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Nutritional Supplements and Patterns of Visits to Dental Clinics among Pregnant Women's Periodontal Health, and Treatment Needs in Diyala Governorate, Iraq

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Abstract: **Background**: *One of the most prevalent oral health diseases affecting people is periodontal disease, which affects the tissues supporting the teeth. Globally, 5 to 70% of older people suffer from periodontal diseases, which impact 65 million persons above the age of 30 in America. Periodontitis and gingivitis are more prevalent during pregnancy as a result of the hormonal and vascular changes that make the periodontal tissue more sensitive to local effects. For this reason, maintaining oral health during pregnancy has been acknowledged as a crucial public health issue on a global scale.*

Aim: *Evaluation of the relationship between nutritional supplements, patterns of visits to dental clinics with pregnant women's periodontal health, and treatment needs in Diyala center, Diyala governorate, Iraq.*

Subjects and Methods: *The community periodontal index for treatment needs based on World Health Organization and Federation Dentaria International guidelines was used in the cross-sectional investigation of 515 pregnant women with ages ranging from (20-40 years) who were examined at eight medical health centers in Diyala center, Diyala governorate, Iraq.*

Results: *The prevalence rate of periodontal disease among pregnant women in Diyala medical health centers was (87.38%). The calculus code 2 recorded approximately the highest code among pregnant women and it was (45.05%), followed by bleeding code 1 recorded (35.34%), then pocket depth from 4-5 mm recorded (4.47%), while the pocket depth of 6 mm or more recorded the least percentage (2.52%) and only (12.62%) of pregnant women had healthy periodontium. The most prevalent needed treatment was treatment needs 2 (49.51%).*

Conclusion: *A significant association was found between nutritional supplements taken and patterns of visits to dental clinics with the highest CPITN codes.*

***Keywords*:** supplements, pregnancy, dental clinics, CPITN, Diyala governorate.

Introduction

Periodontal diseases (PDs) are inflammatory conditions, one of the most common oral diseases that affect mankind, affecting the surrounding structures of the teeth including the gingiva, periodontal ligament, and alveolar bone. These conditions may be restricted to the gingiva (gingivitis) or may extend to the periodontal ligament space and alveolar bone (periodontitis). Periodontitis may lead to tooth mobility, pathologic migration, and eventual loss of teeth (Popoola *et al*., 2015; Tonetti *et al*., 2017). Pregnancy is a unique difficult time in a woman's life that is recognized by a complex physiological and psychological alteration. These including vascular and hormonal alterations, affect the periodontal health status and the responses of oral tissues to local factors such as bacterial plaque (Wu *et al*., 2016) making diagnosis and periodontal therapy for pregnant women very important to prevent any unfavorable pregnancy outcomes (Figuero *et al*., 2020). Thus, very necessary to advise women in this period to improve oral health by maintaining good oral hygiene because hormonal changes with neglected oral hygiene will increase the incidence and severity of periodontal diseases like gingivitis (Agarwal *et al*., 2020). Most recent studies supported this hypothesis and showed that PDs. in the pregnancy period caused adverse risk factors in pregnancy outcomes such as pre-term birth, low birth weight, and preeclampsia (Konishi *et al*., 2020; Mahapatra *et al*., 2021). To evaluate the state of people's periodontal health, the World Health Organization's (WHO) Oral Health Unit and the Federation Dentaria International (FDI) established the Community Periodontal Index for Treatment Needs (CPITN). The population of Diyala Governorate is over than 1,768,920, of whom roughly (71.35%) live in urban areas and (28.65%) live in rural regions, according to the (Central Statistical Organization of Iraq, 2021) it is located in northeastern Iraq, about 60 kilometers east of Baghdad.

