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Original Article

Relationship of Periodontitis in Pregnancy to Premature and Low Birth Weight in a Libyan Women Sample

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ABSTRACT

Objective: To assess the relation between periodontitis and the risk of preterm delivery/low birth weight among Libyan women in Benghazi. **Methods:** A total of 300 Libyan pregnant women attended to the reception of labour department of Al- Jomhuriya Hospital in Benghazi for delivery from May to August 2010 were included in this study. After recording and exclusion of traditional risk factors for premature/low birth weight like; age, weight, smoking, prenatal care, medical history, gestational and obstetric history. They were examined for periodontal status using Plaque Index, Gingival Index and Periodontal Disease Index, all the data obtained were analyzed with the day of delivery and birth's weight. **Results:** The periodontal disease index score (PDI) showed that 47% of the sample had moderate gingivitis, 29% of the sample had mild gingivitis, 10% had severe gingivitis while 11% had mild periodontitis. According to gingival index score, moderate gingivitis had high percentage (60%) which is related to high percentage (51%) in plaque index score. PDI showed insignificant relationship with PLBW at P-value = 0.849. **Conclusion:** This study suggests that there is no association between periodontitis and premature/low birth weight among Libyan ladies in Benghazi.

Keywords: Periodontitis, Premature low birth weight

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INTRODUCTION

In a woman's life, there are major physiological and hormonal changes occur in pregnancy. Physiological state characterized by an increase in oestrogen and progesterone hormones which are responsible for the changes that occur in pregnancy, to create and maintain the conditions for the development of the foetus and birth [(1)]. These changes in hormone levels; promote an inflammatory response that increases the risk of developing gingivitis and periodontitis as a result of varying hormone levels, without any changes in the plaque levels [(2)].

Periodontal disease (PD) is a pathological alteration of the tissue surrounding and supporting a tooth. Results from complex interplay between the etiological agents, specific bacteria found in dental plaque, and the host tissue [(3)].

In the absence of oral hygiene measures, the microorganisms are allowed to attach to the teeth; accumulate and form an organized structure known as a "bacterial biofilm", near the gingival margin, usually what follows is inflammation of the gingiva (gingivitis). In this case, the small space between the gingiva and the teeth, named (gingival sulcus) normally, increases in depth and, consequently, turns into a periodontal pocket (pathological deeping of the sulcus). If the microbial flora of gingivitis is eliminated, the inflammation will recede and the gingiva will return to its normal status. If not properly treated, the pathological process of gingivitis may reach the hard tissue and, slowly or abruptly, cause alterations and result in periodontitis. In periodontitis, the most important alterations are resorption of the alveolar bone and destruction of the connective tissue between the bone and teeth (periodontal ligament), which result in attachment loss, and ultimately, to excess mobility, infection, and loss of the tooth [(4)]. As the disease progresses, the pocket epithelium is the only barrier between the biofilms and connective tissue. The ulcerated epithelium is easily broached, allowing bacterial access to

the connective tissue and blood vessels. This fact allows bacteria and their products to reach other parts of the body, creating lesions. The ability of periodontal pathogens and their virulence factors to disseminate and induce both local and systemic inflammatory responses in the host has led to the hypothesis that periodontal disease may have consequences beyond the periodontal tissue themselves [5].

Preterm low birth weight (PLBW) defined as a birth weight of less than 2500g with a gestational age of less than 37 weeks [6]. Pre-term birth (PTB) is a major cause of infant mortality and morbidity that has considerable societal, medical, and economic repercussions. An estimated 15 million babies are born too early every year. Complications of preterm birth are the single largest direct cause of neonatal deaths; more than one million babies die each year due to complications of PLBW [7]. According to Arifeen (1997) almost half of the infant deaths from pneumonia or acute lower respiratory infections (ALRI) and diarrhea could be prevented if low birth weight were eliminated [8]. Despite health interventions and the significant Advances in the use of drugs to arrest preterm labour, and understanding reproductive physiology, there has been no decrease in low birth weight or preterm infants [9]. Every ten seconds an infant dies from a disease or infection that can be attributed to low birth weight [10].

