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Association between Pre-pregnant Overweight and Obesity and Periodontal Disease during Pregnancy: A Cross Sectional Study

Eman Ali Abd El Moaty Sheha[1], Hanan Elzeblawy Hassan[2] & Wafaa Mostafa Ahmed Gamel[3]

[1] Community Health Nursing, Faculty of Nursing-Fayoum University, Egypt

[2] Maternal and Newborn Health Nursing, Faculty of Nursing, Beni-Suef University, Egypt

[3] Medical Surgical Nursing, Faculty of Nursing, Fayoum University, Egypt

Correspondence: Hanan Elzeblawy Hassan, Maternal and Newborn Health Nursing Department, Faculty of Nursing, Beni-Suef University, Egypt.

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Abstract

Background: Obesity is considered a noteworthy public health issue in both developed & developing countries. Among the 1.5 billion overweight individuals worldwide, 300 million of them were obese women. In the general, the prevalence of maternal obesity has increased 60% in the previous two decades with nearly 1 in 3 women now entering pregnancy obese. Also, the periodontal disease has been observed to be prevalent in pregnant women with the prevalence ranging from 20% to more than 50%, especially economically disadvantaged women.

Aim: explore the relation between pre-pregnant overweight and obesity with periodontal disease during pregnancy.

Subjects & Methods: cross-sectional study among 400 pregnant women were booked in the high-risk obstetric departments and the antenatal outpatient clinics at governmental general hospitals in El-Fayoum City and governmental university hospital in El-Mansoura city.

Results: The mean age of pregnant women was 29.9 ± 6.2 with increase the prevalence of periodontal disease in pregnant women (83.5%). Statistically significant correlation was found between prenatal weight and periodontal disease during pregnancy ($p \leq 0.0001$) with increasing the prevalence of periodontal disease in prenatal obese women (53.2%) and over weight (39.7%) were observed in women who were in their 3rd trimester ($p = 0.011$). Increase prevalence of periodontal with poor oral hygiene and sedentary activity.

Conclusion: increased pre-pregnancy obesity & overweight are positively correlated with periodontal disease prevalence among pregnant women, and Pregnancy itself may also be associated with an increased risk of periodontal disease.

Recommendations: Activating the role of the maternity and community health nurse in branches of Obstetrics and antenatal clinics to enhance pregnant women's knowledge regarding oral health risks of obesity & overweight.

Keywords: pre-pregnant obesity, periodontal disease, pregnancy

1. Introduction

Worldwide, obesity and periodontitis are both global health burdens in both developing & developed countries that are relevant from a clinical & public health perspective. [1] Rates of obesity in the developing world have tripled in the last two decades. [2] The World Health Organization (WHO) estimates that 400 million people worldwide are obese & 1.6 billion are overweight. [3] The Periodontal diseases are mostly establishment and progression depend on the nature of the host resistant reaction & immune response, which may be affected by unhealthy habits & systemic conditions. [4]

Pre-pregnancy weight can impact a woman's weight during her pregnancy. Specifically, if a woman is obese prior to becoming pregnant, she is likely to remain obese during pregnancy because maternal obesity during pregnancy is linked to poor pregnancy outcomes. [5] So, it is important for a woman to consider her weight prior to becoming pregnant. Obesity & overweight are defined as the excessive or abnormal accumulation of fats that

may lead to adverse health outcomes. [6] Additionally, World Health Organization defined obesity as an increased body mass index (ƀBMI) more than 30 kg/ m^2. [7] This excess body fat in these women results in measurable changes in levels of circulating cytokines which have far-reaching effects on distant tissues & organs in the body and may contribute to periodontitis initiation and progression. [8]

In adults, the prevalence of obesity & overweight is commonly evaluated by utilizing Body Mass Index, which estimated by dividing the person's body weight on his square length in meters, kg/m^2, BMI is classified according to criteria laid by the National Institute of Health in the United States and is recommended by WHO. Generally, ƀBMI less than 18.5 kg/m^2 is considered underweight, 18.5 - 24.9 kg/m^2 is normal weight, 25.0 - 29.9 kg/m^2 is overweight & more than 30.0 kg/m^2 is obese. [9, 10] Recently, obesity is further classified into three levels: Class I obesity (ƀBMI 30.0 - 34.9 kg/m^2), Class II obesity (ƀBMI 35.0 - 39.9, kg/m^2) and Class III (ƀBMI ≥ 40.0 kg/m^2). [11, 12]

Obesity is a systemic disease that has been recognized as the main risk factor for the progression of hypertension, type 2 diabetes (non-insulin dependent diabetes mellitus), cardiovascular disease, periodontitis, dyslipidemia, malignancies & certain forms of cancer, respiratory problems and fertility problems. [7] Several studies added that the obesity has been related not only to general chronic diseases but also for localized diseases such as those in the oral cavity. Studies have reported that periodontitis is associated with obesity & chronic diseases. [9, 10, 13] In addition, obesity can apply impacts upon the hypothalamic pituitary ovarian (HPO) axis, therefore interrupt the menstrual cycle & ovulation. [14] Moreover, recent research indicates a conceivable relationship between chronic oral infection and diabetes, heart & lung disease, stroke, and low birth-weight or premature births, indicating that oral health ultimately supports & mirrors the health of the whole body. [15]

On the other hand, obesity has been described as an altered systemic inflammatory state, with an increase in pro-inflammatory cytokines & leukocytes. [16] One of the most important and ubiquitous pro-inflammatory cytokines is TNƑ-α. The acute phase reaction is characterized by an increase in circulating TNƑ-α. Macrophages are the primary producers of the molecule, but numerous other cell types can also release it. The adipocytes of obese women have been appeared to have increased TNƑ-α production. [17, 18] Once produced, TNƑ-α reaches cell surface receptors and has a catabolic effect through a signaling cascade, which in ultimately results in gene regulation and the activation of collagenases and other enzymes that destroy the extracellular matrix. TNƑ- α also increases osteoclastogenesis and differentiation from precursor cells, a pivotal step in inflammatory osteolysis. Both extracellular matrix and bone destruction are key components of periodontitis and it is clear that increased TNƑ-α can promote both processes. [19, 20, 9] Obesity (adipose tissue) as a complex endocrine organ involved in immunomodulation and metabolic regulation. [10]

Other researchers have suggested that TNƑ-α may act as more of an intermediary step in the pathway towards periodontal inflammation. The inflammatory cytokines such as TNƑ-α produced in obese women increases insulin resistance and results in diabetes. Subsequently, diabetes and elevated blood sugar cause the generation of advanced glycation end products; these products go on to increase leukocyte inflammatory cytokine release at the local level, thereby producing periodontitis. [21] Lastly, D'Aiuto & Suvan 2012**,** Zelkha et al. 2010, concluded that the obesity influences periodontitis through changes in pro-inflammatory cytokines, gene expression, immune function, oral pathogens and indirectly via insulin resistance. [22, 16]

Other evidence suggests that mechanisms other than biological phenomena may assume a part in this association. Taking into behavioral perspectives, obese ones tend to present with unhealthier habits as liquor & tobacco consumption, physical inactivity, an unhealthy diet including higher consumption of fat, carbohydrates, and sugar. Additionally, overweight subjects will probably have disregarded oral health habits, since negative self-body image & low self-esteem may impact on the individual's propensity to carry out health-promoting behaviors. [23]

Pregnancy is considered as a natural stressful inflammatory state evident in activation of maternal leucocytes and increased the systemic concentration of acute phase reactants & cytokines. [24, 25] Additionally, Pregnancy is associated with an increase in the levels of both progesterone and estrogen which, by the 3rd trimester, achieves levels 10 to 30 times than seen during the typical menstrual cycle. Changes in the gingiva incorporate an increase in gingivitis that often starts during the 2nd to 3rd month of pregnancy & increases in severity through the eighth month. [26] Moreover, Maternal markers of inflammation including CRP, are elevated in normal physiologic pregnancy. Therefore, the addition of obesity leads to further elevated levels of systemic inflammation during pregnancy. [27]

