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PREVALENCE OF PERIODONTITIS ON A SAMPLE OF ADULT POPULATION: A CROSS-SECTIONAL STUDY II

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ABSTRACT

Aim: The aim of this study is to assess the prevalence, severity, and extent of periodontitis through full-mouth examination of CAL, and its association with socioeconomic status, in a sample of adult Egyptian population.

Methodology: The study was carried out on 581 patients with age group 18-80 years old, attending the outpatients' clinic of the diagnostic center at Faculty of Dentistry, Cairo University, Egypt. A full mouth periodontal chart was filled for each patient, the evaluated parameters were: clinical attachment level (CAL), probing depth (PD), percentage of bleeding on probing (BOP), gingival recession (GR), percentage of dental plaque, furcation involvement and tooth mobility.

A full questionnaire was filled for each patient through a face-to-face personal interview using simple, short, easily comprehended questions including a section for demographic information of age, sex, social, educational levels, medical history, oral hygiene and smoking habits of the patient.

Results: Among the whole study population (581patients), gingivitis was the most prevalent periodontal disease (50.3%). The most prevalent periodontitis stage was Stage II (36.8%) while the least prevalent was Stage IV (8.2%). The most prevalent periodontitis grade was Grade B (42.1%) while the least prevalent was Grade C (19.9%).

Conclusion: There was a statistically significant association between periodontal diseases and Age, Diabetes history, Oral hygiene and Smoking.

KEYWARDS: Periodontitis, periodontal diseases, risk factors , socioeconomic level

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INTRODUCTION

The healthy gingiva is characterized by its pale or coral pink color with stippling, the gingival margin has a knife-edge and tightly adapted to the underlying tissues and located at the cementoenamel junction with scalloped borders**.** The healthy gingival tissue consists of free gingiva, attached gingiva which is located apical to the free gingiva to the mucogingival junction. It is characterized by being keratinized, immobile, and firmly bound to the underlying bone. The alveolar mucosa is non-keratinized and freely mobile that extends from the apical part of the mucogingival junction and continuous with the lining mucosa of the mouth **(Lindhe et al., 2013**).

Periodontal disease is defined as a chronic inflammatory disease of the supporting tissues of the teeth initiated by bacterial biofilm resulting in progressive destruction of the periodontal ligaments and alveolar bone loss, loss of the clinical attachment level (CAL), bleeding on probing (BOP), deepening the pocket depth (PD), furcation involvement, tooth mobility and migration **(Highfield, 2009a)**.

Periodontitis is a true infectious disease affecting the oral cavity. Normally, there is an equilibrium between microbiota and the host immune system, so any changes to this equilibrium in addition to other modifying factors will lead to manifestation of periodontal disease **(Könönen et al., 2019)**.

Periodontitis is always preceded by gingivitis; which is a reversible condition that could properly be controlled by scaling and proper oral hygiene instructions. However, the persistence of gingivitis may lead to loss of attachment and its progression into periodontitis **(Schätzle *et al.*, 2004;Preshaw, 2015).** Periodontitis occurs due to loss of marginal periodontal ligament fibers, apical migration of the junctional epithelium and spread of the bacterial biofilm along the root surface. So, the bacteria and its toxic products have the opportunity to invade the epithelium easily reaching the connective tissue **(Mark Bartold and Van Dyke, 2013)**, resulting in irreversible connective tissue destruction, alveolar bone resorption, and increased probing depths **(Preshaw, 2015).**

Periodontitis is a common disease that results from complex interactions between a pathogenic periodontal microbiota and the host immune response, which are modulated by environmental and genetic factors **(Silva *et al.*, 2015);** that is why periodontal diseases have different clinical forms in a population **(Susin *et al.*, 2004; Susin and Albandar, 2005; Nazir, 2017a).** Periodontitis is characterized by cyclical patterns of progression and resolution at any given site **(Gautam *et al.*, 2011).** It is the second largest oral health problem **(Petersen and Ogawa, 2005).** Periodontitis, with many other complex diseases, should be considered as a syndrome **(Baelum and Lopez, 2003; Offenbacher *et al.*, 2007).**

The aim of this study was to assess the prevalence, severity, and extent of periodontitis through full-mouth examination of CAL, and its association with different risk factors such as gender, age, socioeconomic level, oral hygiene behaviors, smoking status and diabetes mellitus in a sample of adult Egyptian population which was recruited from the diagnostic center at Faculty of Dentistry, Cairo University, Egypt.