Various factors have been associated with the delivery of preterm and/or low-birth weight infants. Maternal risk factors include age, height, weight, socio-economic status, ethnicity, smoking, alcohol, nutritional status, and stress. In addition, parity, birth interval, previous complications, pre and ante-natal care, maternal hypertension, infections, and cervical incompetence may also be important [11]. These risk factors are not present in approximately 50 % of cases [12]. Infection is considered one of the major causes of PLBW deliveries. The primary mechanism by which PLBW occurs could be due to an ascending infection from the vagina. Gram-negative bacteria associated with this condition produce endotoxins and enzymes that stimulate pro-inflammatory cytokine production, which results in increased levels of TNF, IL-1, IL-6, and PGE_2 leading to cervical dilatation, uterus contraction and delivery [13], but increased level of maternal inflammatory mediators and cytokines, may occur even in the absence of infections of the placental complex or the genitourinary tract. This has led to a conclusion that PLBW cases are probably caused by extra-uterine infections of unknown origin [14]. This suggests that distant sites of infection (oral cavity) or sepsis may target the placental membranes. For these reasons, researchers have explored the role of other maternal infections, including periodontitis, in the aetiology of preterm birth [15].

Offenbacher and co-associates (1996) were the first group of investigators reported a link between poor maternal periodontal health and adverse pregnancy outcomes (APOs); they concluded that 18.2 % of PLBW may result from periodontal disease [16].

Mainly, three biological hypotheses theories have been proposed to link preterm birth and periodontal diseases; bacterial spreading, inflammatory products dissemination and role of feto-maternal immune response against oral pathogens [17, 18].

Subsequent studies in different population all around the world have found mixed results, corroborated by some and contradictory by others. The reasons for the differences in findings are unclear [19]. The lack of consistency raises the possibility of associations between clinical periodontal disease and preterm delivery may be evident only in some susceptible populations [20].

This study was conducted to determine the relationship between periodontitis and premature low birth weight among Libyan ladies in Benghazi, and estimation of the prevalence and severity of periodontal disease in Libyan pregnant women sample.

SUBJECTS AND METHODS

The study was conducted on a 300 pregnant ladies attended to reception department of labour at Al-Jomhuriya Hospital in Benghazi for delivery according to inclusion and exclusion criteria. The Participants were informed of the purpose and the design of the study before they accepted in the study. Furthermore, they were given full information about the nature of the procedure they were to receive.

The **inclusion criteria** of the subject included:-

1. All women were Libyan
2. Non-smoker
3. Non-alcoholic drinker
4. Their age $\geq$ 18 and $\leq$ 40 years
5. Their delivery had taken place at Al-Jomhuriya Hospital in labour department.

The **exclusion criteria** included:-

1. Participants with history of IVF (Intra vitro fertilization).
2. Planned caesarean delivery.
3. Participant women who presented cardiopathy, diabetes, or hypertension during their pregnancies.
4. Indication of prophylactic antibiotics for invasive procedures.
5. Participants with multiple pregnancies.
6. Polyhydramnios, Malpresentations, cervical incompetence.
7. Any obstetric complication such as antepartum haemorrhage.

First; the participants invited to answer questionnaire during an interview. Containing the following demographic sections; identification, socio-demographic data, obstetric history, gestational history, smoking, and general health condition.

Second; After the interview, all the participants' weight recorded in kilogram, as the weight is a risk factor of preterm delivery. The thinner the mother, the weaker she would be and thus less able to carry full term [21, 22].

Third; High vaginal swaps taken from each participant before the delivery to avoid contamination, all swaps sent to Microbiology Department in Al-Jomhuriya Hospital Lab.

Fourth; a clinical periodontal examination to assess Periodontal status was done by using Plaque index (PI) – Silness & Loe [24], Gingival index (GI) - Loe & Silness [25] and periodontal disease index Ramfjord (PDI) [26].

Radiographs not taken for this study for the patient safety. As such the radiographic alveolar bone level was not assessed, because the actual degree of periodontitis is better shown by probing depth [27]. In relation to the association of periodontal infection with periodontal pocket, the size of the surface area of the pocket, through which bacterial products can invade the periodontal tissue, was found to be more important than bone levels [28].