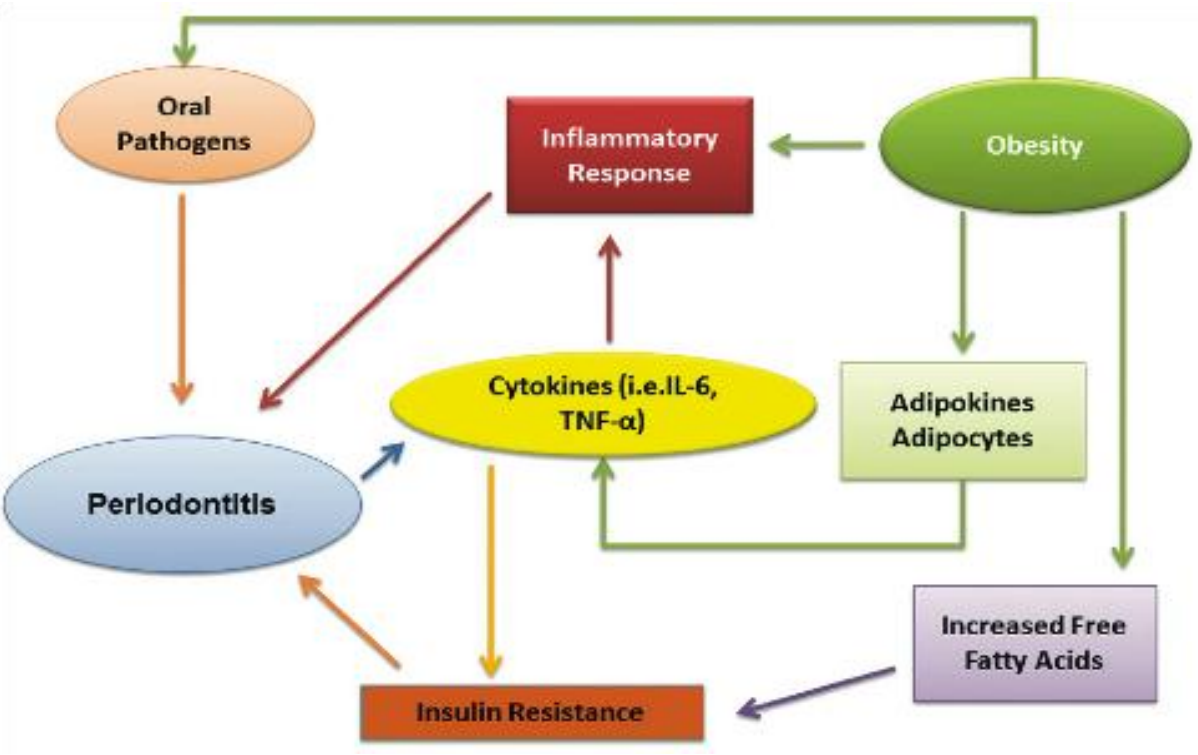

Figure 1. Mechanism of periodontitis related to obesity. [22]

pre-pregnancy obesity increases the risk for unfavorable variations in maternal lipid metabolism, insulin resistance, & inflammation. In normal-weight pregnancies, the exercise improves maternal lipid metabolism, insulin resistance, and inflammation as well as neonatal adiposity. [28, 29, 30] Otherwise, the gingival tissues themselves are affected by the hormonal increases during pregnancy that lead to increased synthesis of hyaluronic acid & to glycosaminoglycan aggregates, which osmotically induce tissue edema and gingival enlargement. [31]

previous studies have demonstrated that pregnancy is associated with a higher risk of gingivitis. Gestational gingivitis has been observed to be extremely common among pregnant women and its prevalence ranges from 35% [32, 33] to 100%. [34] Fewer studies have been concluded the factors that have been suggested to expand the risk of periodontal disease include obesity prior to pregnancy. [35]

Periodontal diseases; gingivitis and periodontitis, as portrays in figure 2, are destructive inflammatory diseases of the gingiva & the supporting structures of the teeth induced by a microbial biofilm commonly called dental plaque. [36, 4]

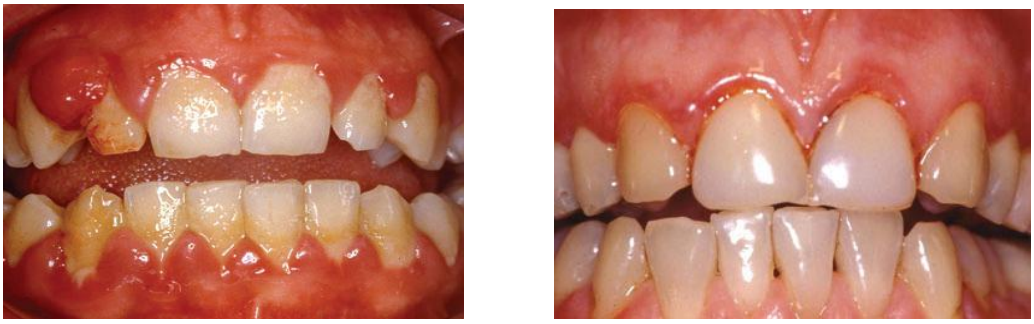

Figure 2. Signs of periodontal disease [37]

Collectively the complex classification of periodontal diseases takes into account clinical presentation, age at diagnosis, the rate of disease progression and systemic and & factors, all which may increase the risk of periodontal disease. [38] In general, periodontal diseases can be classified into two different types: (1) gingivitis in which the irritation and inflammation is kept to the gingiva and is reversible with good oral cleanliness & hygiene. (2) the periodontitis in which the irritation and inflammation continues and results in tissue destruction and alveolar bone resorption. [39, 38] In periodontal disease, destruction of the connective tissue for the most part, comes about because of the association of microscopic organisms (bacteria); their items & their products with mononuclear cells. [40, 41, 42]

A number of studies have shown that there is a wide range of systemic risk factors for periodontal disease; these elements incorporate overweight/obesity, tobacco smoking, respiratory diseases, diabetes mellitus, rheumatoid arthritis, osteoporosis, cardiovascular disorders, kidney diseases, and dementia. [43, 44] Other medical diseases such as certain types of cancer, AIDS, defective dental restoration's medication use. Other significant risk factors incorporate clinching/grinding teeth, family factors, & other genetic factors, and conditions that change female's estrogen levels such as puberty, adolescence, pregnancy, menopause. [23]

Clinical features of periodontal diseases may include bleeding on probing, swelling, redness, mobility, and suppuration. [45] In the same context, during pregnancy, hormonal levels changes may allow bacteria to grow in the mouth and gums more easily. This makes the periodontal disease more common when you are pregnant. Also, Pregnant women may have nausea and vomiting or "morning sickness," especially in their 1st trimester. The gastric acids from vomiting may also destroy teeth's enamel coating. [25]

A primary goal for maternity and the community health nursing is to attain, regain or maintain the health of mothers, children and their families in the community setting. Moreover, focus on early detection of risk factors that lead to unfavorable and undesirable health outcomes for mothers, infant, and children. [46] It is important for a woman to consider her weight prior to becoming pregnant.

1.1 Significance of the Study

The prevalence of maternal obesity is rising rapidly worldwide & constitutes a major obstetric problem. Additionally, increasing prevalence of obesity among pregnant women is a significant health problem, thus, understanding the mechanisms by which obesity induces unfavorable outcomes as well as establishing potential therapeutic targets is critical in order to improve health problems related to periodontal disease associated with pre obesity during pregnancy.

Otherwise, the vast majority of the studies done in Egypt analyzed the effect of obesity and periodontal diseases during pregnancy separately. Thus, little is taught about the effect of pre gestational overweight and obesity on periodontal disease during pregnancy, but our study is the first one that has examined pre-pregnancy ƁMI/obesity and periodontitis specifically among pregnant women in the Egypt.

