum disease	10;9.7%	19;18.4%	74; 71.9%	0.047*
Plaque is soft debris on the teeth.	5;5.7%	21;23.9%	62;70.4%	0.715
Bleeding Gum is a sign of gum disease.	4;2.6%	38;25.0%	110; 72.4%	0.042*
Swollen Gum is a sign of gum disease	9; 7.5%	22; 18.3%	89;74.2%	0.053
Painful gums is a sign of gum disease	9; 8.4%	27; 25.2%	71; 66.4%	0.620
Earliest sign of gum disease is bleeding gum	3; 2.6%	24; 20.9%	88; 76.5%	0.022*
Is gum disease treatable?	18;5.0%	89;24.8%	252;70.2%	0.010*
Is gum disease preventable?	17;4.8%	86;24.4%	250; 70.8%	0.003*
What is the best method to prevent gum disease?	10;3.7%	60; 22.1%	202; 74.2%	0.000*
Is there an association between gum disease and DM?	3;1.9%	45; 27.8%	114; 70.3%	0.014*
Is there an association between gum disease and HIV/AIDS?	1; 1.1%	25; 26.0%	70; 72.9%	0.046*
Is there an association between gum disease and Hypertension?	4; 4.9%	29; 35.8%	48; 59.3%	0.129
Is there an association between gum disease and Stroke?	1; 1.2%	27; 33.8%	52; 65.0%	0.056
Is there an association between gum disease and Stress?	3; 3.2%	30; 31.9%	61; 64.9%	0.211
Is there an association between gum disease and Erectile Dysfunction?	3; 5.5%	22; 40.0%	30; 54.5%	0.064
Is there an association between gum disease and Kidney disease?	1; 1.2%	25;30.9%	55; 67.9%	0.095
Is there an association between gum disease and Respiratory disease?	2;2.3%	26; 29.9%	59; 67.8%	0.200
Is there an association between gum disease and Pregnancy?	1; 1.2%	20; 24.1%	62; 74.7	0.064
Is there an association between gum disease and Hypertension medications?	4; 4.3%	30; 32.3%	59; 63.4%	0.320
Is there an association between gum disease and Kidney disease medications?	2; 2.3%	28; 31.8%	58; 65.9	0.141
Is there an association between gum disease and Epilepsy medications?	6; 6.6%	32; 35.2%	53; 58.2%	0.127
Systemic diseases may lead to gum disease?	5;3.6%	31; 22.3%;	103; 74.1%	0.063
Gum diseases may lead to systemic disease?	6;3.6%	42; 24.9%	121; 71.5%	0.096
Treating gum disease can relieve manifestations of systemic diseases	8;4.4%	39; 21.5%	134; 74.1%	0.028*
Treating Systemic disease can relieve manifestations of PD.	11;5.2%	52; 24.8%	147; 70.0%	0.363

*Statistically significant

Table 4: Level of awareness per question for different socioeconomic strata.

Questions	Socioeconomic Status			p-value
	Upper class	**Middle class**	**Lower class**	
Periodontal disease is same as gum disease	59; 32.4%	92; 50.5%	31; 17.1%	0.001*
Plaque is the main/primary cause of gum disease	27; 26.2%	55; 53.4%	21; 20.4%	0.588
Plaque is soft debris on the teeth.	23; 26.1%	51; 58.0%	14; 15.9%	0.136
Bleeding Gum is a sign of gum disease	49; 32.2%	74; 48.7%	29; 19.1%	0.012*
Swollen Gum is a sign of gum disease	28; 23.3%	62; 51.7%	30; 25.0%	0.955
Painful gums is a sign of gum disease	29; 27.1%	54; 50.5%	24; 22.4%	0.699
Earliest sign of gum disease is bleeding gum	32; 27.8%	58; 50.4%	25; 21.8%	0.530
Is gum disease treatable?	96; 26.7%	181; 50.4%	82; 22.9%	0.064
Is gum disease preventable?	97; 27.5%	178; 50.4%	78; 22.1%	0.012*
What is the best method to prevent gum disease?	79; 29.0%	136; 50.0%	57; 21.0%	0.010*
Is there an association between gum disease and DM?	46; 28.4%	76; 46.9%	40; 24.7%	0.223

Is there an association between gum disease and HIV/AIDS?	36; 37.5%	42; 43.8%	18; 18.7%	0.003*
Is there an association between gum disease and Hypertension?	22; 27.2%	38; 46.9%	21; 25.9%	0.622
Is there an association between gum disease and Stroke?	25; 31.2%	35; 43.8%	20; 25.0%	0.197
Is there an association between gum disease and Stress?	29; 30.9%	47; 50.0%	18; 19.1%	0.177
Is there an association between gum disease and Erectile Dysfunction?	11; 20.0%	32; 58.2%	12; 21.8%	0.587
Is there an association between gum disease and Kidney disease?	25; 30.9%	37; 45.7%	19; 23.4%	0.279
Is there an association between gum disease and Respiratory disease?	27; 31.0%	39; 44.8%	21; 24.2%	0.213
Is there an association between gum disease and Pregnancy?	29; 34.9%	36; 43.4%	18; 21.7%	0.039*
Is there an association between gum disease and Hypertension medications?	29; 31.2%	40; 43.0%	24, 25.8%	0.121
Is there an association between gum disease and Kidney disease medications?	26; 29.5%	38; 43.2%	24; 27.3%	0.193
Is there an association between gum disease and Epilepsy medications?	24; 26.4%	39; 42.9%	28; 30.7%	0.134
Systemic diseases may lead to gum disease?	46; 33.1%	60; 43.2%	33; 23.7%	0.009*
Gum diseases may lead to systemic disease?	58; 34.3%	75; 44.4%	36; 21.3%	0.001*
Treating gum disease can relieve manifestations of systemic diseases	60; 33.1%	82; 45.3%	39; 21.6%	0.002*
Treating Systemic disease can relieve manifestations of PD.	63; 30.0%	99; 47.1%	48; 22.9%	0.028*

*Statistically significant