In this study the prevalence of periodontitis was detected according to the new classification in which periodontitis was classified into four stages according to the severity and the complexity of the case. And the rate of progression will detect the grade of periodontitis that will help in better diagnosis and treatment plan **(Tonetti et al*.*, 2018).**

SUBJECTS AND METHODS

1. Study Design:

This study is an observational study (cross - sectional study).

This is a prospective descriptive study that was conducted at the diagnostic center of the Faculty of Dentistry, Cairo University, Egypt according to

the regulations of the Ethics Committee during the period from October 2019 through September 2020. The average number of patients diagnosed per day was 30 patients.

Recruitment period: 11 months.

2- Subjects

2.1 sample size:

- The aim of this study was to assess the prevalence of periodontitis among a group of Egyptian population with an age range from eighteen to eighty years old, attending the outpatient clinic at the diagnostic center of the Faculty of Dentistry, Cairo University**.** Sample size (581) was determined by the center of Evidence Based at the Faculty of Dentistry, Cairo University.
- Convenient sampling method was applied to recruit all eligible candidates in a period of 11 months.

2.2 Eligibility criteria

All adult patients attending the diagnostic center at the Faculty of Dentistry above 18 years old.

2.3 Exclusion criteria

1. Patients undergone periodontal therapy in the last 6 months.
2. Patients with psychomotor dysfunction.
3. Edentulous patients.

2.4 Ethical consideration:

This research had been approved by the ethical committee of Faculty of Dentistry, Cairo University and a copy of the approval report is attached in. Patients that met the inclusion criteria were enrolled in the study after signing an Arabic approval consent form by the willing participants in all groups. All the data needed were discussed.

3- Data collection methods:

3.1 study variables

- **Primary outcomes:** Prevalence of periodontitis on a sample of Adult Egyptian Population in accordance with the periodontal disease classification **(Tonetti et al., 2018)**.
- **Secondary outcomes**: Gender, age, socioeconomic status, diabetes mellitus, oral hygiene habits and smoking.

3.2 Data collection

The data collected through:

3.2.1 A standardized Transplant Database Questionnaire for every patients including medical, socioeconomic level, oral hygiene, and smoking habits (appendix 1).

3.2.2 Clinical examination:

- Patients were either free of periodontal diseases and diagnosed as healthy, or had periodontal diseases and diagnosed as gingivitis or periodontitis which was confirmed by calibrated evaluator M.H when at least there is 1–2 mm loss of the clinical attachment level (CAL) in interproximal area in two non-adjacent teeth according to the new classification **(Tonetti et al., 2018)** using UNC probe.
- Clinical examination was done by calibrated evaluator M.H through filling periodontal diagnostic chart used to assess the presence/ absence of periodontal diseases, and its stage and grade based on the new classification **(Tonetti et al., 2018)**.
- National Health and Nutrition Examination Survey (NHANES) determined the clinical attachment loss (CAL) and probing depth (PD) at six sites of all teeth (excluding third molars) for the estimation of periodontal disease in

the U.S (Nazir, 2017). Full-mouth clinical assessment of periodontitis is considered to be the gold standard in epidemiological studies **(Al-Harthi *et al.*, 2013).**

3.2.3 Clinical parameters:

The clinical parameters were: Clinical attachment level (CAL), bleeding on probing (BOP), probing depth (PD), plaque index (PI), gingival recession (GR), furcation involvement, and tooth mobility.

4. Statistical methods:

Qualitative data was presented as frequencies and percentages. Numerical data was presented as mean, standard deviation (SD), minimum, maximum and 95% Confidence Interval (95% CI) values. Chi-square test or Fisher's Exact test when applicable was used for comparisons related to qualitative data. Student's t-test or ANOVA test were used for comparisons related to numerical data. Regression analysis was used to determine significant predictors of periodontitis. The significance level was set at $P \leq 0.05$.