Nutrition is a key modifiable risk factor for periodontitis *(*Martinon *et al.*, 2021). Nutrition is classified into macro-nutrition and micro-nutrition, macro-nutrition consists of carbohydrates, proteins, and fats while micro-nutrition is composed of vitamins, minerals, and other trace elements. Nutrition is very important for maintaining periodontal health status and preventing PDs. (Cagetti *et al*., 2020). Increasing rates of overweight and obesity around the world are accompanied by a higher prevalence of PDs. but the deficiency of any nutrition leads to lower resistance of periodontium to bacterial infections, gingival bleeding, and increases the incidence and prevalence of PDs. (Suhail and Al-Obaidi, 2014; Martinon *et al*., 2021), while balanced nutrition plays a significant role in maintaining the symbiosis between oral microbiota and periodontal health (Kato *et al*., 2017). A study by (Ismail and Mahmood, 2022) revealed that daily supplementation of 5mg melatonin tab. significantly improved periodontal health. Another study by (Mageed and Saliem, 2015) demonstrated that alcoholic green tea extract showed inhibition ability against *Aggregatibacteractinomycetemcomitans* more than the aqueous green tea extract and more than CHX and it showed bactericidal activity at 80%, 90%, and 100% concentrations. The rates of Diabetes Mellitus (DM) are increased in overweight people. DM is a clear and high-risk factor for the incidence of periodontitis (Ibraheem and Ahmmad, 2020). PDs. is a risk factor for Cardiovascular Diseases (CVDs), (Hamad and Mahmood, 2022) that can trigger the formation, maturation, and instability of atheroma in the arteries (Shetty *et al*., 2023). There is a causal relationship between PDs. and CVDs. (Ahmed and Maha, 2014) because bacteria in DP. which play a major role in PDs. could enter the bloodstream in a high bacterial load through daily habits like chewing or tooth brushing (Del Giudice *et al*., 2021) known as bacteremia are the primary cause of infective endocarditis (IE), (i.e. a damaged endocardium). The increase in the severity of periodontal disease can be used as an indicator of the increase in risk for vascular disease in type 2 diabetes patients (Abbas and El-Samarrai, 2016).

Obesity is considered a risk factor for PDs. (Al-Fatlawi and Radhi, 2017) and general health (Fakhry and

Faeza et al., 2017) by the possible relationship between obese or overweight patients and periodontitis because these patients are suffering from the biological inflammatory mechanisms processes through a variety of inflammatory pathways (Martinez-Herrera *et al*., 2017). So, the study aims to evaluate the relationship between nutritional supplements, patterns of visits to dental clinics with pregnant women's periodontal health, and treatment needs in Diyala Center, Diyala governorate, Iraq.

Materials and Methods

A. Study settings: Eight health institutions in Iraq's Diyala Governorate, which is sixty kilometers away from Baghdad, were used for the research. Roughly 1,768,920 people reside in the Diyala Governorate, with about 71.35% of them living in urban regions and 28.65% in rural ones (Central Statistical Organization of Iraq, 2021). The knowledge was gathered from each pregnant woman using a sheet of paperwork and authorization form before anything else subsequently followed by a questionnaire to record the patterns of dental clinic visits (frequency of visits, reasons for visits, and factors affecting dental attendance), as well as nutritional supplements taken. Finally, each pregnant woman underwent a clinical periodontal examination using a CPITN-E probe (Perfection-Plus company in the United Kingdom). Additionally, the duration of data gathering and recording was from March until July 2022.

B. The population of the study: The study population consisted of pregnant women from the health centers in the center of Diyala governorate, Iraq. Diyala center contain eight health centers attended by pregnant women for regular checking. The age of the pregnant women ranged between (20-40 years) and all the pregnant women in the three trimesters are included in the study also, pregnant women with a partial denture, crown, bridge, implant, and orthodontic appliance are included but if pregnant women not willing to participate in the study, or with medically compromised conditions (such as Acquired immune deficiency syndrome), or with any medical conditions which may influence their periodontal health status (such as blood disorders, diabetes, cardiovascular diseases, and rheumatoid arthritis), or who take medications affecting periodontium (such as corticosteroids and anti-hypertension drugs), and pregnant women missing all index teeth when examined should be excluded. The total number of pregnant women in the year 2021 was about (13,203)**.**

C. Pilot study: It investigated in January 2022 on eighty pregnant women in three health centers in Diyala center (Al-Rahmah, Al-Hodaid, and Al-Yarmouk health centers) within two weeks (a single visit every week), by utilizing two-step random sampling methodology (WHO, 2013); and the incidence of periodontal disease had been (62%), (codes 0, 1, 2, and 3) with codes 4 and x not displayed.

D. Sampling methodology: The final sample size was 515 pregnant women who were examined from eight medical health centers of primary care. The pregnant women were chosen by using stratified random sampling according to (WHO, 2013), and calculated according to the following equation: (Number of pregnant women in each medical health center (n) /total number of pregnant women in medical health center (N) × sample size = a number of pregnant women participate from each medical health center.