Additionally, one of the goals of the Healthy People 2020, which is put forth by the US Department of Health & Human Services (HHS) once every decade, is that 53.4% of women should have a healthy weight (ƁMI 18.5 - 24.9 kg/m^2) before pregnancy by 2020. [47] This goal is a 10% improvement from the level observed in 2007.

As nurses comprise the greatest group of health services suppliers & they are in charge of the quality of care provided to the pregnant women, their points of view on the effectiveness of their care are very important. [48, 49] Unfortunately, studies on oral health, so the significance of the study spins around the undermining effect of obesity on periodontal disease during pregnancy which turns the light towards the pivotal role of maternity and community nurses and nutritionists who have to play an essential role in commencing weight reduction programs to women based on healthy diets of lower calories and sport practice in order to enhance women health.

1.2 Aim of the Study

Based on the cited facts, this study aimed to explore the effect of pre-pregnant overweight and obesity on oral disease during pregnancy in females seeking high-risk pregnancy or antenatal care in El-Mansoura and El-Fayoum, Egypt. The primary study purpose, therefore, was to assess the impact of obesity on the prevalence of periodontal disease. A secondary purpose was to effect of the life style of obese pregnant women on periodontal disease.

1.3 Research Questions

1. Is maternal pre-pregnancy overweight and obesity affect the prevalence of periodontal disease among pregnant women in two different settings in Egypt?

2. Is there is any association between life style of those overweight/obese pregnant women & their periodontal disease?

2. Subjects and Methods

2.1 Research Design

A cross-Sectional design was adopted to carry out this study to assess the relationship between pre pregnant overweight and obesity with the periodontal disease during pregnancy regardless different setting.

2.2 Subjects and Setting

The study was conducted at the governmental general hospital at El-Fayoum city and university hospitals at El-Mansoura city, over a period of 6 months, from September 2015 to February 2016. Data were collected from 400 pregnant women going to the hospital to follow up their pregnancy, who were booked in the high-risk obstetric departments and the antenatal outpatient clinics at previously mentioned hospitals. Pregnant women were informed about the purpose of the study & accepted to join us in our study.

2.3 Methods and Phases of Data Collection

Tools of data collection were created by the researchers after inspecting the applicable writing literature. Data were collected using a self-constructed face-to-face interviewed questionnaire with strongly emphasized that the information collected would be used for scientific research only, would be confidential. The interviewing questionnaire was held with each pregnant woman alone, each woman took 20 to 30 minutes to complete the questionnaire.

The study tool was divided into 3 sections and covered the following items, part (1) sociodemographic data as age, education, ect., part (2) women's past and present medical and obstetrical history as gestational age, parity, physical activity, medical complaints, etc., part (3) dental history and present signs & symptoms of periodontal problems known to be associated with pregnancy in relation to overweight and obesity.

The following parameters were used to determine obesity/overweight; Body Mass Index (ƀBMI): women's pre-gestational self-reported weight in kilograms divided by women's height squared. The overweight group included subjects with ƀBMI $\geq$ 25 - < 30 Kg/m^2 and $\geq$ 30 Kg/m^2 for obese subjects. Each point is scored from 0 to 3; 0 & 1 (applied very much or most of the time) but 2 & 3 (did not apply at all). Higher scores on each subscale indicate greater levels of dental disease.

Validity testing was done to the tool by submitting the tool to a jury of 5 experts in the field of maternity and community health nursing, biostatistician expertise, their recommended modification had been done.

The pregnant women were interviewed during study time in the outpatient clinic from 9 Am to 12 Pm and in high-risk obstetric departments from 12 Pm to 3 Pm 3 days weekly. Work started from September 2015 to February 2016. The researchers arranged with the director of hospitals for the properly available days for data collection.

The clarity of language, the applicability of items and time consumed for filling in the tools items are evaluated by a pilot study which included about 10% of the study sample, a pilot study was excluded from our study sample.

2.4 Data Analysis

Data were stored, coded, organized, categorized and then transferred into specially designed formats and analyzed by using the statistical package for social science (SPSS Inc, USA) program version 18.0. The data were summarized in tables, charts, and graphs. Quantitative data were expressed as means ± SD. Independent t-test was used as a test of significance to compare between two means. For qualitative data the number and percent distribution was calculated, chi square (χ^2) or Fischer exact test was used as a test of significance. For interpretation of results of tests of significance, significance was adopted at P $\leq$ 0.05. To detecting significance results was as follows:

P value $\leq$ 0.05 was considered significant differences

P value $\leq$ 0.001 was considered highly significant differences

P value > 0.05 was considered not significant differences

3. Results

The total study sample was 400 pregnant women associated with different types of obesity and periodontal diseases which 334 women were complained from periodontal disease during pregnancy, the prevalence of

periodontal diseases during pregnancy was 83.5% as presented in Figure 3.

Various items of sociodemographic characteristics of the study sample are presented in **Table 1**. The mean age of the studied sample in El-Fayoum and El-Mansoura city was ranged from 28.1 ± 6.1 years and 30.4 ± 6.6 years, respectively. The higher percent of the studied sample (92% and 79%), respectively, in both cities were live in rural area, more than half (51% and 59%) of them respectively were secondary educated, all the studied sample (100%) in El-Fayoum city and more than three-quarter (87%) of the studied sample in El-Mansoura city were housewives, slightly more than half (51%) of the studied sample in El-Fayoum city were having low monthly income and just 6% were high monthly income. While 39% of the studied sample in El-Mansoura city were having high monthly income and the minority (18%) were having low monthly income. There were highly statistical significant differences in all items of sociodemographic characteristics (P-Value < 0.0001).

The prevalence of dental signs & symptoms in El-Fayoum and El-Mansoura city was presented in Table 2. It is observed that the majority of studied sample in El-Fayoum and El-Mansoura city complained from recurrence of dental pain (74%) & (91%), redness and swelling gums (63%) & (85%), tenderness gum with teeth brushing (52%) & (75%), gum and teeth inflammation (55%) & (88%), painful chewing (59%) & (91%) respectively with a highly statistical significant differences (P-Value < 0.0001). However, the minority of studied sample in El-Fayoum and El-Mansoura city complained from gum away from teeth (5%) & (24%), receding gum (5%) & (7%), decayed teeth (33%), missing teeth (17%) & (29%).

Various levels of periodontal disease associated with sociodemographic characteristics of the studied sample are presented in Table 3. The mean age of the studied sample complained from periodontal diseases in El-Fayoum and El-Mansoura city was (29.1 ± 5.6) years and (30.6 ± 6.6) years respectively. A highly statistically significant differences was found between age and periodontal disease (P-Value < 0.0001) in El-Fayoum city. The majority of the studied sample that complained from periodontal diseases were live in rural area in El-Fayoum and El-Mansoura city (92.1% and 79.1%), respectively. No statistically significant differences were found between residence and periodontal disease (P-Value = 1.000) in El-Fayoum and El-Mansoura city. It was observed that the highest percentage of periodontal disease (46.1% and 59.3%) was found in the secondary educated level in El-Fayoum and El-Mansoura city, respectively, and statistically significant differences were found between periodontal disease and women's level of education in El-Fayoum city. In addition, the highest percentage of periodontal disease (100% and 85.7%) in El-Fayoum and El-Mansoura city was observed in housewives' women. Moreover, the highest percentage of periodontal disease in El-Fayoum city (50.0% and 42.1%) of the studied sample was found in low and middle monthly income respectively. However, the highest percentage of periodontal disease in El-Mansoura city (41.8% and 38.5%) of the studied sample was found in middle and high monthly income respectively.