RESULTS

A. Descriptive statistics

A-1. Demographic data

The present study was conducted on 581 subjects; 225 males (38.7%) and 356 females (61.3%). The mean (SD) values for age were 35.4 (11) years with a minimum of 18 and a maximum of 80 years old. More than half of the subjects had high education, quarter of the participants had middle education and the minority of subjects had elementary education or was illiterate. As regards monthly income; about quarter of the subjects have income ranging from 4000 – 6000 or >6000 LE/month, more than one third of the subjects have income ranging from 2000 – 4000 LE/month while the minority of subjects had income <2000 LE/month.

TABLE (1) Descriptive statistics for demographic data of the study participants (n = 581)

Demographic data	
Gender [n (%)]	
Male	225 (38.7%)
Female	356 (61.3%)
Age [Mean (SD)]	35.4 (11)
Education [n (%)]	
Illiterate	52 (9%)
Elementary education (1-6 years of education)	32 (5.5%)
Middle education (7-12 years of education)	143 (24.6%)
High education (>12 years of education)	354 (60.9%)
Income [n (%)]	
<2000 LE/month	94 (16.2%)
2000 – 4000 LE /month	216 (37.2%)
4000 – 6000 LE /month	134 (23.1%)
>6000 LE /month	137 (23.6%)

Four-hundreds and sixty-five participants (80%) don't suffer from diabetes. About twenty percent of subjects were either controlled (10.8%) or uncontrolled diabetics (9.1%). About one-third of participants (31.7%) had poor oral hygiene, 30.3% had fair oral hygiene while 38% had good oral hygiene. The prevalence of smoking in the present study is 19.9%. Light smokers presented 7.9% of the study participants while heavy smokers represented 12%. About half of the participants (50.3%) had gingivitis, 29.4% had periodontitis while 20.3% were healthy

A-2 Periodontal examination

Descriptive statistics for Clinical Attachment Level (CAL), Pocket Depth (PD), Plaque Index (PI) and Bleeding on Probing (BOP) are presented in Table (2).

TABLE (2): Shows Descriptive statistics for Clinical Attachment Level (CAL), Pocket Depth (PD), Plaque Index (PI), Bleeding on Probing (POB) (n = 851), prevalence of periodontitis stages and grades

Periodontal parameters	Mean	SD	95% CI	Median	Minimum	Maximum
CAL (mm)	1.14	2.06	0.97 – 1.3	0	0	10
PD (mm)	3.58	0.84	3.51 – 3.65	3	0	7
PI (%)	27.5	17.8	26 – 28.9	25	0	75
BOP (%)	22.6	13.5	21.5 – 23.7	20	0	65

Frequencies (n) and percentages (%) for prevalence of periodontitis stages and grades (n = 171)

Periodontitis stages	n	%	Periodontitis grades	n	%
Stage I	57	33.3	Grade A	65	38
Stage II	63	36.8	Grade B	72	42.1
Stage III	37	21.6	Grade C	34	19.9
Stage IV	14	8.2			
Total	171	100	Total	171	100

A-3. Prevalence of periodontitis

Periodontitis with different stages was found in 171/581 subjects giving a prevalence of 29.4%. Distributions of different stages and classes of periodontitis are presented in Table (2). The most prevalent periodontitis stage was Stage II (36.8%) while the least prevalent was Stage IV (8.2%). The most prevalent periodontitis grade was Grade B (42.1%) while the least prevalent was Grade C (19.9%).

B. Univariate analysis

The severity of Periodontitis was statistically significant associated with gender, mean age, income, diabetes, oral hygiene, and smoking (*P*-value <0.001). However, there was no statistically significant association between educational level and periodontitis stages (*P*-value =0.274) as shown in the following table.

