



# Sociodemographic Disparities and Self-reported Oral Health Problems Associated with Pregnancy: A Case-control Study in Morocco

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## ABSTRACT

**Background:** Dental and periodontal diseases are a public health problem over the world, however little is known about individual characteristics or behaviors associated with self-reported oral status during pregnancy. This cross-sectional study examines the relationships between pregnancy and Dental and Periodontal Health (DPH), socio-demographic factors and DPH, and health behavioral factors and DPH.

**Study design:** This study adopted a cross-sectional, descriptive and correlational research design to investigate the current oral health related health behavior, and socio-demographic disparities in pregnant and non-pregnant women in the MARRAKESH region in Morocco.

**Methods:** Participants (n=539, 251 pregnant, and 288 non-pregnant women), recruited from two health centers in the Marrakesh region (urban and rural), completed questionnaires addressing: Education, economic status, dental insurance, self-reported DPH, oral hygiene practices, and dental care utilization.

**Results:** 162 women were urban and 87 were rural in the pregnant group, while 226 women were urban vs 62 in the non-pregnant group. Also, 181 women were educated and 68 were illiterate in the pregnant group while 238 women were educated and 50 were illiterate in the non-pregnant women group. Moreover, pregnant women brush less frequently than non-pregnant women, dental visits were more important amongst non-pregnant women than pregnant women, and only 37 pregnant women visited a dentist while 82 pregnant women visited a dental quack.

**Conclusion:** This study highlights the effect of pregnancy and sociodemographic disparities on self-reported DPH, and provides useful findings for preventive and therapeutic interventions.

**Keywords:** pregnancy, dental health, periodontal health, sociodemographic, dental quack

## INTRODUCTION

Fairly four billion people over the world are affected by oral diseases (1,2). Tooth decay is one of the most frequent oral diseases which is an infectious disease due to biological, behavioral and socioeconomic factors and causing pain and stress with negative effects on the quality of life of pregnant women (3-5). Pregnancy is a state of progressive physical, psychological, and hormonal changes (6,7). Poor oral health during pregnancy may due to a limited attention to oral hygiene, leading to an increasing physical and emotional demands (8). Poor oral hygiene, increased acidity in the oral cavity, sugary dietary and hormonal changes increase the risk of developing oral health problems such as dental decay, gingivitis or gingival inflammation and periodontitis (8-10). Increased levels of *Streptococcus mutans* and *Lactobacillus* may increase the risk of tooth decay amongst Pregnant women (11). Gingivitis is an inflammatory disease affecting the supporting tissues of the tooth (9). As well as associated with

pregnancy, gingivitis is initially occurred by dental plaque and after aggravated by steroid hormones essentially progesterone and a decreased immune response (8). Around 60% to 75% of pregnant women have gingivitis, and near half of pregnant women in the United States have periodontitis which correspond to gingivitis with gingival recession accompanied by loss of connective tissue and alveolar bone (8,12).

Many factors independent of pregnancy could also play an important role such as demographic and socioeconomic status, health practices and health care utilization, and finally the broader social context and environment (5,13-18).

In addition, many studies proved that Maternal periodontal disease has been associated with preterm birth, development of preeclampsia, and delivery of a small-for-gestational age infant. Also, maternal oral flora is transmitted to the newborn infant, and increased cariogenic flora in the mother predisposes the infant to the development of caries (19).

Several studies were conducted over the world to assess the oral health status of pregnant women. The studies of Ait

addi et al, and Sidqui et al were the only ones conducted in Morocco, which compared the dental and periodontal status of pregnant women and non-pregnant women. Both of the studies found a high degree of tooth mobility in the pregnant women and a poor dental and periodontal health status amongst pregnant and non-pregnant women. However, the samples of the two studies were small (respectively 105 and 100) and the socio-economic and behavioral factors were not assessed. Also, no study in Morocco has been performed on oral health behaviors nor to assess dental quackery.

The objectives of this study were to assess the dental and periodontal health in a sample of pregnant women compared to non-pregnant women in the Marrakesh region in Morocco, and to study the associated risk indicators such as sociodemographic and behavioral factors.