At the end of the periodontal examination, each participant was given oral hygiene instructions, and instruction regarding dental treatment needs by educating participants; Educational component will focus on the importance of oral health and the impact of oral disease on perinatal health. Following the educational component, referrals for an appropriate dentists were provided for participants to begin improving their oral health. On the day of the delivery newborns weight were collected from the labour register book in labour department.

Statistical analysis: Results were expressed as mean ± standard deviation (SD) or number and percentage. Statistical analysis was performed with the aid of the statistical package for the social sciences (SPSS) computer program (version 18 windows). t- test, x2 (chi-square test) and Pearson correlation were used when needed, P-value considered significant when $P \leq 0.05$.

RESULTS

The highest percentage of sample's age was between 26-30 year-old, 27.6% was between 31-35 year-old as well as 27.7% was between 21-25 year-old, that means the highest percentage of the sample is less than 30 years old (Figure 1).

71.7% of the subjects were from Benghazi and 28.3% were from Outside Benghazi (Figure 1).

84.7% of the subjects have been pregnant for 1-4 times. 44.3% were Nulipara whereas 54.7% had 1-5 parity. 74% had no history of abortion (Figure 1).

99 % of the subjects visited their doctor during prenatal care more than 6 times (booked) and only 1% not booked. 89% of the sample had no history of low birth weight and 93.7% had no history of pre-term delivery (Figure 1).

51% had a history of passive smoking (second hand smoking) from their husbands (Figure 1).

94% of the sample had negative vaginal swap result, that means 281 of cases were negative for local infection (Figure 2).

Figure 3 showed that 40 % had a negative culture. 53.7 % with normal flora, and 6.3 % with pathological culture distributed as 3.7 % staph aurous, 2.3 % streptococcus, and 0.3 % was Candida.

88 % of the sample had no medical finding (Figure 4), while the rest of the participants had a positive medical history (Figure 5).

About 12 cases are considered missing as they didn‘t deliver at Al Jomhuriya Hospital (after answering the questionnaire, had a vaginal swap and went a periodontal examination). Therefore, 288 participants showed; 82 % for full term pregnancy and 14 % for preterm (Figure 6).

In addition to the missed subjects (12), there were 13 birth weights which are not sure about their birth weight due to technical problems (12+13), so 25 birth weight droped from the sample (Figure 7).

The basic characteristic of the study population like mother age and weight, parity, gravidity and birth weight had significant relationship with gestational age. Whereas other characteristics of the study population like; abortion, residence, prenatal visit, past low birth weight and past preterm delivery, passive smoking and socio economic status are not significant with gestational age (Table 1).

Plaque index results showed that 153 subjects had moderate plaque deposition (51%), 78 subjects had mild plaque deposition (26%), and 21 subjects had poor plaque deposition (7%), while 16 % subjects normal according to Silness and Loe score criteria (Figure 8).

180 subjects had moderate gingivitis (60%), 85 subjects had mild gingivitis (28.4%) and 24 subjects had sever gingivitis (8%), while 3.6% subjects had normal gingiva according to Loe and Silness criteria (Figure 9).

141 subjects had moderate gingivitis (47%), 87 subjects had mild gingivitis (29%), 30 subjects had sever gingivitis (10%), and 33 subjects had mild periodontitis (11%). 3% had normal PDI status according to periodontal disease index of Ramfjord (Figure 10).

Figure 11 showed that 60 % of subjects had moderate gingivitis which is related to a high percentage of plaque deposition (51%).

There was insignificant relationship between preterm with both GI and PDI (P=0.826 and p=0.936, respectively). On the other hand, Plaque index (PI) had a statistically significant relationship with preterm (p=0.031) (Table 2).

Birth weight (B.W) had an insignificant relationship with PDI and GI, P-value was 0.887 and 0.525, respectively (Table 3).

Premature low birth weight (PLBW) had an insignificant relationship with PDI and GI, P-value was 0.849 and 0.302, respectively (Table 4).