TABLE (3): The following table shows the Descriptive statistics and results of the association between gender, income, diabetes, oral hygiene, smoking, educational level, mean age and periodontitis stages

	Stage I (n = 57)		Stage II (n = 63)		Stage III (n = 37)		Stage IV (n = 14)		*P*-value	*Effect size (v)*
	n	%	n	%	n	%	n	%		
Gender	Descriptive statistics and results of Chi-square test for the association between gender and periodontitis stages									
Male	17/57	29.8	35/63	55.6	22/37	59.5	13/14	92.9	<0.001*	0.356
Female	40/57	70.2	28/63	44.4	15/37	40.5	1/14	7.1		

	Stage I (n = 57)		Stage II (n = 63)		Stage III (n = 37)		Stage IV (n = 14)		*P*-value	*Effect size (v)*
	n	%	n	%	n	%	n	%		
Income	Descriptive statistics and results of Fisher's Exact test for the association between income and periodontitis stages									
<2000 LE/month	5/57	8.8	7/63	11.1	1/37	2.7	0/14	0	0.018*	0.209
2000 – 4000 LE /month	24/57	42.1	25/63	39.7	19/37	51.4	2/14	14.3		
4000 – 6000 LE /month	10/57	17.5	18/63	28.6	11/37	29.7	2/14	14.3		
>6000 LE /month	18/57	31.6	13/63	20.6	6/37	16.2	10/14	71.4		
Diabetes history	Descriptive statistics and results of Fisher's Exact test for the association between diabetes history and periodontitis stages									
Free	34/57	59.6	29/63	46	12/37	32.4	3/14	21.4	<0.001*	0.442
Controlled diabetes	23/57	40.4	21/63	33.3	2/37	5.4	0/14	0		
Uncontrolled diabetes	0/57	0	13/63	20.6	23/37	62.2	11/14	78.6		
Oral hygiene	Descriptive statistics and results of Fisher's Exact test for the association between oral hygiene and periodontitis stages									
Poor	33/57	57.9	22/63	34.9	20/37	54.1	13/14	92.9	0.001*	0.258
Fair	13/57	22.8	30/63	47.6	8/37	21.6	0/14	0		
Good	11/57	19.3	11/63	17.5	9/37	24.3	1/14	7.1		
Smoking	Descriptive statistics and results of Fisher's Exact test for the association between smoking and different periodontitis stages									
Non-smoker	47/57	82.5	32/63	50.8	14/37	37.8	2/14	14.3	<0.001*	0.375
Light smoker	6/57	10.5	12/63	19	3/37	8.1	0/14	0		
Heavy smoker	4/57	7	19/63	30.2	20/37	54.1	12/14	85.7		
Educational level	Descriptive statistics and results of Fisher's Exact test for the association between periodontitis stages and educational levels									
Illiterate	5/57	8.8	12/63	19	3/37	8.1	2/14	14.3	0.274	0.147
Elementary education	2/57	3.5	3/63	4.8	3/37	8.1	0/14	0		
Middle education	16/57	28.1	11/63	17.5	15/37	40.5	4/14	28.6		
High education	34/57	59.6	37/63	58.7	16/37	43.2	8/14	57.1		
Mean Age	Descriptive statistics and results of one-way ANOVA test for comparison between age values of patients with different periodontitis stages									
	Stage I (n = 57)		**Stage II (n = 63)**		**Stage III (n = 37)**		**Stage IV (n = 14)**		**P-value**	**Effect size (Eta squared)**
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI	0.002*	0.084
	44.5 (8.8) ^{C}	42.2-46.9	44.7 (11.6) ^{BC}	41.8-47.6	50.7 (9.5) ^{B}	47.5-53.9	51.9 (5) ^{A}	49.1-54.8		

**: Significant at P ≤ 0.05, Different superscripts are statistically significantly different*

C . Multivariate analysis

Binary logistic regression analysis to determine significant risk factors of periodontitis

Binary logistic regression model was constructed using prevalence of periodontitis (Yes/No) as the dependent variable. Gender, age, educational level, income, diabetes history, oral hygiene and smoking were the independent variables. Model fitting was tested by several methods; first is the statistically significant -2 Log Likelihood test (-2 Log Likelihood = 334.4, *P*-value <0.001). Secondly; pseudo R-square tests results were as follows: Cox and Snell = 0.471, Negelkerke = 0.67. Values of these tests indicate good model fit.