## MATERIALS AND METHODS

### Study Design, Setting and Participants

This study adopted a cross-sectional, descriptive and correlational research design to investigate the current oral health related health behavior, and socio-demographic disparities in pregnant and non-pregnant women in the Marrakesh region in Morocco.

Actually, the Marrakesh region (31° 37' 48" N 8° 00' 00" W) is located in the center of the country, includes a part of the High Atlas Mountains, and populated by 4 520 569 habitants with 1 938 016 living in the urban area and 2 582 553 living in rural area (20).

Participants were recruited from two health centers urban and rural by simple random sampling method from August 2015 to July 2017 without previous appointment. In fact, the study recruited 539 women, with 251 pregnant, and 288 non-pregnant women whom consulted for Checkups of pregnancy, or for contraception and met the following selection criteria:

Inclusion criteria: Aged 18–40 years.

Exclusion criteria:

- a) Women with more than 10 missing teeth.
- b) Women with any systemic health conditions such as diabetes, cardiovascular diseases or blood dyscrasias.

### Outcomes and Measurements

A structured self-administered questionnaire was used to explore the socio-demographic background, oral health status, attitude and practices of the participants.

The questionnaire was evaluated by a local committee as valid and reliable, and consisted of three parts:

Part one included socio-demographic characteristics including age, living environment (we classified our subjects as either from rural or urban area), number of pregnancies, occupation, dental insurance, educational level attained.

In Part two, oral health behavior was assessed with questions on tooth brushing frequency and method, dental visits, and where they did dental visits: if the visit was done with a qualified dentist or with a person who is not qualified but do visits illegally “dental quack” (we distinguish between a qualified dentist and a quack dentist by the presence or not of the government registration number).

Finally, in the part three Self-reported oral health status was assessed by questions on dental and periodontal status. They respond by yes or no if they have: Dental abscess, dental mobility, dental decay, gingival recession, dental loss, periodontitis, and calculus.

All data were collected by qualified nursing students for a better comprehension.

### Data Collection Procedure

The researchers recruited women who were currently undergoing the health centers in the study. Potential participants were given an information sheet explaining the study's aims, procedures, their responsibility, possible benefits, alternatives to participation, confidentiality of data and voluntary participation. Those who were willing to participate, provided verbal consent to take part in the study. Following this, they were given a self-administered questionnaire, which took about 15 min to complete. This was conducted in a private room to ensure privacy.

A token of appreciation was given to each participant after they had completed the questionnaire.

### Ethical Considerations

The participants were questioned after having the full explanation of the purpose of our study and receiving their consent. The consent procedure was approved by the health ministry delegation. Also, our study has been independently reviewed and approved by the health ministry delegation. We note that we have not yet a local ethics committee because of that the health ministry delegation ensures that function. Finally our research has been conducted in full accordance with the World Medical Association Declaration of Helsinki <http://www.wma.net/en/30publications/10policies/b3/index.html>

### Statistical Analysis

Data was entered and analyzed by SPSS ver. 13.0 (Chicago, IL, USA). The number of women is calculated in each question which they have responded.

Descriptive statistics were computed to compile data for the demographics and other key variables of interest.

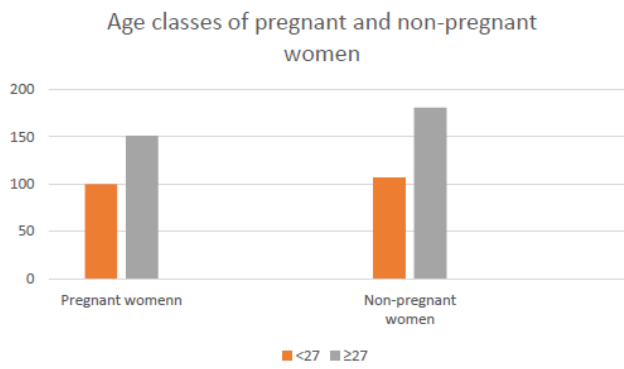
The economic status was based on the type of profession and the presence or not of dental insurance.

In addition, response for self-perception of oral health status was also categorized for data analysis. The correlation between oral health determinants, sociodemographic factors and the oral health status was analyzed using chi-square. The level of statistical significance was set at  $p < 0.05$ .