The relation between setting with prenatal overweight and obesity and periodontal diseases were clarified in Table 4. Approximately similar high prevalence of prenatal obesity women's in El-Mansoura (51.0%) and El-Fayoum city (45.0%), and P-Value = 0.0001. Regarding periodontal disease, it is clear that the majority of the studied sample have periodontal disease present in El-Fayoum (76.0%) and El-Mansoura (91%) city, as the same, statistically significant correlation was observed between periodontal disease and different setting of the study (P-Value = 0.0001).

Prenatal weight and associations with periodontal disease were clarified in Table 5. The slightly more than half and one-third of the studied sample complained from periodontal disease in El-Fayoum and El-Mansoura city were observed in prenatal obese (51.3% & 54.9%) and overweight women (32.9 % & 40.7%), respectively, compared with the minority of the studied sample complained from periodontal disease in El-Fayoum and El-Mansoura city were observed in prenatal normal weight women (15.8% & 4.4%), respectively. There were a highly statistical significant differences between prenatal weight and periodontal disease (P-Value < 0.0001).

The prevalence of periodontal disease in relation to prenatal weight among different gestational stages were clarified in Figure 4. The majority of the women belonged to periodontal disease were observed in prenatal overweight (33.35%) and obese (66.7%) women who were in their first trimester. Also, high prevalence of the women belonged to periodontal disease were observed in prenatal overweight (28.6%) and obese (51.4%) women who were in their second trimester, high percentage of the women belonged to periodontal disease were observed in prenatal overweight (39.7%) and obese (53.2%) women who were in their third trimester compared to the minority of the studied sample that complained from periodontal disease in 1st, 2nd & 3rd trimester respectively (0.0%), (20%), (7.1%) were prenatal normal weight. There was a statistical significant difference (p-Value = 0.011).

The distribution of the studied sample as regards association between periodontal disease with lifestyle and

dental care during pregnancy is presented in Table 6. It demonstrates that the majority of the studied sample (71.3%) who eats incomplete meal contents complained from periodontal disease compared to slightly more than one-third of the studied sample (45.5%) who eats complete meal contents does not complain from the periodontal disease during pregnancy. Around two-thirds of the studied sample (58.1%) who sedentary activity complained from the periodontal disease compared to the majority (66.6%) of the studied sample who life style activity does not complain from periodontal disease. About two-thirds of the studied sample who do not wash their teeth daily, no flossing habits and doesn't visit the dentist doctors (67.7%), (70.7%) & (58.1%), respectively, complained from periodontal disease Compared to the majority of the studied sample who wash their teeth daily, flossing habits and visit the dentist when a problem arises in the teeth (63.6%), (72.7) & (84.8%) does not complain from periodontal disease. There were highly statistical significant differences between periodontal disease with life style and dental care (P-Value < 0.0001).

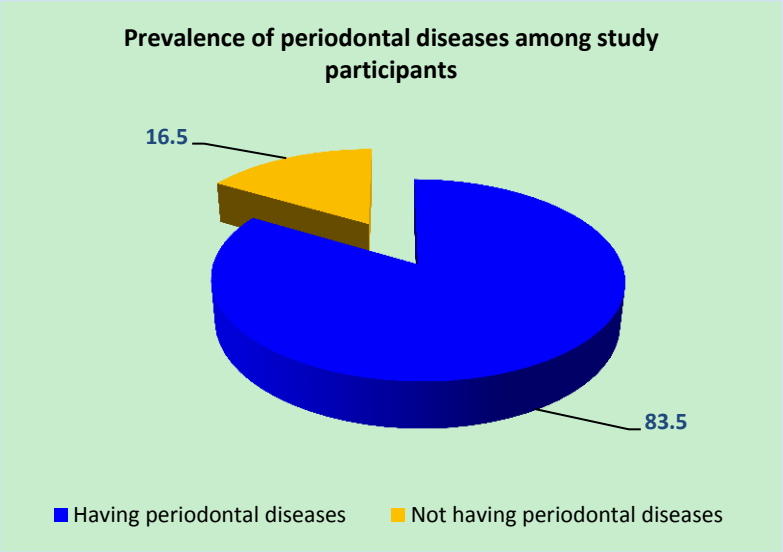

Figure 3. Prevalence of periodontal diseases among study participants N=400

Table 1. Demographic characteristics of the study sample and association with periodontal diseases

Variable	El-Fayoum (n = 200)		El-Mansoura (n = 200)		P-value
	Mean ± SD		**Mean ± SD**		
Age (years)	28.1 ± 6.1		30.4 ± 6.6		< 0.0001*
Residence	**N**	**%**	**N**	**%**	
Rural	184	92%	158	79%	
Urban	16	8.0%	42	21%	< 0.0001*
Level of education					
Read & Write	44	22%	26	13%	
Primary education	46	23%	6	3%	
Secondary education	102	51%	118	59%	< 0.0001*
university education	8	4%	50	25%	
Occupation					
Employee	0	0.0%	26	13%	
Housewives	200	100%	174	87%	< 0.0001*
Monthly income					
Low income	102	51%	36	18%	
Middle income	86	43%	86	43%	
High income	12	6%	78	39%	< 0.0001*

* P ≤ 0.05 is considered significant

Table 2. Prevalence of Dental Signs & Symptoms in El-Fayoum and El-Mansoura City

Variable	El-Fayoum (n = 200)		El-Mansoura (n = 200)		P-value
Recurrence of dental pain	148	74%	182	91%	< 0.0001*
Redness & swelling gums	126	63%	170	85%	< 0.0001*
Tender gum with teeth brushing	104	52%	150	75%	< 0.0001*
Gum bleeding with teeth brushing	48	24%	58	29%	0.275
Gum and teeth Inflammation	110	55%	176	88%	< 0.0001*
Gum away from teeth	10	5%	48	24%	< 0.0001*
Painful chewing	118	59%	182	91%	< 0.0001*
Receding gum (longer teeth appearing)	10	5%	14	7%	0.400
Sensitive teeth	60	30%	130	65%	< 0.0001*
Loose teeth	24	12%	30	15%	0.380
Decayed teeth	66	33%	66	33%	1.000
Missing teeth	34	17%	58	29%	0.004*
Filled teeth	24	52%	66	33%	< 0.0001*

* P ≤ 0.05 is considered significant

N.B: All items are not mutually exclusive

Table 3. Association of Socio Demographic Characteristics with Periodontal Disease in El-Fayoum and El-Mansoura City

Periodontal diseases / Variable	El-Fayoum (n = 200) Present n = 152		El-Fayoum (n = 200) Absent n = 48		P-value	El-Mansoura (n = 200) Present n = 182		El-Mansoura (n = 200) Absent n =18		p-value
Age (years)	**Mean ± SD**		**Mean ± SD**			**Mean ± SD**		**Mean ± SD**		
	29.1 ± 5.6		25.5 ± 6.2		< 0.0001*	30.6 ± 6.6		27.6 ± 6.1		0.059
Residence	**No**	**%**	**No**	**%**		**No**	**%**	**No**	**%**	
Rural	140	92.1%	44	91.7%		144	79.1%	14	77.8%	
Urban	12	7.9%	4	8.3%	1.000	38	20.9%	4	22.2%	1.000
Level of education	**No**	**%**	**No**	**%**		**No**	**%**	**No**	**%**	
Read & Write	40	26.3%	4	8.3%		26	14.3%	0	0.0%	
Primary education	34	22.4%	12	25%		4	2.2%	2	11.1%	
Secondary education	70	46.1%	23	66.7%	0.012*	108	59.3%	10	55.6%	0.058
university education	8	5.3%	0	0.0%		44	24.2%	6	33.3%	
Occupation	**No**	**%**	**No**	**%**		**No**	**%**	**No**	**%**	
Employee	0	0.0%	0	0.0%		26	7.8%	0	0.0%	
Housewives	152	100%	48	100%	-----	156	85.7%	18	100%	0.137
Monthly income	**No**	**%**	**No**	**%**		**No**	**%**	**No**	**%**	
Low income	76	50.0%	26	54.2%		36	19.8%	0	0.0%	
Middle income	64	42.1%	22	45.8%	0.133	76	41.8%	10	55.6%	0.109
High income	12	7.9%	0	0.0%		70	38.5%	8	44.4%	