Using Cochran's equation, sample size (N) was calculated (Charan and Biswas, 2013).

$N=Z^2\ P\ (1-P)/D^2$; N= Minimum sample size. Z= Value of standard normal distribution (1.96 at $p<0.05$); P= Expected proportion of the population which has the attribute based on previous studies or pilot studies (periodontal disease). D=Absolute error or precision has to be decided by a researcher (3%). $N= (1.96)^2\ (0.62)\ (1-0.62)/\ (0.03)$.

E. Questionnaire and variables

The study's variables are contained in a specially designed questionnaire including the followings:

1.Nutritional Supplements:

1-Use of supplements (Yes or No)

2-Type of supplements taken: (A. Iron, B. Folic acid, C. Calcium, D. Vitamin D3, E. Iron, folic acid, calcium, vitamin D3, and others such as (omega 3, 6, 9, vitamin C and vitamins B complex)).

2. pattern of visits to the dental clinic:

1.Frequency of visits to the dentist (regular, irregular, never, and on emergency. Regular= once or twice /year; Irregular = on need or more than a year; On emergency= only for emergent cases.

2.Reasons for dental visits (curative and preventive), (Farsi, 2010).

Curative: pain, dental and gingival problems; Preventive: regular and random check-ups. 3.Factors affecting dental attendance (anxiety, cost, time, and unnecessary (Ghali, 1989).

J. Periodontal health status and treatment needs

1.Examination settings:

The mouth was separated into six sextants based on WHO guidelines for evaluating periodontal health status, and the teeth were examined using a sterile CPITN-E probe and a disposable mouth mirror in the following order: upper right posterior sextant, upper anterior sextant, upper left posterior sextant, lower anterior sextant, lower anterior sextant, and lower right posterior sextant (Scribd, 2019). Table (1) shows the borders of each sextant with teeth numbers for those aged 20 and up.

Table 1: Borders of each sextant with teeth number for age 20 years and above (Marya, 2012).

17-14	13-23	24-27
47-44	43-33	34-37

The recording and examination of the sextant were set when only (two or more teeth) were present in the sextant and moved to the next sextant when (less than two teeth) were present in the sextant, and recorded 'X' (missing sextant). When only one tooth was present in a sextant, it is included in the adjacent sextant. If two or more teeth in the sextant were present (index teeth) they examined for the presence of 6 mm or deeper pockets; 4 to 5 mm pockets, calculus and other plaque retentive factors such as (Crown or bridge margins, overhang restoration, defective marginal restoration, orthodontic appliance, anatomic grooves on the roots and subgingival caries or resorptive lesions), then bleeding on probing in that specific order. Third molars were not included, except where they were functioning in place of second molars. Only the highest code for each sextant was determined and there was no need to examine for the presence of lower code criteria (Scribd, 2019). The purpose of the examination was to record the highest code applicable to each sextant with the least number of measurements (Marya, 2012). Only ten specified index teeth were examined for pregnant women aged from (20 years and above), (Marya, 2012).

2.Coding criteria of CPITN index: A code from 0 to 4 was assigned for each of the six sextants under examination and the codes are presented below in decreasing sequence of treatment complexity as follows (Marya, 2012):

Code X: When only one tooth or no tooth is present in the sextant (third molars are excluded unless they function in place of second molars).
Code 4: Pathological pocket of the 6 mm or more, that is, the black area of the CPITN probe is not visible.
Note: If the designated tooth or teeth are found to have a 6 mm or deeper pocket in the sextant being examined, a code of 4 was given to the sextant. Recording code 4 makes further examination of that sextant unnecessary. There is no need to record the presence or absence of pathological pockets of 4 or 5 mm, calculus, or bleeding.
Code 3: Pathological pocket of 4 or 5 mm is when the gingival margin is on the black area of the probe.
Note: If the deepest pocket was found at the designated tooth or teeth in a sextant were 4 or 5 mm, a code 3 was recorded. There is no need to examine for calculus or gingival bleeding.
Code 2: Calculus or other plaque retentive factors such as ill-fitting crowns or poorly adapted edges of restoration are either seen or felt during probing.
Note: The black band remains fully visible.
Code 1: Bleeding observed during or after probing (either immediate or delayed).
Code 0: Healthy tissue: The black band on the probe remains fully visible. There was no bleeding after probing. No calculus, restoration overhangs or other plaque retention factors were present.