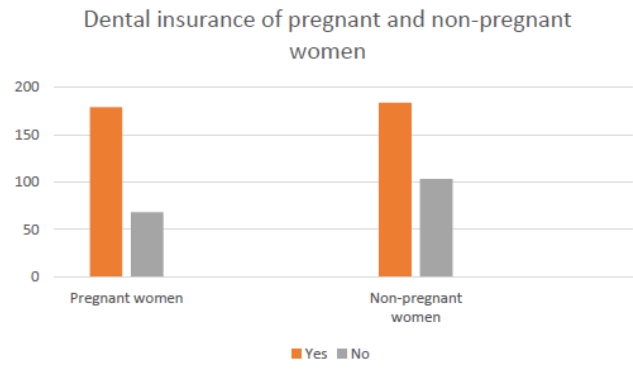
## RESULTS

Overall, 539 women were included in this study whose 251 (46.56%) pregnant and 288 (53.44%) non pregnant women.

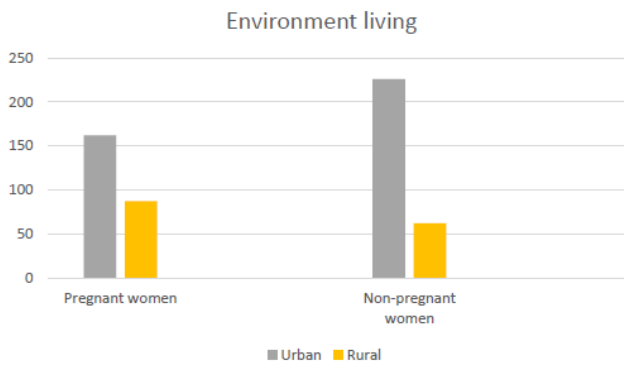
The living environment showed a high significant difference between pregnant and non-pregnant women ( $P=0.001$ ), in fact there were less pregnant women living in the urban area than non-pregnant women (**Figure 1, B**). According to educational level, a high significant difference was noted between pregnant and non-pregnant group with more illiteracy amongst pregnant women than non-pregnant women (**Figure 1, C**). It was also shown that there was a high significant



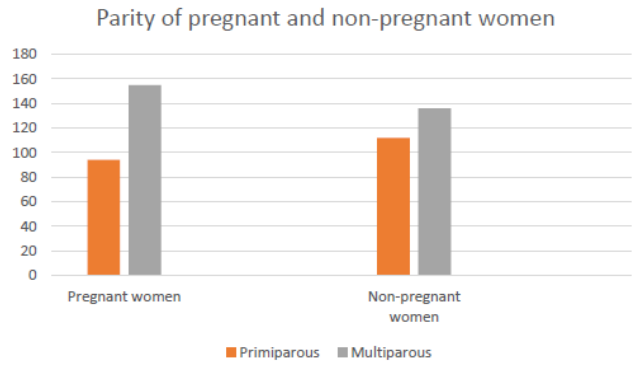
A: Age classes of pregnant and non-pregnant women