* P ≤0.05 is considered significant

Table 4. Relation between setting & perinatal overweight & obesity

Variable	El-Fayoum (n = 200)		El-Mansoura (n = 200)		P-value
	N	**%**	**N**	**%**	
Prenatal weight					
Obese	90	45.0%	102	51.0%	
Overweight	62	31.0%	84	42.0%	< 0.0001*
Normal	48	24.0%	14	7.0%	
Periodontal diseases					
Present	152	76.0%	182	91.0%	< 0.0001*
Absent	48	24.0%	18	9.0 %	

* P ≤ 0.05 is considered significant

Table 5. Relation of periodontal diseases to prenatal overweight & obesity

Periodontal diseases / Prenatal weight	El-Fayoum (n = 200)				P-value	El-Mansoura (n = 200)				p-value
	Present n = 152		Absent n = 48			Present n = 182		Absent n =18		
	No	%	No	%		No	%	No	%	
Obese	78	51.3%	12	25%	<0.0001*	100	54.9%	2	11.1%	<0.0001*
Overweight	50	32.9%	12	25%		74	40.7%	10	55.6%	
Normal	24	15.8%	24	50%		8	4.4%	6	33.3%	

* P ≤0.05 is considered significant

Table 6. Relation of periodontal diseases with lifestyle and dental care

Variable / Periodontal diseases	Present (n = 334)		Absent (n = 66)		p-value
	No	No	No	%	
Diet					
Complete	96	28.7%	30	45.5%	0.008*
Incomplete	238	71.3%	36	54.5%	
Physical activity					
Sedentary	194	58.1%	2	3%	< 0.0001*
Light activity	64	19.1%	10	15.2%	
Moderate activity	44	13.2%	10	15.2%	
Active life style	32	9.6%	44	66.6%	
Tooth brushing					
Never	226	67.7%	24	36.4%	< 0.0001*
≥ 1 time per day	108	32.3%	42	63.6%	
Flossing habits					
Never	236	70.7%	18	27.3%	< 0.0001*
≥ 1 time per day	98	29.3%	48	72.7%	
Dentist visit					
Never	194	58.1%	10	15.2%	< 0.0001*
Only for problem	140	41.9%	56	84.8%	

* P ≤ 0.05 is considered significant

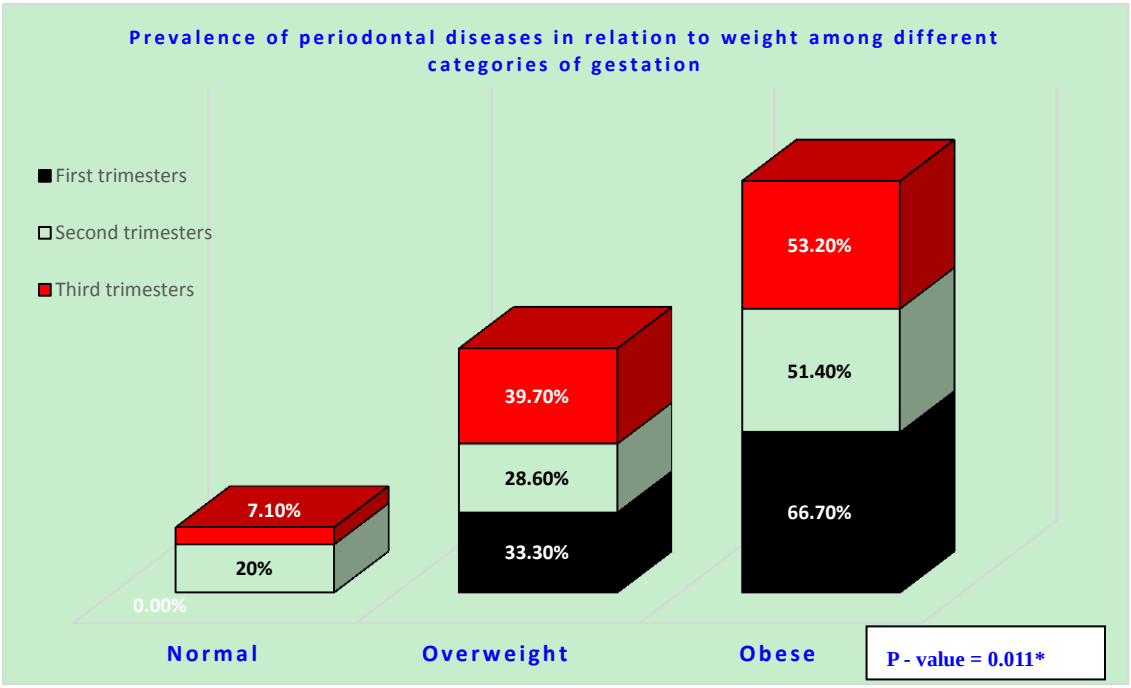

Figure 4. Prevalence of periodontal diseases in relation to weight among different categories of gestation

* P ≤ 0.05 is considered significant

4. Discussion

Poor oral well-being is a noteworthy public health concern. [15] In 2000, the Surgeon General featured oral health as a noteworthy part of general health & prosperity since it is essential to the general health of individuals and the population. [50] Additionally, the prevalence rates of obesity in the all-inclusive community have increased substantially in the past 20 years and more alarming is the number of women of childbearing age who are overweight or obese. [51] This expansion in the prevalence of maternal obesity is of great concern as it has been found to be associated with adverse health outcomes affecting the mother during pregnancy. [52] According to these facts, this study introduces answers to a main general question about the conceivable effect of obesity on oral health and periodontal disease and another secondary question about the effect of the life style of obese pregnant women on periodontal disease.

The results of the current study revealed that Prevalence of periodontal diseases among study all participants was 83.5% which represents 76.0% of El-Fayoum and 91.0% of El-Mansoura study sample. The high prevalence of periodontitis may also reflect the lower socioeconomic status of our study sample as 43% of the studied sample in both El-Fayoum and El-Mansoura have middle monthly income which leads to poor oral health status. This finding is in consistency with the results of Celeste & Nadanovsky (2009) they found that the low-income seems to be an important factor associated with poor oral health in Brazilian studied subpopulations. [53]

Concerning to the socio-demographic characteristics of the studied sample, the present study revealed that the most range of their mean age in El-Fayoum and El-Mansoura city was ranged from 28.1 ± 6.1 to 30.4 ± 6.6. This is due to the high age of marriage in lower Egypt than upper Egypt. The majority of the studied women in both cities (92.0% &79.0%) were living in rural area. These findings are in line with Karunachandra's study who found that the mean age of the rural & urban of antenatal women was 27 ± 4.6 years and 29 ± 4.6 years, respectively ($p = 0.001$), the majority of Karunachandra's studied pregnant sample were housewives 73.8% (rural) & 71.5% (urban), respectively. [54] Moreover, the results of the present study revealed that the minority (only 4.0%) of the studies sample in El-Fayoum city compared to 25.0% of the studies sample in El-Mansoura city had university educational level, therefore the majority of them were unfamiliar with the importance of the follow-up during pregnancy. Additionally, all the studied sample (100.0%) in El-Fayoum city and more than three quarters (87.0%) of the studied sample in El-Mansoura city were housewives. This may have attributed that, most of the women in Upper Egypt either prefer or forced to sit at home and become housewives to care their houses and not allowed exiting to outside work, which leads to a lack of financial resources resulting in follow-up their pregnancy or health problem in public hospitals. On the contrary, in Lower Egypt, there is more freedom that allows women to work, which raises their economic status and therefore they can follow-up their pregnancy or health problem in private clinics. These finding confirmed the results obtained by AJAY, 2016, who found that 10% of his studied subject had no formal education, 30% of them had primary education, 25% had secondary and 13.3% had collegiate education. Moreover, 85% of his studied subject were housewives. [55] This was in contrast with the results of Xie (2014) who reported that around 40.0% of the study sample had high school or lower education. Highly prevalence of periodontitis may also reflect that study sample was of relatively lower socioeconomic status. [56] More than half (51.0%) of the studied women in El-Fayoum city have low monthly income, while only 6.0% of them have high monthly income, conversely, only 18.0% of the studied women in El-Mansoura city has low monthly income, while 39.0% of them have high monthly income. The possible explanation for that may be the low socioeconomic status in Upper Egypt. There were highly statistically significant differences between El-Fayoum and El-Mansoura city in all items of sociodemographic characteristics.