3.Treatment needs interpretations of CPITN index: Bleeding on gentle probing, plaque retentive factors, 4, 5, 6 mm or deeper pockets are basic indicators of TNs. These criteria for treatment were chosen for the following reasons (Marya, 2012):
1. TN 0: No need for treatment.
2. TN 1: Bleeding is a sign of an early disease which can be overcome by self-care following suitable oral health care educations and instructions. Control of gingival bleeding is a prerequisite for all periodontal therapy. This treatment is recognized as TN1. The control or elimination of gingival bleeding should be the prime goal even if further treatment is not available.
3.TN2: Although not pathological in themselves, calculus and other plaque retentive factors favor plaque retention and inflammation. Unlike plaque that can be eliminated by oral hygiene instructions on home self-care, the removal of calculus demands professional care defined as TN 2, also shallow to moderate pocketing (4 or 5 mm, code 3) defined as TN 2, both codes 2 and 3 requires OHI and scaling that will reduce inflammation and bring 4- or 5-mm pockets to the value of or below 3 mm. Thus, sextants of these pockets are placed in the same treatment category as scaling and root planning, i.e., TN 2.
4.TN3: In patients with deep pockets even after deep scaling, root planning, and control of bleeding by oral hygiene methods there will generally be residual pockets. The treatment of these conditions may require complex therapy for which skilled and trained dental professionals are needed. This treatment is recognized as TN 3.
4.Sites for probing: The mesial, midline, and distal on both facial (labial/buccal) and lingual (palatal) surfaces are the recommended sites for probing. The probe is withdrawn between each probing with the probe tip remaining in the sulcus, the probe may also be 'walked' around the tooth (Marya, 2012).
K. Statistical analysis: Data processed and analyzed by using SPSS version 23 (statistical package for social science) windows statistics, version 23 (IBM SPSS V.23). Both descriptive and qualitative analyses will be used by cross-tabulation, ratio, percentage, and Pearson chi-square (X^2) test. The Level of significance as a p-value (P) of ≤ 0.05 was considered statistically significant (S) while, 0.05 was considered non-significant (NS).

Results

The prevalence rate of periodontal diseases was (87.38%), according to the results of this cross-sectional study on the periodontal health status and TNs among pregnant women in Diyala Center, the third trimester revealed the highest incidence of periodontal disease (96.57%), which was followed by the second trimester (89.39%) and the first trimester (70.45%).

1. Pregnant women distributed at each medical health center: The numbers of pregnant women from the eight health centers were not selected uniformly. The names of health centers as well as the numbers and percentages of pregnant women were Al-Rahmah health center 80(15.53%), Al-Yarmouk health center 70(13.59%), Shifttah health center 50(9.71%), AL-Hodaid health center 65(12.62%), Al-Sarrai health center 75(14.56%), Al-Mustafa health center 50 (9.71%), Al-Tahrir one health center 65(12.62%) and Al-Tahrir two health center 60(11.65%).

2. Periodontal Health Status and Treatment Needs: assessment of the periodontal health status using CPITN revealed in Table (2) which display the findings of the clinical periodontal evaluation.

Table 2: Pregnant women distribution according to periodontal health status by using CPITN.

CPITN	Numbers	Percentages
Healthy periodontium	65	12.62%
Bleeding	182	35.34%
Calculus	232	45.05%
Pocket depth 4-5 mm	23	4.47%
Pocket depth 6 mm or more	13	2.52%
Total	515	100%

According to the type of treatment needed for every pregnant woman. Figure (1) display the findings of the clinical periodontal evaluation.