E: Dental insurance of pregnant and non-pregnant women

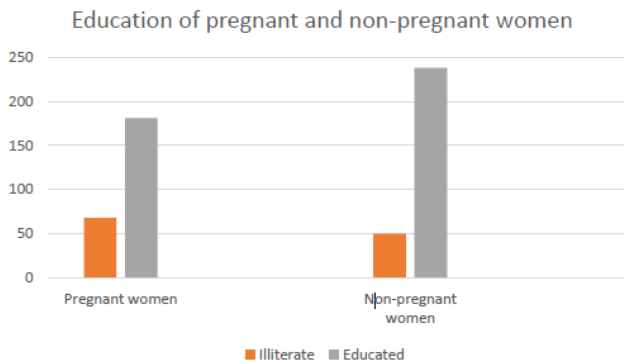


B: Environment living of pregnant and non-pregnant women

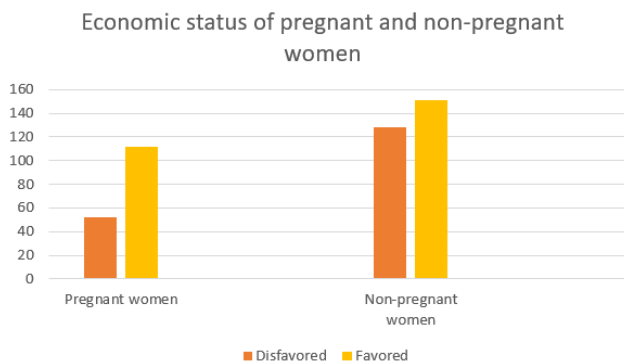


F: Parity of pregnant and non-pregnant women

Figure 1 (continued). Socio-demographic characteristics of pregnant and non-pregnant women (A, B, C, D, E, F)



C: Education of pregnant and non-pregnant women

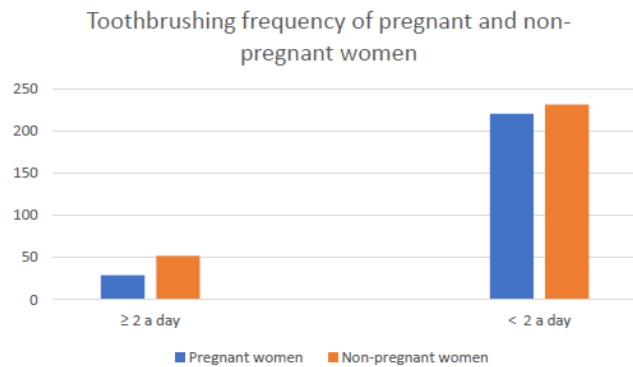


D: Economic status of pregnant and non-pregnant women

Figure 1. Socio-demographic characteristics of pregnant and non-pregnant women (A, B, C, D, E, F)

difference in the economic status between the two groups. Indeed, pregnant women were more favored than non-pregnant women (Figure 1, D).

In comparison to pregnant women pregnant women brushed their teeth less frequently than non-pregnant women (Figure 2, A).

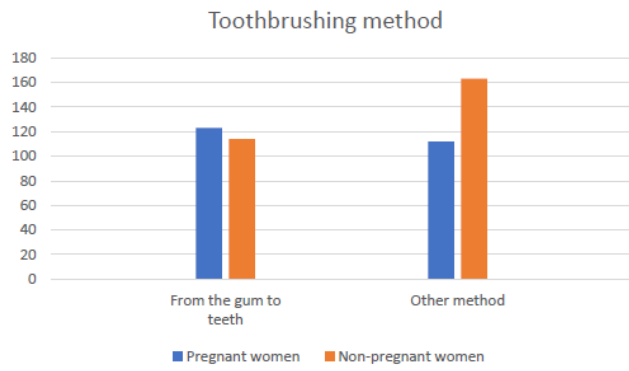


A: Toothbrushing frequency of pregnant and non-pregnant women

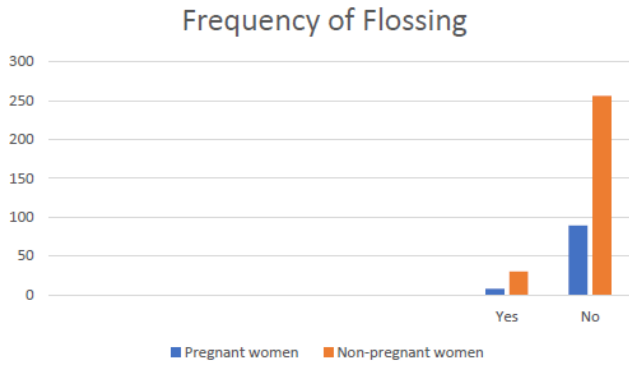
Figure 2. Oral health characteristics between pregnant and non-pregnant women (A, B, C, D, E)

Also, pregnant women used the right tooth brushing method more than non-pregnant women, however pregnant women were using less other method than non-pregnant women (Figure 2, B). Furthermore, dental visits were noted more in the non-pregnant group than the pregnant women group, and only 37 pregnant women visited a dentist while 82 pregnant women visited a dental quack (Figure 2, D, E).