Gingivitis affects up to 70.0% of pregnant women. [57] Pregnant women showed a higher incidence of gingivitis & dental caries with 83.3% & 81.7% of patients respectively. Most of the patients with pregnancy gingivitis complained of bleeding gums & halitosis. A total of 9.2% patients showed erosion of the tooth surface. Only 0.8% showed tooth mobility. A total of 7.2% pregnant women had complaints of the Temporomandibular joint (TMJ) and myofascial pain. [58] Some other authors made similar observations, reporting a prevalence of gingivitis was 86.2% & 97.0% [59, 60] Meanwhile, some cross-sectional research demonstrated that the percentage of pregnant women with gingivitis was 89.0% in Ghana, 86.2% in Thailand, & 47% in Brazil. [35, 61] Among the pregnant women examined, 62.0% presented with moderate gingival inflammation, & 64.0% presented with at least some plaque. [62] Moreover, severe gingival bleeding, a lower incidence of pregnant women with an erosion of teeth was observed in a study by Annan and Nuamah, 2005. [63] In another study, bleeding on probing (BOP) decreased from 41.2% at the 12th week of pregnancy to 26.6% postpartum without any active periodontal therapy. [64] In yet another study carried out in Pondicherry, only 0.8 % women had bleeding gums, 20.1% had calculus & 20.6% showed shallow periodontal pockets. [65]

The current study has highlighted that, the majority of studied sample in El-Fayoum and El-Mansoura city, respectively, complained from recurrence of dental pain (74.0% & 91.0%), redness and swelling gums (63.0% & 85.0%), tenderness gum with teeth brushing (52.0% & 75.0%), gum and teeth inflammation (55.0% & 88.0%), painful chewing (59.0% & 91.0%). But still the high percentage of dental signs and symptoms severity in El-Mansoura than El-Fayoum city with a highly statistically significant difference. However, the minority of studied sample in El-Fayoum and El-Mansoura city complained from gum away from teeth (5.0% & 24.0%), receding gum (5.0% & 7.0%), decayed teeth (33.0% & 33.0%), missing teeth (17.0% & 29.0%). This due to high standard of living in El-Mansoura city makes people increased food intake, meal frequencies and the consumption of refined food, which increases the percentage of dental signs and symptoms, but in El-Fayoum city tend to eat more vegetables, which decrease the severity of signs and symptoms of dental disease. The results of present study are in consistence with the results of the previous study it found that the prevalence of pregnancy gingivitis ranges from 35% to 100%. [66] Mital, et al, 2013 found 66.8% & 61.5% of pregnant women had gingivitis and dental caries respectively. [67] In the same line, the higher prevalence of gingivitis (85.2%) during pregnancy, 19.1% of pregnant women had pigmented gingivae and 28.5% had red gingivae was well-established by Soroye & Ayanbadejo, 2106. [68] A value comparable to 86.2% reported gingivitis in Thailand. [61] Also Rakchanok's results reported that 86.2%, Three-quarter of pregnant women had gingivitis and dental caries respectively. It has been noted that the most clinical signs of diseases seen during pregnancy include redness, swelling, and bleeding from the gingiva. [61] Such findings suggest the existence of a relationship which is in agreement with those of many reports in the literature. [69, 70, 71, 34] In agreement with the previous study found that the mean ± standard deviation of the decayed, missing and filled teeth was shown as 6.21 ± 1.4, 2.23 ± 0.9, 1.95 ± 0.9 respectively. [58] Lastly, the finding of the present study is in consistency with the result of Kornman and Loeshe who reported that one-quarter of the women of reproductive age had dental caries. [70] With contrast the finding of the previous study reported that the prevalence of dental caries was higher in pregnant than in non-pregnant women is in agreement with that of many other studies. [72, 73]

Regarding the relationship between sociodemographic characteristics of the studied pregnant women and prevalence of periodontal disease in El-Fayoum and El-Mansoura city, the results of the present study revealed that, there is no significant association between all and almost socioeconomic status in El-Fayoum and El-Mansoura, respectively and periodontal disease. Although, our findings were in accordance with the finding of Xie (2014) who reported that there was no statistically significant relation between almost sociodemographic characteristics or health variables and periodontitis. [56] Statistical significance associations between periodontal disease & income adequacy. [74] These findings contradicted the results obtained by some authors**,** they found that the possible association between periodontal disease & socioeconomic status. [75, 76. 77] The results of our study revealed that, the periodontal diseases are more prevalent among older age in both El-Fayoum and El-Mansoura city. The results illustrated that the mean age of the studied subject complained from periodontal diseases in El-Fayoum and El-Mansoura city (29.1 ± 5.6) years and (30.6 ± 6.6) years, respectively, while mean age of the studied subject not complained from periodontal diseases in El-Fayoum and El-Mansoura city was (25.5 ± 6.2) years and (27.6 ± 6.1) respectively. The possible explanation for that may be the increase of women age and recurrence of pregnancy number leads to decrease the immune system and increase the availability to periodontal disease. This finding is in consistency with the results of John & Mahendram (2017), who reported that the mean age of case study was 29.5 ± 2.9. [78] In agreement with the finding of the present study which showed that the prevalence & severity of periodontal disease increase with age. [79, 80, 81] Statistically significant relationship between age and periodontal disease in El-Mansoura was observed. This supports the results of Hershenfield (2014) who reported that statistical significance associations between periodontal disease and age. [74] Additionally, Mannava (2015) reported highly statistical significance between age and periodontal disease. [45]

Moreover, the result of the present study revealed that, the majority of the studied pregnant women who complained from periodontal diseases, in both El-Fayoum and El-Mansoura, respectively, were housewives (100.0% & 85.7%) and live in the rural area (92.1% & 79.1%). These finding confirmed the results of some previous study, they reported that the gingivitis and dental caries was more in women who were housewives and resident of the rural area. [67, 82, 83, 61] Additionally, these results are in consistent with the results of Singh, et al, (1982) who reported that 13.2% rural dwellers showed loss of tooth attachment compared to 22.9% urban ones. 95.8% dwellers of a Semi-Urban community of Poona had calculus, 62.2% had gingivitis and 34.3% showed advanced periodontal involvement. [84] Another study found that the rural women (91.7%) had a significantly higher prevalence of dental caries than urban (81.3%) women (p=0.001). [54] Also, Nethravathi's study in 2015 confirmed that, the urban population had better periodontal health than rural population and this relationship was statistically significant ($P < 0.05$). [85] However, this was in contrast with the results of **Varenne, 2004**, who reported that higher the prevalence of dental caries among urban than rural children. [86]