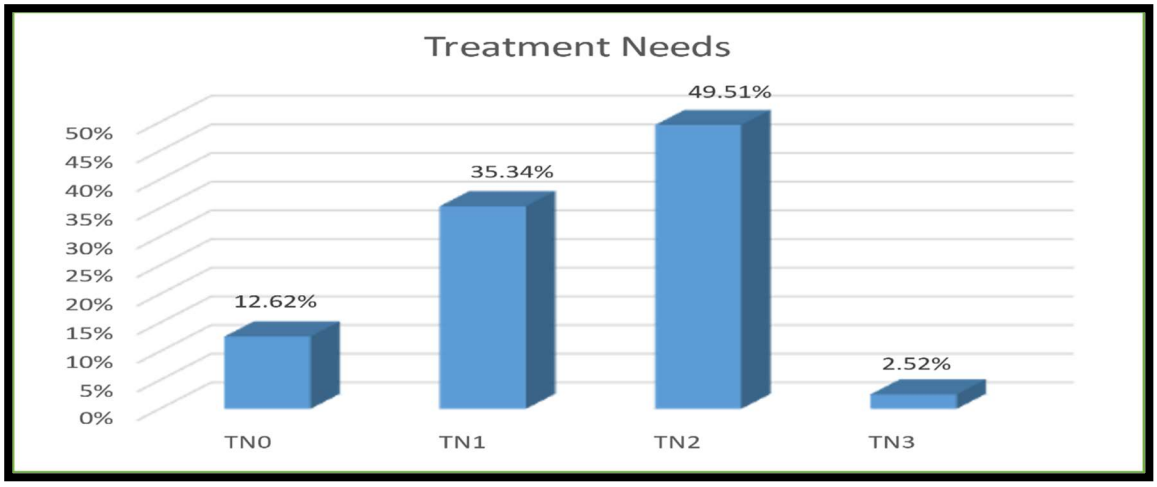

Figure 1: Bar chart for pregnant women's treatment needs by using CPITN.

3. Nutritional supplements are taken during the pregnancy period: The numbers and percentages of pregnant women are shown in Table (3) in relation to the nutritional supplements consumed during pregnancy. Most of the sample of pregnant women who used nutritional supplements during pregnancy with a percentage of (86.41%), while the percentage of those who did not take any supplements was (13.59%). The percentage of pregnant women taking iron, folic acid, calcium, vitamin D3, and other supplements such as omega 3, 6, and 9 was the highest (24.5%), while the percentage of pregnant women taking only iron was the lowest (13.93%).

Table 3: Distribution of pregnant women based on nutritional supplements taken during the pregnancy period.

Use of nutritional supplements	Numbers	Percentages
Yes	445	86.41%
NO (None)	70	13.59%
Total	515	100%
Types of nutritional supplements taking	Numbers	Percentages
Iron	62	13.93%
Iron + Folic acid	80	17.98%
Iron + Folic acid + Calcium	92	20.67%
Iron + Folic acid + Calcium + Vitamin D3	102	22.92%
Iron + Folic acid + Calcium + Vitamin D3 + others	109	24.49%
Total	445	100%

4. Patterns of visits to the dental clinic: Table (4) presents the distribution of pregnant women based on their pattern of visits to the dentist. It is seen that a significant majority of pregnant women sought dental care an emergency situation with a percentage of (62.91%), and most of their visits to dentist for curative reasons with a percentage of (71.87%), many factors have been affecting dental attendance but the cost of dental treatment represented the highest percentage (45.05%).

Table 4 : Distribution of pregnant women based on the pattern of dental clinic visits.

Behaviors	Numbers	Percentages
Frequency of visits to dentists		
Regular	29	5.63%
Irregular	102	19.81%
Never	60	11.65%
On emergency	324	62.91%

Total	515	100%
Reasons for visits to dentists		
Curative	327	71.87%
Preventive	128	28.13%
Total	455	100%
Factors affecting dental attendance		
Anxiety	99	19.22%
Cost	232	45.05%
Time	114	22.14%
Unnecessary	70	13.60%
Total	515	100%

5. Association between highest CPITN codes with nutritional supplements taken during the pregnancy period

Use of nutritional supplements: In relation to nutritional supplements utilized during pregnancy, the highest percentages of healthy periodontium (14.61%), bleeding (36.85%), and calculus (47.19%) in pregnant women who were taking nutritional supplements, while the highest percentages of pockets depths 4-5 mm (28.57) and 6mm or more (14.29%) in pregnant women not taken nutritional supplements during pregnancy period. The relationship between the use of nutritional supplements and the highest CPITN codes was statistically significant (P≤0.05) and presented in Table (5).

Table 5: Distribution of pregnant women and statistical analysis based on their highest CPITN codes by the use of nutritional supplements.