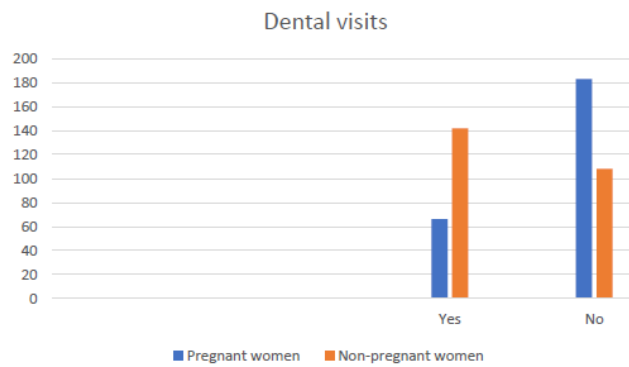
In self-reported oral health, pregnant woman had significantly more dental decay, dental abscess, dental mobility, dental loss, gingival recession, periodontitis and calculus than non-pregnant women (Figure 3). Living environment showed a significant difference in periodontitis, gingival recession, dental loss, dental decay, and dental mobility which were more important amongst rural women than urban women (Figure 4). Significant differences were



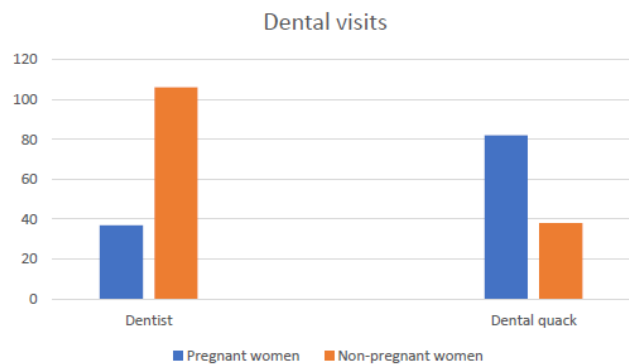
B: Toothbrushing method of pregnant and non-pregnant women



C: Frequency of flossing of pregnant and non-pregnant women



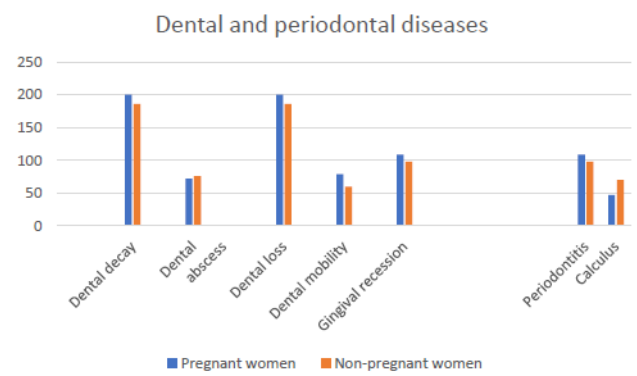
D: Dental visits of pregnant and non-pregnant women



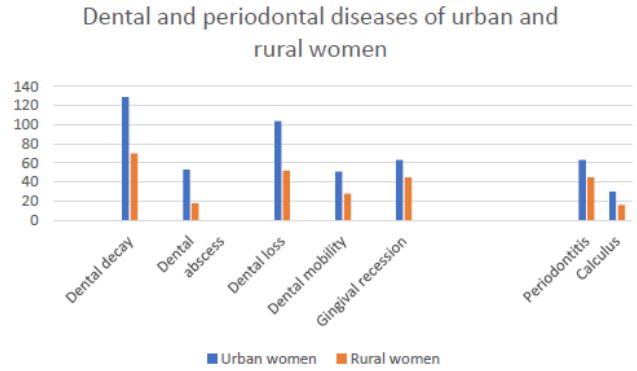
E: Dental visits location of pregnant and non-pregnant women