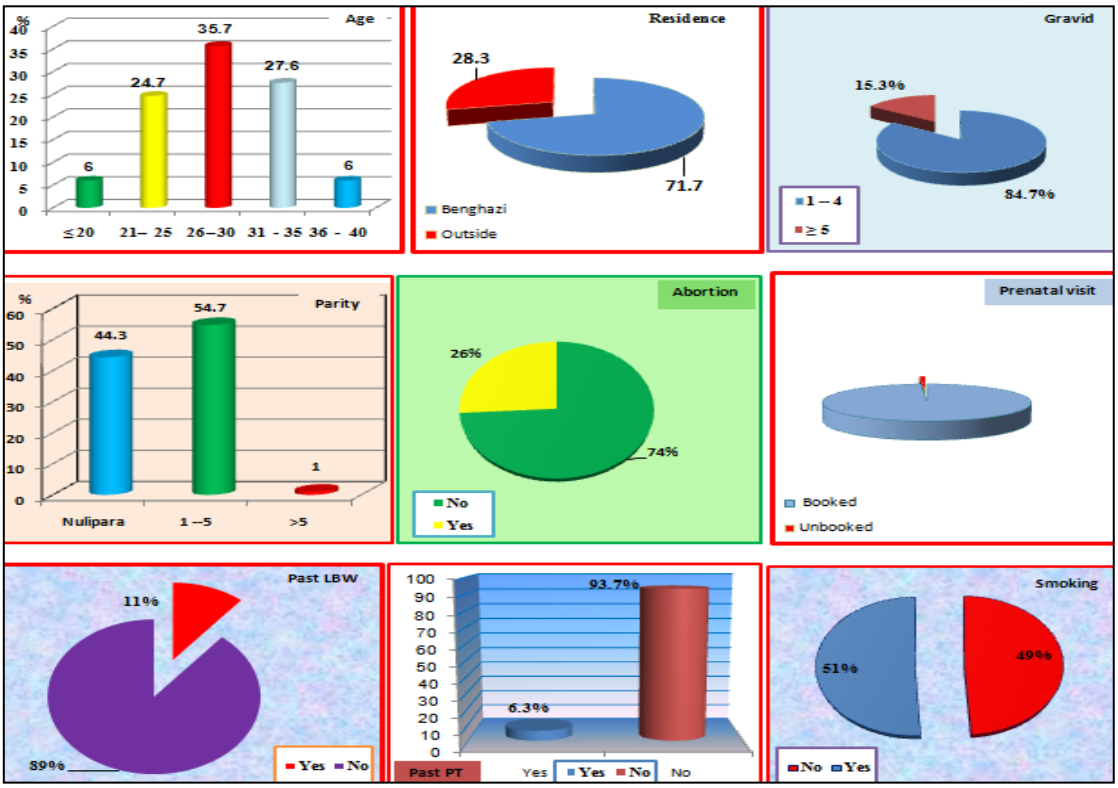

Figure 1: Descriptive data obtained from questionnaire

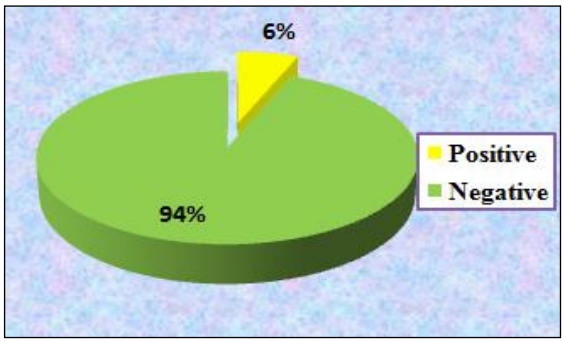

Figure 2: Descriptive data obtained from High Vaginal Swap.