Results of the regression model showed that gender, educational level and income were non-statistically significant predictors for periodontitis. The following variables were the statistically significant risk factors for prevalence of periodontitis as shown in the following table (4):

Variable	Regression coefficient (β)	Standard Error (SE)	*P*-value	Odds Ratio (*OR*)	95% CI
Age	0.168	0.018	<0.001*	1.183	1.142-1.226
Diabetes history (Reference category: Free)					
Controlled diabetics	1.929	0.407	<0.001*	6.882	3.097-15.294
Uncontrolled diabetics	1.92	0.553	0.001*	6.82	2.308-20.149
Oral hygiene (Reference category: Good)					
Poor oral hygiene	1.003	0.36	0.005*	2.727	1.347-5.523
Fair oral hygiene	0.634	0.377	0.093	1.884	0.900-3.945
Smoking (Reference category: Non-smoker)					
Light smoker	0.84	0.51	0.048*	2.317	0.852-6.298
Heavy smoker	1.74	0.426	<0.001*	5.696	2.471-13.130

: Significant at P ≤ 0.05

DISCUSSION

The benefits of the new classification were properly to assess the complexity of the condition, set a definitive diagnosis, assess the prognosis and the associated risk factors for each case, and to help establish a clear and solid treatment plan **(Tonetti et al., 2018).**

In the current study, full mouth periodontal clinical examination was adopted because it is more accurate for attaining better diagnosis of periodontal disease than recording selective sites that may lead to misdiagnosis and risk of bias **(Eke et al., 2012b; Al-Harthi et al., 2013).** This cross sectional observational study aimed to detect the prevalence of Periodontitis in the adult Egyptian dental outpatients attending the diagnostic center at faculty of Dentistry, Cairo University. The present study was conducted on 581 subjects. The results of this study may be applicable for a larger population because a wide range of patients from age 18 to 80 participated in this study.

A full questionnaire included information about the patient's age, gender, social, educational levels, annual income, diabetes, oral hygiene habits and smoking status of the patient to detect possible risk

factors that may upgrade the grade of periodontitis into a higher grade. The questionnaire was filled in a simple way through face to face interview and relied on the veracity of the patients **(Machado et al., 2018).**

The prevalence of periodontal diseases among the current sample was as follows; (50%) 292 gingivitis,(29%) 171 periodontitis, while the rest (20.3%) 118 were healthy subjects. **Khan et al., (2016)** mentioned that about 310(70%) suffered from periodontitis while 113(30%) were healthy. Their results were much more than the present study. This could be due to that 55.1% in their study were smokers. Another cross sectional study conducted in KSA by **Al Qahtani et al., (2017b)**, Their results showed 297(30%) gingivitis, 160(16%) periodontitis while, 543(54%) were healthy, which were less than the result of our study. This could be explained by different sample size and population.

In the current study out of the total periodontitis sample (171), 87 were males (51%) and 84 females (49%) with ratio1.03:1 that showed no gender predilection. This result was convergent with a cross sectional study conducted by **Machado et al., (2018)** where the authers reported that no gender association with ratio 1:1.32 females to males. Moreover, a systematic review conducted by **Needleman et al.(2018a)** who concluded that gender had a little effect on annual clinical attachment loss.

In our study, although both males and females showed comparable results for developing periodontal disease, the severity of periodontitis varied between males and females, where most of stage II, III and IV groups were males (55.6%, 59.5% and 92.9%) respectively while females fell in stages I (70.2%). This could be attributed to poor oral hygiene rituals, in addition to increased smoking habits among males **(Susin *et al* 2004).** On the other hand, **Holde *et al.*, (2017)** reported that (9.1%) suffered from severe periodontitis (6.9%) females and (11.4%) males. The difference between the results of this study and the results of our study could be explained by different sample size and populations.

In the present study, there was a positive correlation between age and periodontitis. Older age subjects were found to be 1.183 folds prone to periodontitis than younger ones. This result was in accordance with **Aimetti et al., (2015)** who reported that the prevalence of severe periodontitis increased to 52.63% in the 50–59 years old group in Italy population. Additionally, a cross-sectional study performed by **Holde et al., (2017)** to determine periodontitis prevalence and severity in Norway, who concluded that the prevalence was five times higher in the older age group than in the younger one.