**Figure 2 (continued).** Oral health characteristics between pregnant and non-pregnant women (A, B, C, D, E)

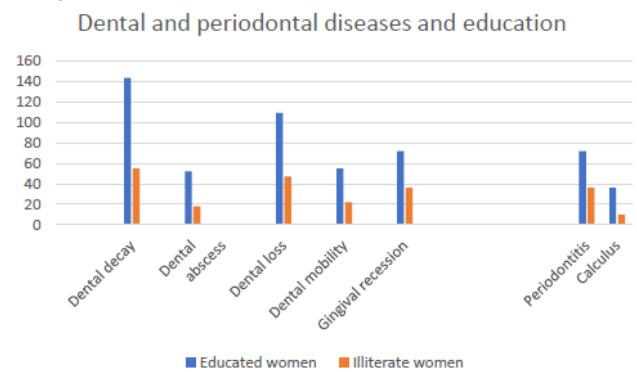
recorded in dental abscess, gingival recession, dental loss, and periodontitis which were more important in illiterate women than educated women (**Figure 5**).



**Figure 3.** Dental and periodontal diseases of pregnant and non-pregnant women



**Figure 4.** Dental and periodontal diseases and environment living



**Figure 5.** Dental and periodontal diseases of pregnant and non-pregnant women

## DISCUSSION

To our knowledge this is the first study which has explored dental quackery and socio-demographic disparities related to oral health behavior among women in Morocco.

The study reported that 87.72 % of pregnant women had dental decay vs 74,7 % of non-pregnant women which is highly significant and may be explained by the increased acidity in the oral cavity, sugary dietary cravings, and limited attention to oral health (21). In contrary, the study of Ait addi et al (2018), reported no significant difference in DMFT index (Decay-missing-filled index) between pregnant women and non-pregnant women. Also, Chung and al reported in a survey of 99 pregnant women that 45% had untreated dental decay (22,23).

Pregnant women had significantly more dental abscess, dental loss than non-pregnant women which may be explained by the fact that dental abscess and dental loss are dental

**Table 1.** Socio-demographic and self-reported oral health behavior characteristics between pregnant and non-pregnant women

Variables and modalities		Pregnant women	Non-pregnant women	p value
Age classes (n= 539) <b>a</b>	<27 Years	100(39.84 %)	107(37.15 %)	0.535
	≥ 27 Years	151(60.16 %)	181(62.85 %)	
Environment living (n= 537) <b>a</b>	Urban	162(65.06 %)	226(78.47 %)	<b>0.001**</b>
	Rural	87(34.94 %)	62(21.53 %)	
Education (n= 537) <b>a</b>	Educated	181(72.69 %)	238(82.64 %)	<b>0.007**</b>
	Illiterate	68(27.31 %)	50(17.36 %)	
Economic status (n= 443) <b>a</b>	Disfavored	52(31.71 %)	128(31.71 %)	<b>0.004**</b>
	Favored	112(68.29 %)	151(54.12 %)	
Dental Insurance (n= 534) <b>a</b>	No	179(72.47 %)	184(64.11 %)	<b>0.041*</b>
	Yes	68(27.53 %)	103(35.89 %)	
Parity (n= 497) <b>a</b>	Primiparous	94(37.75 %)	112(45.16 %)	0.102
	Multiparous	155(62.25 %)	136(54.84 %)	
BMI classes (n= 379) <b>a</b>	Subweight and normal weight	69(53.9 %)	129(51.39 %)	0.665
	Overweight and obesity	59(46.1 %)	122(48.61 %)	
Frequency of Tooth brushing (n=534) <b>a</b>	≥ 2 a day	29(11.6 %)	52(18.31 %)	<b>0.039*</b>
	< 2 a day	221(88.4 %)	232(81.69 %)	
Tooth brushing method (n=512) <b>a</b>	From the gum to teeth	123(52.34 %)	114(41.15 %)	<b>0.013*</b>
	Other method	112(47.66 %)	163(58.85 %)	
Frequency of Flossing (n=383) <b>a</b>	Yes	8(8.25 %)	30(10.50 %)	0.694
	No	89(91.75 %)	256(89.50 %)	
Dental visit (n=499) <b>a</b>	Yes	66(26.50 %)	142(56.8 %)	<b>0.000**</b>
	No	183(73.5 %)	108(43.2 %)	
Dental visit with (n=263) <b>a</b>	Dentist	37(31.09 %)	106(73.61 %)	<b>0.000**</b>
	Dental quack	82(68.91 %)	38(26.39 %)	

**a** Chi-squared test

\*P&lt;0, 05: statistically significant.