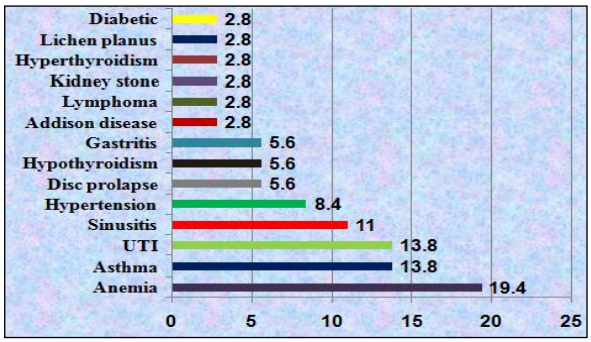

Figure 5: Data about the general condition of patient.

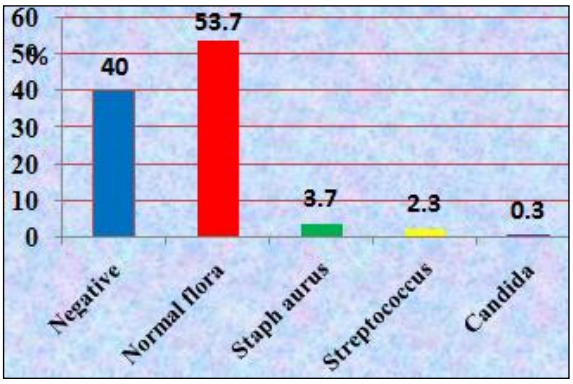

Figure 3: Results of High Vaginal Swap Culture.

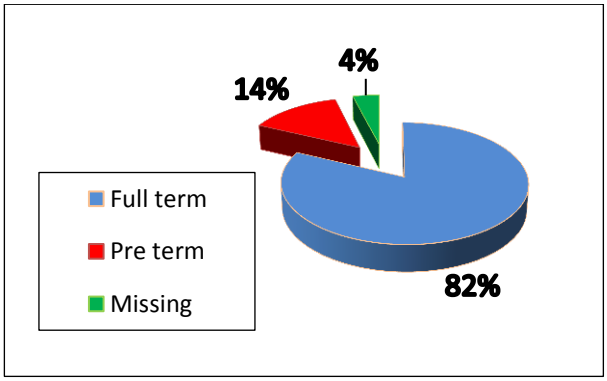

Figure 6: Classification of subjects according to the gestational age

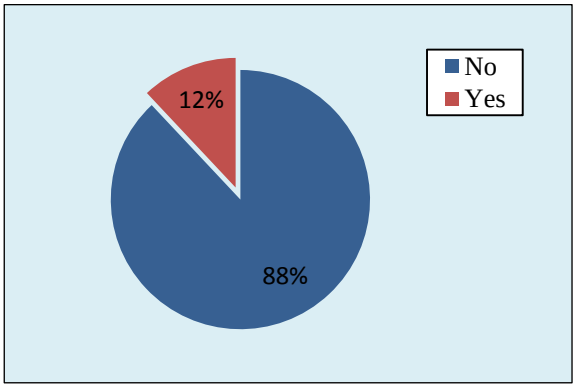

Figure 4: Classification of subjects according to the medical condition.

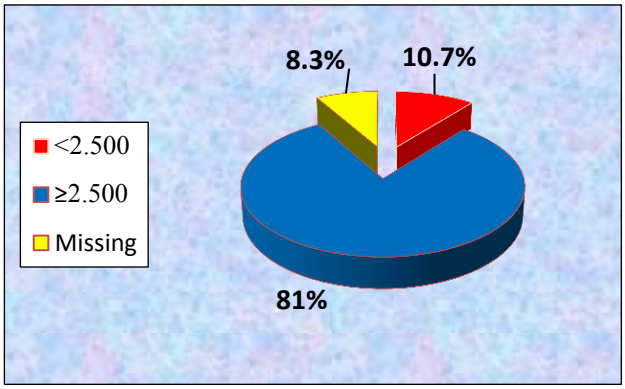

Figure 7: Classification of subjects according to the birth weight.