In the present study, it was also noticed that the severity of periodontitis was increased by age, since stage IV (8%) periodontitis group showed the highest mean age 51.9. Comparatively, **Holde et al., (2017)** mentioned that the highest percentage 81.3% of severe periodontitis was in the 65 to 79 year age group. Moreover, **Al Qahtani et al., (2017b)** mentioned that the severity of periodontitis increased with age. In their study the highest percentage of severe periodontitis for subjects with CAL >5mm showed among age group 65-74 (33.3%) while, only (4.58%) at age group 35-44 years old. These results could be explained in the light of the cumulative effect of the long lasing chronic inflammatory effect on the amount of clinical attachment loss throughout life **(Costa et al., 2009).**

In the current study socioeconomic level (education and individual income) did not affect the progression of periodontitis which was in accordance with a systematic review conducted by **Klinge and Norlund (2005).** They concluded that socioeconomic level was not a significant risk factor when compared with smoking. Additionally, in our study, the severity of periodontitis was not related to the educational level. In contrast, **Susin *et al.*, (2011), and Ababneh et al., (2012)** conducted a cross-

sectional study to study risk indicators for chronic periodontitis. They mentioned that individuals with low socioeconomic status (low education and low income) had a two and five fold higher chance of having chronic periodontitis, respectively.

The difference between these results and our study could be explained by different fields of high education such as engineering and medicine, does not mean that these individuals have sufficient knowledge to keep the integrity of periodontal health and maintain their oral hygiene. That is why it is of an utter importance to raise awareness for periodontal care in dental centers and educational colleges.

In the current study income was not a risk factor for prevalence of periodontitis. However, the severity of periodontitis increased with higher income [subjects with 6000 LE/month were prevalent at stage IV (71.04%) while subjects with less than 2000 LE/month were prevalent at stage II (11.1%)]. Although individuals with high income could pay the high expenses of dental treatment however; they can as well pay for harmful habits such as cigarette, cigar and shisha. On the other hand, governmental hospitals and educational universities afford high quality of treatment with free payment for individuals with low income.

In the present study, there was a positive correlation between Diabetes mellitus and periodontitis; Subjects with uncontrolled diabetes are 6.82 folds prone to periodontitis compared to diabetes-free subjects. Comparatively, **Mealey and Ocampo, (2007), and Al Qahtani et al., (2017a)** conducted a systematic review and a cross sectional study, respectively to detect the relationship between diabetes mellitus and periodontal disease. They reported that the uncontrolled diabetic individuals are more susceptible to have periodontitis three and two folds more than the healthy one**,** respectively.

According to our study, although the prevalence of periodontitis at subjects suffered from controlled and uncontrolled diabetes were nearly equal. The severity of periodontitis highlighted that uncontrolled diabetes subjects were prevalent at stage IV while controlled were prevalent at stage I which showed the importance of detecting periodontitis stages to estimate to what extend the risk factors affect the periodontal diseases. Furthermore, a systematic review conducted by **Leite *et al.*, (2018)** to assess the effect of poorly controlled diabetes on periodontitis progression and reported that uncontrolled diabetes increases the progression of periodontitis compared with non-diabetics and controlled diabetes by 86%. Uncontrolled diabetes significantly increase periodontal destruction due to the increase in production of pro-inflammatory and pro-oxidant cytokines that trigger tissue inflammation, impairment of cell function which allow bacterial persistence with deepening the periodontal pocket.

In the present study, there was a positive correlation between oral hygiene and periodontitis. Subjects with poor oral hygiene (51%) are 2.727 folds prone to develop periodontitis compared to those with good oral hygiene (19%). The result of our study was in accordance with **Ababneh et al., (2012)** who mentioned that the prevalence of periodontitis increased almost 2.5 times in subjects who reported not brushing their teeth compared to subjects who reported regular tooth brushing.

In our study, all subjects who reported irregular brushing their teeth showed the highest prevalence with most of them falling in stage IV (92.9%). On the other hand, all the subjects who reported that they brush their teeth once daily were prevalent in stage II (47.6%). The results of our study were convergent with the results reported by **Mathur et al. (2011)** who conducted a cross sectional study in India. They reported that the prevalence of periodontal disease was 100% in poor oral hygiene group. This could be explained by the accumulation of plaque and calculus that results in gingival inflammation, and consequently may progress into periodontitis if left untreated.