\*\*P&lt;0,001: Highly significant.

**Table 2.** Clinical self-reported oral health characteristics and pregnancy, environment living, and educational level

Variables and modalities	Pregnant women	Non-pregnant women	p value	Urban women	Rural women	p value	Educated women	Illiterate women	P value	
<b>Dental abscess</b>	n= 413 <b>a</b>		<b>0.006**</b>	n= 163 <b>a</b>		0.17 n.s	n= 162 <b>a</b>		<b>0.04*</b>	
	Yes	72(43.9%)		76(30.52%)	53(40.77%)		18(54.54%)	52(39.39%)		18(60%)
	No	92(56.1%)		173(69.48%)	77(59.23%)		15(45.46%)	80(60.61%)		12(40%)
<b>Dental mobility</b>	n= 433 <b>a</b>		<b>0.000**</b>	n= 184 <b>a</b>		<b>0.017*</b>	n= 183 <b>a</b>		0.1 n.s	
	Yes	79(42.70%)		60(24.19%)	51(37.5%)		28(58.33%)	55(38.73%)		22(53.65%)
	No	106(57.3%)		188(75.81%)	85(62.5%)		20(41.67%)	87(61.27%)		19(46.35%)
<b>Dental decay</b>	n= 477 <b>a</b>		<b>0.000**</b>	n= 227 <b>a</b>		<b>0.031*</b>	n= 226 <b>a</b>		0.65 n.s	
	Yes	200(87.72%)		186(74.7%)	129(84.32%)		70(94.6%)	143(86.66%)		55(90.16%)
	No	28(12.28%)		63(25.30%)	24(15.68%)		4(5.40%)	22(13.34%)		6(9.84%)
<b>Gingival recession</b>	n= 476 <b>a</b>		<b>0.000**</b>	n= 189 <b>a</b>		<b>0.000*</b>	n= 188 <b>a</b>		<b>0.000**</b>	
	Yes	109(57.36%)		98(34.26%)	63(45.98%)		45(86.54%)	72(49.65%)		36(83.72%)
	No	81(42.64%)		188(65.74%)	74(54.02%)		7(13.46%)	73(50.35%)		7(16.28%)
<b>Dental loss</b>	n= 448 <b>a</b>		<b>0.000**</b>	n= 196 <b>a</b>		<b>0.05*</b>	n= 195 <b>a</b>		<b>0.014*</b>	
	Yes	157(79.69%)		145(57.76%)	104(75.92%)		52(88.14%)	109(75.69%)		47(92.15%)
	No	40(20.31%)		106(42.24%)	33(24.08%)		7(11.86%)	35(24.31%)		4(7.85%)
<b>Periodontitis</b>	n= 481 <b>a</b>		<b>0.000**</b>	n= 193 <b>a</b>		<b>0.000**</b>	n= 192 <b>a</b>		<b>0.000**</b>	
	Yes	109(56.18%)		98(34.14%)	63(44.68%)		45(86.53%)	72(48.65%)		36(81.81%)
	No	85(43.82%)		189(65.86%)	78(55.32%)		7(13.47%)	76(51.35%)		8(18.19%)
<b>Calculus</b>	n= 186 <b>a</b>		<b>0.000**</b>	n= 55 <b>a</b>		1 n.s	n= 55 <b>a</b>		1 n.s	
	Yes	47(83.92%)		70(53.84%)	30(83.33%)		16(84.21%)	36(16.28%)		10(83.33%)
	No	9(16.08%)		60(46.16%)	6(16.67%)		3(15.79%)	7(83.72%)		2(16.67%)

**a** Chi-squared test

\*P&lt;0, 05: statistically significant.