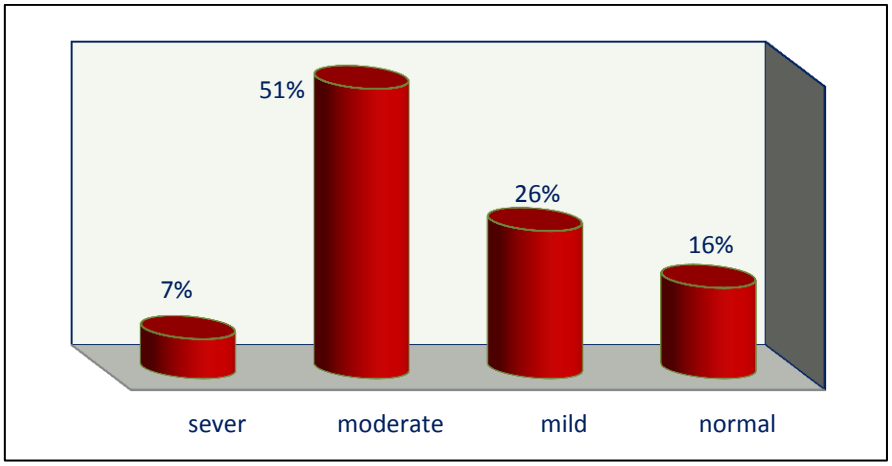

Figure 8: Distribution of patients according to plaque index score.

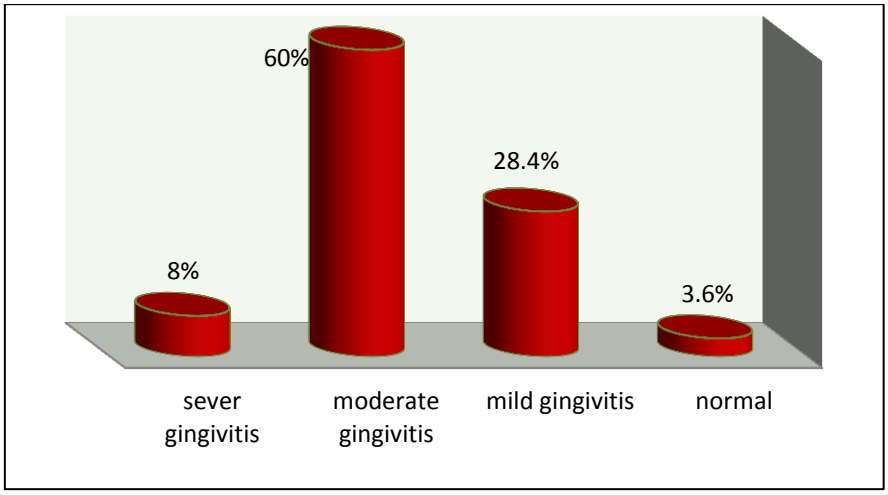

Figure 9: Distribution of patients according to gingival index score.

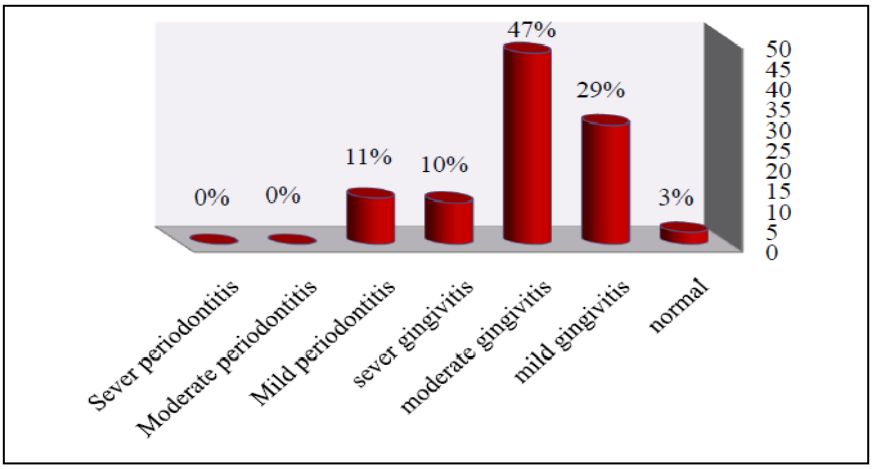

Figure 10: Distribution of patients according to periodontal disease index score.