Use of nutritional supplements	Yes No.(%)	No No.(%)	Total No.(%)	Statistical analysis
Healthy Periodontium	65(14.61)	0(0)	65(12.62)	χ^2=165.48 Df. = 4 (P≤0.05) (S)
Bleeding	164(36.85)	18(25.71)	182(35.34)	
Calculus	210(47.19)	22(31.43)	232(45.05)	
Pocket depth 4-5 mm	3(0.67)	20(28.57)	23(4.47)	
Pocket depth 6 mm or more	3(0.67)	10(14.29)	13(2.52)	
Total	445(86.41)	70(13.59)	515(100)	

Types of nutritional supplements: In relation to the various types of nutritional supplements consumed during pregnancy, it was observed that the group of pregnant women who ingested a combination of iron, folic acid, calcium, vitamin D3, and additional supplements such as omega 3, 6, 9, vitamin C, and vitamins B complex exhibited the highest percentage of sample with a healthy periodontium, accounting for (22.94%). Conversely, the group of pregnant women who solely consumed iron supplements displayed the highest percentages of bleeding (53.23%), pockets depths measuring 4-5mm (3.23%), and 6 mm or more (3.23%). Furthermore, the group of pregnant women who exclusively consumed iron and folic acid supplements reported the highest proportion of calculus (52.5%). The relationship between the types of nutritional supplements consumed during pregnancy and the highest CPITN codes was statistically significant (P≤0.05) and presented in Table (6).

Table (6): Distribution of pregnant women and statistical analysis based on their highest CPITN codes by types of nutritional supplements taken.

CPITN Codes	Types of consumed nutritional supplements during pregnancy period					Total No. (%)	Statistical analysis
	(Iron) No.(%)	(Iron + folic acid) No.(%)	(Iron + folic acid + calcium) No.(%)	(Iron + folic acid + calcium + Vitamin D3) No.(%)	(Iron + folic acid + calcium + Vitamin D3 + other) No.(%)		
Healthy periodontium	1(1.61)	1(1.25)	18(19.57)	20(12.82)	25(22.94)	65(12.62)	χ^2=54.57 DF. = 16 (P≤0.05) (S)
Bleeding	33(53.23)	35(43.75)	36(39.13)	30(19.23)	30(27.52)	182(35.34)	
Calculus	24(38.71)	42(52.5)	38(41.3)	52(33.33)	54(49.54)	232(45.05)	
Pocket depth 4-5 mm	2(3.23)	1(1.25)	0(0)	0(0)	0(0)	23(4.47)	
Pocket depth 6 mm or more	2(3.23)	1(1.25)	0(0)	0(0)	0(0)	13(2.52)	
Total	62(100)	80(100)	92(100)	156(100)	109(100)	515(100)	

DF: (Degree Of Freedom)
P-value: (Probability level of statistical decision) *S: (Significant)*

6. Association between highest CPITN codes with patterns of visits to dental clinics: Table (7) presents the distribution of pregnant women and statistical analysis based on their highest CPITN codes, categorized by their patterns of visits to dental clinics.

Frequency of visits to the dentist: The highest percentage of a healthy periodontium (100%) was found among pregnant women who maintained regular visited to the dental clinics. Conversely, irregularly, pregnant women who visited the dental clinics exhibited the highest bleeding percentage (68.63%). Notably, pregnant women who did not attend any dental clinic appointments displayed the highest percentages about calculus (63.33%), pocket depth measuring 4-5mm (20%), and pocket depth measuring 6mm or more (16.67%). The relationship between the frequency of visits to the dentist and the highest CPITN codes was statistically significant (P≤ 0.05).

Reason for dental visits: The highest percentages of healthy periodontium (46.88%) and bleeding (46.88%) were found among pregnant women with preventive dental care at a clinic. Conversely, the highest percentages of calculus (56.88%), pocket depth of 4-5mm (3.36%), and pocket depth of 6mm or greater (0.92%) were found among pregnant women with curative dental care at a clinic. The relationship between the reason for dental visits and the highest CPITN codes was statistically significant (P≤0.05).

Factors affecting dental attendance: The group of pregnant women with cost-related factors exhibited the highest percentages of healthy periodontium (13.79%) and bleeding (42.24%). Conversely, the pregnant women with time-related factors group had the highest percentage of calculus (61.40%). The highest percentages of pockets depths of 4-5mm (14.29%) and 6mm or more (7.14%) were reported among pregnant women group with unnecessary reason. The relationship between factors affecting dental attendance and the highest CPITN codes was statistically significant (P≤0.05).