\*\*P&lt;0,001: Highly significant.

decay's complications. In addition, the study reported that pregnant women had significantly more gingival recession and periodontitis than non-pregnant women which can be explained by the fact that gingival recession and periodontitis are gingivitis's complications. Indeed, gingivitis is due to the variation in estrogen and progesterone levels in the course of pregnancy that influences subgingival microbiota (the development of *Prevotella intermedia*) and a range of inflammatory responses in gingival tissues through the changes of chemotaxis, cytokines, enzymes, and antioxidants

(12,13,24). Besides, the studies of Cohen et al, Figuero et al, and Rashidi Maybodi et al, observed an intensification in gingivitis from the first to the third trimester which confirms that gingivitis ameliorates, during pregnancy (9, 25). Also, Raber-Durlacher et al, and Abraham-Inpijn et al found that changes in clinical parameters during pregnancy are reversible in the postpartum (13). likely, studies who followed 48 pregnant Spanish women with healthy periodontium and examined their periodontium found that their Gingival Index (GI) increased during pregnancy and decreased in postpartum (26).



Nonetheless, some studies further found that the association between gingivitis and pregnancy is confirmed but combined with poor hygiene (26). Moreover, another study found that pregnant women had significantly higher GI and periodontal pocket depth (PPD) with the same plaque index (PI) compared with non-pregnant women (26). In another study with a small sample size of pregnant women, bleeding on probing (BOP) decreased from pregnancy to postpartum without any periodontal therapy (26). Nevertheless, Ait addi et al, Jonsson et al, and Miyazaki et al observed that there was no difference in periodontal status between pregnant and non-pregnant women in a study using clinical parameters (periodontal pocket depth PPD and Gingival index GI), and the community periodontal index of treatment needs (CPITN) to assess the periodontal conditions of pregnant and non-pregnant women (22,26).

In the study findings, pregnant women had more calculus, and brushed their teeth significantly less than non-pregnant women which could be attributed to various reasons: (i) increase in hormones, (ii) leading to more plaque accumulation and gingivitis, (iii) followed by habitual decrease in oral health practices, leading to worsening oral symptoms such as bleeding gums, and surge in dental pain.

Non-pregnant women visited the dentist more than pregnant women. It is explained by the ignorance of dental care utilization during pregnancy and the cultural idea that pregnant women should not visit the dentist.

Lower educational level has been proved as a major risk factor for dental caries (5). Likewise, the study of Wu and al, showed that patients with a lower degree of schooling and lower income had a greater chance of exhibiting periodontitis (26).

Rural living environment is a determinant factor of high frequency of dental decay. Indeed, Karunachandra et al found that rural pregnant women in Sri Lanka have as twice as many untreated dental caries compared with urban women which confirms our results (27).

Numerous population-based surveys of pregnant women report low utilization of dental care and disparities by sociodemographic characteristics. Actually, Care-seeking and utilization are influenced by factors at the personal provider, and environmental levels that include: financial resources and insurance; health literacy regarding knowledge of insurance eligibility; need for care, and perceptions of the importance and value of oral health; the availability of care; access to care; and provider knowledge or comfort in treating pregnant women (8,15,18,23,28).

The results showed that more than 2/3 of the pregnant women consulted a dental quack which may cause major health diseases form of AIDS to hepatitis (29). This can be explained by the poor economic status, the lack of dental insurance, low educational level, and also due to ignorance of the difference between a certified dentist and other (29). Additionally, people use quacks because they guarantee painless and immediate treatment (30). However, it may be due to cultural, sociological and perceptual disparities. Actually, since several decades, Moroccan people used to visit dental quacks before the establishment of dental schools, and thereafter people prefer visit a dental quack than a qualified dentist. Also, because of unconditional traditions people find that these unqualified medical healers are more familiar and competent than qualified dentists.

The limitation of this study is the use of a questionnaire of self-reported dental and periodontal status rather than objective measures of oral diseases and untreated dental needs. However, studies reported that self-reported and clinical surveys had good consistency (31).

## CONCLUSION

Oral health promotion programs must continue to inform pregnant women about proper oral hygiene self-care and utilizing of professional dental care before during and after pregnancy, especially rural and illiterate women. Also, oral health care services should be made more accessible and acceptable to all pregnant women. Finally, programs against illiteracy must continue to reduce illiteracy and also campaigns against illegal practice in dentistry must carry on to secure and improve dental care.

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