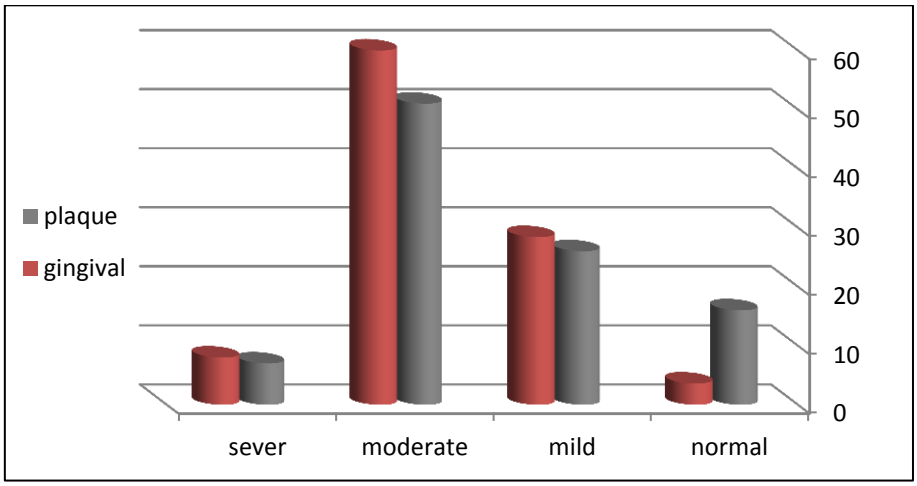

Figure 11: Correlation between plaque index and gingival index scores.

Table 1: Basic characteristic of the study population

Characteristics	Term delivery (n= 246) Mean ± Std.Deviation	Preterm delivery (n=42) Mean ± Std.Deviation	P Value t- test
Age (Year)	27.8 ± 4.7	30.6 ± 4.7	0.0001*
Gestational age	39.6 ± 1.6	34 ± 4.6	0.0001*
Parity	1.15 ±1.3	3.2± 2.3	0.0001*
Birth weight	3.3 ± 0.55	2.2 ± 0.786	0.0001*
Gravidity	2.5 ± 1.6	2.9 ± 2.3	0. 001*
Mothers weight	78.7 ± 15.2	75.7 ± 14.1	0.010*

*Significant (<0.05)

Table 2: Correlation of preterm with PDI,GI & PI

Parameter	Pearson correlation	P value
PDI	**-.013**	**0 .826**
GI	**-.005**	**0.936**
PI	**-.129**	**0.030***

*Significant (<0.05)

Table 3: Correlation of birth weight with PDI, GI.

Parameter	Pearson correlation	P value
PDI	**0.009**	**0.887**
GI	**0.038**	**0.525**

Table 4: Correlation of premature low birth weight with PDI, GI.

Parameter	Pearson correlation	P value
PDI	**0.048**	**0.849**
GI	**- 0.258**	**0.302**

DISCUSSION

In this study periodontitis had been examined in addition to different factors which may contribute to PLBW. In order to determine the relation between periodontitis and preterm low birth weight (PLBW) among Libyan pregnant ladies. To our knowledge this association was not explored among Libyan women (at least Benghazi). Women in Libya are of similar ethnic background, non-smokers, non-alcohol drinkers, and has only one sexual partner all through their life. Such characteristics were found to be associated with PLBW. Additionally most of the confounding variables that well known as risk factors associated with PLBW were analyses, and recorded like; age, socioeconomic factors, previous preterm history, previous LBW history, vaginal infection, prenatal care and past medical and obstetric history. So the strength of our study lies in the fact that was adjusted for the most important confounders in addition the study was conducted among homogenous women. The periodontal examination performed when women came to the labour department to give their birth. Plaque Index (PI), Gingival Index (GI) and Periodontal Disease Index (PDI) used to assess periodontitis in pregnant Libyan ladies.