Measures of women's socioeconomic status such as education, income status have to be good predictors of periodontal condition. But contrary with this finding in persons of low-income and/or low education attainment will probably have periodontitis than individuals with high socioeconomic status. [87] Moreover, Hershenfield (2014) reported statistically significant associations between periodontal disease and education and income adequacy. [74] In our study, the highest prevalence of periodontal disease in El-Fayoum city was found in low (50.0%) and middle (42.1%) monthly income, while in El-Mansoura city was found in middle (41.8%) and high (38.5%) monthly income. This may be attributed to, the populations living in El-Fayoum city (upper Egypt) are reflected to be middle to low-income class families, thus they are more prone to nutritional deficiencies. Also, as many women do not plan a pregnancy, in particular, those at periodontal disease risk because of poor dietary habits and/or poor oral hygiene practice, and lack or absence of awareness about dental and oral care. Conversely, El-Mansoura city (lower Egypt) reflected high and middle-income class families, thus they had more opportunity to get sweets, heavy meals, which increase the probability of periodontal disease. These previous findings were in accordance with the finding of Hershenfield (2014) who reported statistically significant associations between periodontal disease and income adequacy. [74] Moreover, the highest prevalence of periodontal disease in both El-Fayoum and El-Mansoura city was found among women with secondary education (46.1% and 59.3%), respectively. This was in contrast with the results of Nethravathi's study (2015) who reported that, the periodontal disease is more severe in individuals with poorer education. [85] Additionally, several studied contrary with our finding and denoted that, the gingivitis and dental caries was more in women who were illiterate. [67, 82, 83, 61]

Genco et al., 2005, have concluded clearly related the obesity to periodontal disease through the pathway of insulin resistance especially among those aged between 18 and 34 years. Results showed a statistically significant relationship between obese patients with periodontal disease. [21] Women with pre-gestational overweight/obesity had significantly more periodontal attachment loss & gingivitis compared with those with normal ƁMI. [88] A cross-sectional study applied to evaluate factors associated with periodontitis, they found that the odds of having periodontitis in pregnant women who were overweight/obese before pregnancy was 2.22 times the odds in pregnant women with normal weight. [89] The risk of Periodontitis increases by l6% per increase of 1 kg/m^2 in ƁMI. [90] Another study reporting a 57% risk of periodontitis per increase of 1 kg/m^2 in ƁMI. [91] Mannava R, (2015) found that increased body mass index is positively correlated with periodontal disease prevalence. [92] Regard to the relation between setting with prenatal overweight and obesity and periodontal diseases, the present study revealed that approximately similar prevalence of prenatal obesity and overweight women's in El-Fayoum and El-Mansoura city, respectively, around half (45.0% & 51.0%) of the studied pregnant women were obese women and around one-third (31.0% & 42.0%) of them were overweight women. It was clear that, the high prevalence of periodontal disease (83.5%) among all studied sample (400 women), slightly more than two third (76.0%) of the studied pregnant women in El-Fayoum city and the majority (91.0%) of the studied pregnant women in El-Mansoura city have complained from periodontal diseases. There was a highly statistically significant difference between prenatal weight and periodontal disease with the setting of the studied pregnant women ($P < 0.0001$). The possible explanation, for the high prevalence of periodontal disease, may be the presence of pre-natal overweight and obesity has been postulated to reduce blood flow to the periodontal tissues, so, promoting the development of periodontal disease regardless of the difference in place. This supports the results of Xie (2014) who found that about one-third (30.8%) of the women with periodontal disease were obese before pregnancy. [56] Also, who found that 64.2% ($n = 102$) of the women were diagnosed as having periodontitis during pregnancy, mean PD was slightly higher in overweight and obese women than those in under/normal weight women ($p < 0.01$). [56] Also these finding in the same line with the results documented by another author who carried out a population-based birth-cohort study and showed that overweight & obesity increased the prevalence of periodontitis in adults aged thirty-one years old. [93] Hershenfield (2014) reported that, the higher prevalence of periodontitis observed in obese participants as compared to those who were not obese. [74]

Obesity & Periodontitis are listed among the most common chronic disorders affecting the world’s populations. Recent reviews suggest a potential association between overweight/obesity and periodontitis. [94] The women who were underweight or normal weight before pregnancy were at a lower risk of complaining periodontitis during pregnancy than those who were overweight or obese.

Pre-pregnancy obesity was statistically significantly linked with periodontitis during pregnancy, with obese women at 1.7 times higher risk compared with under/normal weight women ($p < 0.01$). While revealed that did not a statistically significant difference in the risk of periodontitis between overweight women and under/normal weight women. [56] This point of view was in agreement with many authors, they suggest that obesity influences

periodontitis through changes in pro-inflammatory cytokines, gene expression, immune function, oral pathogens and indirectly via insulin resistance. [22, 16] The present study revealed that the slightly more than half and one-third of the studied pregnant women in El-Fayoum and El-Mansoura city, respectively, complained from periodontal disease were prenatal obese (51.3%), (54.9%) and overweight (32.9%), (40.7%), respectively, compared with the minority of the studied pregnant women in El-Fayoum and El-Mansoura city complained from periodontal disease were prenatal normal weight (15.8%), (4.4%). There was a highly statistically significant difference between prenatal weight and periodontal disease ($p < 0.0001$). The possible explanation for that may be pre-pregnancy overweight/obesity can impact a women's weight during her pregnancy through changes in pro-inflammatory cytokines, gene expression, immune function, oral pathogens and indirectly via insulin resistance and contribute to periodontitis initiation and progression. This results in consistence with the results of Nascimento (2015) who estimates from prospective longitudinal studies which have shown that the risk of periodontitis incidence was 13.0% and 34.0% higher in individuals who became overweight and obese, respectively. [95] Other previous studies reported a positive relationship between obesity & the severity and prevalence of periodontitis. [96, 36, 97, 98, 35] In the same line this, results agreed with Haffajee & Socransky 2009, who noted in the subgingival biofilms of periodontal healthy, overweight & obese individuals, suggesting a higher BMI may contribute to periodontitis initiation & progression. The likelihood of developing the periodontal disease in overweight & obese individuals, respectively, was 27% & 81% higher than in individuals with normal weight and a strong association between periodontal disease & obesity. [23] Additionally, these findings confirmed the results obtained by Xie (2014) who found the proportion of women with periodontitis in under/normal weight, overweight & obese groups were 50.7%, 64.9% & 83.7%, respectively ($p < 0.01$). [56] However, finding of other previous studies were in contrast to the finding of our study, they failed to demonstrate significant positive associations between obesity and periodontitis, as measured by probing depth & Clinical Attachment Level (CAL) [99,100]

Risks for the occurrence and progression of gingivitis/periodontitis highly increase during pregnancy. [101] Vogt et al., (2012) reported that, the prevalence of periodontal disease was 47%. [35] Increased tooth mobility has been detected in pregnancy even in periodontal healthy women. [63] The upper incisors are most mobile during the last month of pregnancy. [102] The palatal surfaces of the upper incisors and canines the most a complaint of sensitivity. [103] On the contrary with lopez et al, 2002, reported a lower prevalence of Periodontal disease of 29.85% in the pregnant Chilean population. [104] Piscoya et al.2012, who found that the prevalence of periodontitis was 11%.[89]

Concerning with prevalence of periodontal disease in relation to prenatal weight among different gestational stages in the first, second and third trimester. The results of the present study revealed that, two-thirds (66.7%) of the studied women, who had prenatal obesity, complained from periodontal disease were in their first trimester, while more than half of them (51.4%) suffered in their second trimester and 53.2% complained in the third trimester. Moreover, around one third (33.3%) of the studied women who complained from periodontal disease in first trimester (33.35%), second trimester (28.6%) and third trimester (39.7%), respectively, were prenatally overweight compared to the minority (0.0%, 20% & 7.1%) of the studied women that complained from periodontal disease in their 1st, 2nd & 3rd trimester respectively were prenatally normal weight. Statistical significant differences between prenatal weight and periodontal disease among different gestational stages were observed ($p = 0.011$). The possible explanation for that may be Pregnancy is associated by dramatically increasing both estrogen & progesterone levels which, by the 3rd trimester, reaches levels 10 to 30 times than seen during the typical menstrual cycle. Changes in the gingiva include an increase in gingivitis that usually starts during the 2nd to 3rd month of pregnancy (first trimester) and increases in severity through the eighth month (third trimester). [26] This point of view was in agreement with vogt, et al (2012), they concluded that a significantly associated of periodontal diseases with higher gestational age. [35] Epidemiological and longitudinal studies carried out and clearly showed that the pregnancy is associated with an increase in gingival inflammation and a worsening of periodontal status. [31] The results were in line with another study finding, it was mentioned that pregnant women had a significantly higher gingival index and periodontal pocket depth (PPD) with similar plaque index (PI) compared with non-pregnant women. [83, 105] Increased in parallel with the increase in the stage of pregnancy, which reached the maximum at the 8th month. [83] Additionally, gingival inflammation is a heightened reaction to dental plaque during a period of estrogen & progesterone imbalance. [106] Other author reported that during the 1st months of pregnancy, women may have a severe toothache secondary to caries. [107]