The current study had also investigated the correlation between smoking and periodontitis; heavy smokers (more than 10 cigarettes) are 5.696 folds prone to periodontitis compared to non-smokers. Comparatively, **Khan et al. (2016)** stated that smokers increased the prevalence of periodontitis 3.5 times compared with non-smokers while heavy smokers are 5.3 folds liable to develop periodontitis**.**

In the current study, the severity of periodontitis differed between the smokers and non-smokers groups where patients with periodontitis stage I was prevailed by non-smokers 95(55%), on the other hand, stage IV showed the highest prevalence of heavy smokers 55(32%). Comparatively, **Khan et al. (2016)** reported that heavy smokers were associated with an increased burden of chronic periodontitis (96.7%) as compared to moderate/light smokers (66.1%). On the other hand, the highest percentage of subjects who suffered from severe periodontitis as reported by **(Holde *et al.*, 2017a)** was at smoker groups (18.4%), while (11.6%) were former smokers and (7.4%) were nonsmokers. This draws inferences about the strong causal relationship between smoking and periodontal disease progression **(Gautam *et al.*, 2011)**.

Finally, the results of all cross sectional epidemiological studies were estimation to the real prevalence aiming to understand the importance of periodontal diseases, possible risk factors and early treatment to avoid further progression of the periodontal diseases and to provide a positive impact on the general health. It is worth to mention the importance of detection of the severity of periodontitis that represents the main core instead of just mentioning the prevalence of periodontal diseases that represented the outer shell.

CONCLUSIONS

- Gingivitis was the most prevalent periodontal disease (50.3%) while, (29.4%) was the prevalence of periodontitis. The prevalence of periodontitis Stage II was (36.8%) then Stage I (33.3%). The prevalence of Stage III was (21.6%) while Stage IV showed the least prevalence (8.2%).
- Age, Diabetes history, oral hygiene and smoking were identified as risk factors for periodontitis in this referred subpopulation.
- The results of our study highlight the importance of developing appropriate public health programs to educate the Egyptian population about the burden of periodontal diseases.

Limitations and Recommendations

There are some limitations to note:

1. Unavailability for radiographic examination to the most affected sites
2. The assessment of risk factors depended on the veracity of the subjects
3. Our study was hospital based study which may not succeed in estimation the true prevalence of periodontal disease compared with field studies.

RECOMMENDATIONS

1. Larger scale of cross-sectional studies involving the whole country are recommended to investigate the prevalence of gingivitis and periodontitis.
2. The risk factors should be investigated in longitudinal studies to elucidate whether they are true risk factors or not.

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APPENDIX 1: ORAL HEALTH QUESTIONNAIRE FOR ADULTS QUESTIONNAIRE

Patient information

- Name: .....
- Gender: Male ☐ female ☐ Phone number .....
- Address: .....
- Marital status Single ☐ Married ☐ Divorced ☐ Widowed ☐
- Occupation .....
  employed unemployed retired
- Educational
  level illiterate ☐ elementary (1-6 years) ☐ middle (7-12 years)☐ higher (>12 years)☐
- Annual income: 20000-39000Le ☐ 40000-60000 Le ☐ >61000 Le ☐

Medical history:

Medically free ☐

Have systemic disease

- Diabetes: controlled ☐ uncontrolled ☐
- Hypertension ☐ hypotension ☐ heart disease ☐
- Rheumatoid arthritis ☐ hepatitis b ☐ hepatitis c ☐ others .....

Dental history:

- Last time you visit dental clinic .....
- The purpose .....
- Do you suffer from bleeding of the gum: yes ☐ no ☐
- Do you feel any mobility in your teeth: yes ☐ no ☐

Oral hygiene status:

- How many times do you brush your teeth?
  (once ☐ twice ☐ 3 times ☐ irregular ☐ never ☐)
- Are you smoker? (yes - no)
- If yes how many cigarettes do you smoke per day?