The preterm births data from "National, regional and worldwide estimates of preterm birth rates in the year 2010 for selected countries since 1990"; shows Preterm birth rate (2010) in Libya 8.3 % [28]. While the preterm birth rate in this study sample was found to be 14 %. In a study was done in neonatal department at Al-Jomhuriya-Hospital (2008) LBW was 9.55 % [29], and in our study the LBW was 10.7 %. The sample showed that 62 % of pregnant Libyan ladies had gingivitis, this is in accordance with American Dental Association (ADA) "approximately 60-75 percent of pregnant women had gingivitis" [30]. Periodontitis showed insignificant relationship with PLBW in accordance of most studies conducted in European countries or Canada and in contrast with studies conducted in the USA or in developing countries [31]. In 2011 Africa CWJ. mentioned that "significant association between periodontal disease and adverse pregnancy outcomes found in, Thailand, Saudi Arabia, Turkey, Brazil, Venezuela, Chile, Senegal, South Africa, Hungary, Croatia, Finland, USA, Austria, Taiwan and Japan. No association and/or contradictory outcomes were reported by studies undertaken in many countries such as Sri Lanka, Pakistan, Turkey, England, Germany, Iceland, Tanzania, Rwanda**,** Brazil, Chile" [32] and Italy [33].

A potential link between periodontal infections and adverse pregnancy outcomes has been established based on 2 principles. First, periodontal bacteria can directly cause infections to the uteroplacenta and to the fetus; second, systemic inflammatory changes induced by periodontal diseases can activate responses at the maternal–fetal interface. However the link between periodontal health status of pregnant women and adverse pregnancy outcomes is still contentious as the associative studies have produced different results in different population groups at different countries and no conclusive evidence has still been produced [34].

The risk factors of preterm birth appear to be similar to risk factors for periodontal diseases (tobacco, ethnicity, socioeconomic and educational levels) and may confound the association between periodontitis and preterm birth. Actually, smoking is recognized as one of the principal risk factors for both adverse pregnancy outcomes and periodontitis [35]. Also, both periodontitis and premature labour involve multi factor aetiology. It's probable that maternal periodontitis may interact synergically with other maternal risk factors to induce preterm births, such as a short cervix is more closely associated with preterm births when the woman has also BV [36].

Some unknown genetic or environment factors may exist which locates the patient in the risk category of the periodontal disease and the premature labour at the same time [37]. Like gene-environment association between Bacterial Vaginosis (BV), Periodontal Disease (PD), and Preterm Birth (PTB) suggests that only pregnant women with BV and / or PD who have a genetic predisposition to mount a damaging inflammatory response to anaerobic oral or genitourinary flora will develop periodontitis, chorioamnionitis and PTB. Pregnant women who have BV and/or PD, but who do not have a predisposition to mount a damaging inflammatory response, are less likely to deliver preterm. As a result, a woman with a genetic predisposition to mount a damaging inflammatory response to infection may have varying full term or preterm deliveries in their pregnancy history based upon their exposure to anaerobic bacteria during each individual pregnancy [38].

CONCLUSION

The preterm rate in the pregnant Libyan sample was 14%. And the rate of low birth weight was 10.7%.

It showed that, maternal age, maternal weight, gestational age, birth weight, parity and gravidity had significant relationship with preterm delivery among the Libyan pregnant sample.

Abortion, previous preterm, previous low birth weight, local infection, prenatal visit and socioeconomic status had insignificant relationship with preterm delivery among the selected sample.

The sample showed 62% of pregnant Libyan ladies had gingivitis.

No significant relationship has been shown between periodontitis and preterm delivery, birth weight and preterm low birth weight among Libyan women in Benghazi.

RECOMMENDATIONS

It is still recommended that women who are pregnant or planning to become pregnant continue to maintain optimum periodontal health with professional cleaning and meticulous oral hygiene to prevent periodontal disease.

Based on the results of this study, future investigators in this area should consider full chart for accurate diagnosis of periodontal disease

We need to conduct good-quality, multi-center studies and intervention studies in different Libyan cities. Before this can assume to be a causal relationship among Libyan ladies.

Health professionals as part of their regular care should provide oral health care to pregnant women. At the same time, pregnant women, should have the knowledge of the obvious signs of oral disease.

A better communication between dentists and medical doctors is needed, and more responsibilities and effective team approaches in the clinical management of their shared patients for better oral health and general health.

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