Lifestyle including nutritional habits plays a curial role in the development of a healthy pregnancy. Not only does the pregnant woman need to have an understanding of the essential nutritional elements, but she must also be able to assess and modify her diet for the developing fetus &her own nutritional maintenance. [108] Concerning

to the relation of periodontal disease with lifestyle and dental care, the finding of this study found that more than two-thirds (71.3%) of the studied sample, who eats incomplete meal contents, complained from periodontal disease compared to less than one third (28.7%) of the studied women who eats a complete meal contents. On the other hand, more than half (54.5%) of pregnant women who did not complain from periodontal disease during pregnancy did not gain complete diet compared to 45.5% of women who gain complete diet. A significant correlation was observed between diet and periodontal disease ($p = 0.008$). This is due to improper food intake and women who take high fatty diet or unbalanced diet during pregnancy will have a higher subcutaneous fat deposit and lead to increase the availability to periodontal disease. This was in consistency with the results of Nascimento (2017) who suggested a strong relationship between obesity & periodontal disease. When individuals presented with other detrimental habits such as smoking, high consumption of alcohol and a diet rich in fat and carbohydrates combined with overweight and obesity, the risk of periodontitis was even greater. [93] Another previous author used the healthy eating index as a dietary quality assessment tool and found that a poor diet was linked with increased odds of periodontal disease and the healthy diet may be associated with lower risk of periodontal disease. [109] This point of view was in agreement with Clapp & Little (1995) who found that women who continued their workout regimen throughout pregnancy compared to those who stopped their workout either before conception or in early pregnancy had a significantly ($p < 0.05$). [110]

There is an association between high physical activity and low level of inflammatory markers, such C-reactive protein (CRP) and fibrinogen. Also, poor physical activity was related to the higher need for periodontal treatment. [111, 112] The results of the current study portrayed that, The higher the activity, the lower the incidence of periodontal diseases. The results revealed that, more than one-half (58.1%) who sedentary activity compared to only 9.6% of the studied women who had active life style complained from periodontal disease. Moreover, 66.6% of the studied women who life style activity does not complain from periodontal disease during pregnancy. A high statistically significant correlation was observed between physical activity and periodontal disease ($p < 0.0001$). This may be due to women who decrease physical activity or discontinued an active lifestyle during pregnancy had a higher subcutaneous fat deposit and lead to increase the availability to periodontal disease. These results confirmed by the results of Tinius (2015) who found that inflammation is lower in physically active obese pregnant women when compared to sedentary obese pregnant women. [30] Clapp & Little (1995) also demonstrated that women who continued an active lifestyle during pregnancy had a lower subcutaneous fat deposit compared to those who were inactive during gestation ($p < 0.001$). [110] Olson & Strawderman (2003) added that, women who decreased physical activity compared to those who maintained or increased their physical activity participation during pregnancy had a significantly greater growth weight gain ($p < 0.01$). [113]

Oral hygiene practices alter the oral microbiome & also initiate imbalance in the gut microbiome. Poor oral hygiene is greatly responsible for the accumulation & multiplication of bacteria and microbes inside biofilms. [114] Failure to detach aggregating plaque will prompt leading to overgrowth of microbes/bacteria that may end up noticeably pathogenic, reduce the biodiversity of the oral cavity, & eventually cause maladies such as dental caries or periodontal disease. [115] The present study portrayed the figure of the pregnant women who suffered from periodontal disease as the following; about two third (67.7%) of them don't wash their teeth daily, 70.7% don't follow flossing habits and more than half (58.1%) of them never visit the dentist doctors. On the other hand, pregnant women who didn't complain from periodontal disease; 63.6% wash their teeth regularly, 72.7% follow flossing habits and 84.8% visit the dentist when any problem arises in the teeth. The possible explanation for that may be poor oral hygiene is greatly responsible for the accumulation of bacteria within biofilms and induce to initiate imbalance in the gut microbiome and overgrowth of bacteria that may become pathogenic, reduce the biodiversity of the oral cavity and ultimately cause dental diseases. This was in consistency with the results of with Xie (2014) who found that lack of dental care services has been associated with a higher likelihood of periodontitis. [56] Also, Poor oral cleanliness was associated with the Periodontal disease by the mean estimations of plaque & bleeding on probing indexes significantly greater in Periodontal disease group. [35] In a four-state study in the U.S.A., only 34.7% of moms got dental care during their pregnancy. Even among those mothers with a dental problem, half did not seek dental treatment." [116] The results of our study portrayed highly statistical significant differences between periodontal disease with tooth brush ($p < 0.0001$), flossing habits ($p < 0.0001$) and dental care visits ($p < 0.0001$). The better oral hygiene and dental care, the lower the incidence of periodontal diseases. In the same line this results agreed with Hershenfield (2014) who found statistically significant association between periodontal disease and frequency of dental visit. [74] On the contrary, Merchant et al. (2002) examined oral hygiene practices and periodontitis in 553 health care professionals. They mentioned that the frequency of tooth brushing & flossing did not relate to periodontitis. [117]

5. Conclusion

In the bright of the study results, it was concluded that, various levels of periodontal disease among pregnant women associated with sociodemographic characteristics. The periodontal disease appears to be affected by existing conditions such as residence, economic status living or educational level, gestational age and obesity/overweight can be considered an important factor in periodontal disease. At a higher risk of periodontal disease were found among obese/overweight rural residences women, who are housewives, middle educational level and/or middle monthly income. Additionally, among obese pregnant women who were in their first trimester while in the third trimester among overweight pregnant women. Our results reaffirm that increased pre-pregnancy overweight and obesity, as well as the lifestyle, is positively correlated with periodontal disease prevalence among pregnant women. Pregnancy itself may also be associated with an increased risk of periodontal disease.

6. Recommendations

Based on the finding and conclusions drawn from the study, the following recommendations are suggested:

1. Because so few pregnant women seek regular preventive dental treatment, they must be educated in settings other than the dental office by activating the role of the maternity and community nurse in antenatal clinics and centers and all branches of obstetrics to enhance their knowledge and took care of well.
2. Nurses can be critical in providing periodontal education to expectant mothers. Health education programs should be commenced to raise awareness about the negative impact of obesity on periodontal disease. Such programs should not only focus on pregnant women but should include non-pregnant ones and health care givers as well. Nurses must become these frontline educators who can screen for the periodontal disease.
3. Oral health education opportunities within and among disciplines. Developing of a core set of oral health competencies and curricula for non-dental healthcare professionals to enhance their role in oral health promotion and disease prevention.
4. Most importantly, maternity and community nurses should be able to identify signs and symptoms of periodontal disease (bleeding and/or swollen gums, loose teeth, and a foul taste and/or bad breath) and be able to effectively teach these signs and symptoms to expectant mothers. This way, if a woman discovers that she is experiencing these signs and symptoms, she will be able to associate them with possible periodontal infection and seek early professional treatment before she begins experiencing systemic effects.
5. Nursing programs and curriculum need to change to prepare and train nursing graduates with core competencies of oral health access to care issues as they are the main oral health educators and providers.

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