Table 7: Distribution of pregnant women and statistical analysis based on their highest CPITN codes by patterns of visits to dental clinics.

CPITN Codes							Statistical Analysis
Frequency of Visits to Dentists	Code 0 No.(%)	Code 1 No.(%)	Code 2 No.(%)	Code3 No.(%)	Code 4 No.(%)	Total No.(%)	
Frequency of visits to the dentist							
Regular	29(100)	0(0)	0(0)	0(0)	0(0)	29(5.63)	χ^2=389.25 DF. = 12 (P≤0.05) (S)
Irregular	14(13.73)	70(68.63)	18(17.65)	0(0)	0(0)	102(19.81)	
Never	0(0)	0(0)	38(63.33)	12(20)	10(16.67)	60(11.65)	
On emergency	22(6.80)	112(34.57)	176(54.32)	11(3.40)	3(0.93)	324(62.91)	
						515(100)	
Reason for dental visits							
Curative	5(1.53)	122(37.31)	186(56.88)	11(3.36)	3(0.92)	327(71.87)	χ^2=195.3 DF. = 4 (P≤0.05) (S)
Preventive	60(46.88)	60(46.88)	8(6.25)	0(0)	0(0)	128(28.13)	
						455(100)	
Factors affecting dental attendance							
Anxiety	13(13.13)	41(41.41)	40(40.40)	3(3.03)	2(2.02)	99(19.22)	χ^2=28.74 DF. = 12 (P≤0.05) (S)
Cost	32(13.79)	98(42.24)	96(41.38)	5(2.16)	1(0.43)	232(45.05)	
Time	15(13.16)	19(16.67)	70(61.40)	5(4.39)	5(4.39)	114(22.14)	
Unnecessary	5(7.14)	24(34.29)	26(37.14)	10(14.29)	5(7.14)	70(13.60)	
						515(100)	

Discussion:

Community investigations are required to assess the state of periodontal health and the efficacy of therapy, and this epidemiological cross-sectional investigation was conducted among pregnant women due to a lack of prior research examining pregnant women's periodontal health status and treatment requirements in the Diyala governorate. The CPITN was established by the FDI and WHO as a result of its several advantages (simplicity, speed, and worldwide uniformity), (Dhingra and Vandana, 2011) It was selected as the subject of this inquiry. The total incidence percentage of PDs in this investigation was (87.38%), which is an extremely high percentage. The extremely high incidence of PDs is a result of pregnant women's absence of knowledge about dental clinics, their fear, and anxiety about dental treatment during pregnancy, and their lack of use of interdental devices or mouthwash, all of which have an important effect on periodontal condition and elevate the incidence of TNs. The high prevalence rate also revealed by a study by (Krüger et al., 2017) revealed that (7.8%) of the sample with healthy periodontium had code 0, (29.1%) had code 1, (46.6%) had code 2, (12.8%)

had code 3, and (3.7%) had code 4. Regarding the CPITN codes, the most prevalent code in the presented study was code 2 (calculus) followed by code 1(bleeding), then code 0 (healthy periodontium), after that code 3(pocket depth of 4-5mm) and at last code 4 (pocket depth of 6 mm and more). While for TNs, majority of pregnant women in the present study were reported to be in category of TN2 which indicated the need for scaling and root planning that preceded previously by OHI followed by TN1, TN0 and TN3 finally.

1.Association between highest CPITN codes with nutritional supplements taken during the pregnancy period: The present investigation identified significant correlation between the highest CPITN codes with the consumption of nutritional supplements during pregnancy. The pregnant women who consumed a combination of iron, folic acid, calcium, vitamin D3, and various other supplements including omega 3, 6, 9, vitamin C, and B complex exhibited a healthy periodontium. The results of this study were consistent with the findings of a previous investigation conducted by (Spezzia *et al*., 2016) on a sample of 158 participants in Brazil. The aforementioned study shown a significant correlation between CPITN codes and deficiencies in nutritional supplements. Another study carried out by (Boggess *et al.,* 2011) examined a cohort of 117 pregnant women, revealing a correlation between nutritional insufficiency and the occurrence of PDs. this finding underscores the significance of maintaining adequate nutritional levels as a potential therapeutic approach to enhance both oral and maternal health, while also mitigating the risk of adverse pregnancy outcomes because pregnancy period led to increased oxidative stress and decreased the antioxidant factors (Hassan and Laylani, 2017). Furthermore, recent research conducted by (Martinon *et al.,* 2021) examined the correlation between nutritional deficiencies and the development and progression of PDs. Additionally, it has been shown that keeping a balanced nutrition is crucial in preserving the symbiotic link between oral microbiota and periodontal health, as highlighted by (Kato *et al.,* 2017).

2.Association between highest CPITN codes with patterns of visits to dental clinics.

A. **Frequency of visits to the dentist:** The current study found significant correlation between the frequency of dental visits and the highest CPITN codes. Pregnant women who regularly visited the dentist exhibited the highest percentage of healthy periodontium, whereas those who never visited dental clinics had the highest percentages of calculus, shallow pockets, and deep pockets. These findings agreed with a study by (Cengiz *et al*., 2018) that showed significant correlation between subjects who never visit a dentist and increased severity of PDs. Study by (Patel, 2023) revealed a significant association between the frequency of visits to the dentist with the highest CPITN codes hence, the people generally lacked of knowledge about the benefit of regular visits to the dentist for identifying and preventing oral disease such as PDs, therefore the responsibility of dentists to educate and motivate individuals to attend the dental clinic regularly (Srivastava *et al*., 2023).

B. **Reason for dental visits :** Significant correlation was identified between the reasons for dental visits and the highest CPITN codes. This suggests that a majority of pregnant women sought dental care primarily for curative purposes, as they lacked awareness on the significance of dental checkups in terms of early detection and prevention of oral conditions such as PDs. The results of this study are largely consistent with the findings of a previous study conducted by (Balenović *et al*., 2019), which indicated that the majority of individuals seek dental care either on weekends or in emergency

situations. Additionally, these results align with the findings of other studies conducted by (Gomes *et al*., 2015 and Olatosi *et al.*, 2019), which demonstrated a significant correlation between the reasons for dental visits and the highest CPITN codes. Previous research has indicated that a majority of individuals seek dental care primarily for the purpose of receiving curative treatment rather than for preventive measures (Gambhir *et al*., 2015; Tadin *et al*., 2022 and van der Zande *et al*. 2022).

C. **Factors affecting dental attendance :** Significant association was observed between factors affecting dental attendance and the highest CPITN codes. The most affecting factor to dental attendance in the present study is cost, followed by lack of time, anxiety and the last unnecessary factors. A study by (Alenezi *et al*., 2022) reveled the majority of individuals fear from dental treatment therefore those are more likely to avoid regular dental visits ,while another study demonstrated the lack of time was most common factor affecting the dental attendance (George *et al*., 2012) and other study conducted by (Balkrishna *et al*., 2022) showed that most patients avoided dental examinations because they had not seen the necessity for it, followed by cost and lack of time. Recent study found that the most common cause for irregular dental visits is lack of dental problems (Dosumu *et al*., 2022).

Conclusion:

Pregnant women in Diyala governorate had a high incidence of periodontitis, which was accompanied by a lack of understanding of periodontal health status and insufficient access to suitable periodontal therapies. As a result, it is strongly advised for proper PDs. awareness. It is critical to ensure that the governorate of Diyala has enough dental professional coverage because the majority of pregnant women require scaling and root planing (TN2). Also, it is critical to pay closer attention to the variables that have a significant correlation with the highest CPITN codes and encourage pregnant women to modify or avoid certain behaviors, such as promoting smoking or alcohol cessation and enhancing periodontal care by teeth cleaning, correct teeth brushing technique, inter-dental device use, mouthwash use, correct the frequency of dental visits, living a healthy lifestyle, and using nutritional supplements.

Ethical Approval

The ethical institution committee of the Faculty of Dentistry/University of Baghdad authorized protocol reference number: 826 in 1-6-2023. Before beginning the intervention, all patients provided written informed permission, which reflected their agreement to participate in the trial. The general director of the Diyala health department and the directors of each health center in Iraq's Diyala governorate offered their consent and permission for the investigation to evaluate pregnant women who visited primary care medical health centers.

Self-funding

The author who corresponds with the study is solely responsible for paying all research funding on behalf of the research.

Consent to Participate

Everyone who participated provided informed permission.

Authorship

MQH assisted in acquiring data, analyzing it, and writing the original research. MAA reviewed the analysis that helped the writing and gave the final stamp of approval.

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