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ABSTRACT Good oral health is important in pregnancy but little is known about the oral health and knowledge and practices of pregnant Sudanese women. This cross-sectional study was conducted to address this gap. A sample of 420 pregnant women attending the prenatal clinic at Omdurman maternity hospital were interviewed and examined for caries and periodontal disease. The mean age of the women was 27.1 (SD 5.8) years, 52.4% had > primary school education and 7.1% were employed. Only 12% had a high level of oral health knowledge and 21.2% a positive attitude towards oral health. Most of the women (65.9%) had poor oral health practices; only 10.2% had visited a dentist during pregnancy. On clinical examination, 58.6% had healthy gums while 12.1% had bleeding gums and 22.9% had calculus. The mean decayed, missing and filled teeth value was 1.16 in the age group 16–19 years and 3.49 in age group ≥ 20 years. These findings suggest the need for oral health programmes as part of prenatal care for pregnant Sudanese women.

État de santé bucco-dentaire, connaissances et pratiques en la matière parmi des femmes enceintes à la maternité de l'hôpital d'Omdourman (Soudan)

RÉSUMÉ Une bonne santé bucco-dentaire est importante en période de grossesse, mais peu d'informations sont disponibles sur l'état de santé bucco-dentaire, les connaissances et les pratiques des femmes enceintes soudanaises en la matière. La présente étude transversale a été conduite afin de combler cette lacune. Un échantillon de 420 femmes enceintes de la clinique prénatale de la maternité de l'hôpital d'Omdourman ont été interrogées et examinées afin de déterminer si elles souffraient de caries et de parodontopathies. L'âge moyen des femmes étaient de 27,1 ans (ET 5,8) ; 52,4 % avaient suivi un enseignement primaire, et 7,1 % avaient un emploi. Seulement 12 % d'entre elles avaient une bonne connaissance de la santé bucco-dentaire, et 21,2 % démontraient une attitude positive en la matière. La majorité des femmes (65,9 %) avaient de mauvaises pratiques d'hygiène bucco-dentaire, et seulement 20 % s'étaient rendues chez un dentiste au cours de leur grossesse. À l'examen clinique, 58,6 % avaient des gencives saines, contre 12,1 % qui souffraient de saignements gingivaux et 22,9 % qui avaient du tartre dentaire. La moyenne de l'indice CAO (dent cariée, absente ou obturée) était de 1,16 pour le groupe d'âge des 16–19 ans, et de 3,49 pour le groupe d'âge des 20 ans et plus. Ces résultats laissent penser qu'il existe un besoin en programmes de santé bucco-dentaire dans le cadre des soins prénatals pour les femmes enceintes soudanaises.

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Received: 22/08/14; accepted: 26/07/16

Introduction

Pregnancy is a natural process characterized by physiological changes, including fluctuating hormones. These changes increase susceptibility to oral infections such as pregnancy gingivitis, periodontitis and oral pyogenic granuloma (1–4). Periodontal disease has been reported to be associated with other health problems such as cardiovascular disease, diabetes, low birth weight and preterm birth (5–7). In addition, certain cultural beliefs may impede proper nutrition and the ability of pregnant women to achieve good oral health (8). Unfortunately, it is widely observed that many women with obvious signs of oral disease do not visit a dentist before, during or after pregnancy (9). Some, fear that they or their fetus might be harmed by dental

treatment, others consider poor oral health status during pregnancy as normal (10). Appropriate knowledge, attitude and behaviour of pregnant women could prevent oral problems and their complications during pregnancy (11).

A woman's knowledge of and action on her own oral health are important for the oral health of her children (12). Children whose mothers have poor oral health are 5 times more likely to have oral health problems than children whose mothers have good oral health (13). Mothers are the main source of transmissible cariogenic bacteria to their children; it has been shown that Streptococcus mutans of mother and child are phenotypically and genotypically similar (14).

Pregnant women are readily accessible as most of them have regular antenatal check-ups. Furthermore, their key position in the family enables them to have a great influence over the behaviour of family members and they play a very important role in educating the young generation (15). Thus, educating pregnant women on oral health can be an effective way of conveying dental health education to the general public, starting at the individual level, then to the family and finally to the community level (16).

Pregnant women in Sudan generally have limited access to oral health education and no previous study in Sudan has assessed the oral health status, and knowledge, attitude and dental practices of pregnant women. The aim of this study therefore was to assess the oral health status, knowledge, attitude and practices among a sample of pregnant Sudanese women in order to obtain the base-line data needed to establish an oral health preventive programme during pregnancy.

Methods

Study design and setting

This was an observational, cross-sectional, hospital-based study conducted among pregnant women attending the prenatal outpatient clinic in Omdurman Maternity Hospital. This hospital was selected because it is the largest government maternity hospital in Sudan and a considerable number of pregnant women of different socioeconomic levels attend daily for examination and regular prenatal care. It has 12 wards for delivery (248 beds) and 5 delivery rooms (25 beds) with about 65 deliveries per day. In addition the hospital has an outpatient clinic and prenatal care with approximately 350 visits a day from pregnant women.

Sample size and selection

The minimum sample size was computed using the formula n = z2pq/d2, where n = required

sample size; z = 1.96 at 95% confidence interval; p = anticipated prevalence of women with good oral health knowledge (set at 50%); q = 1 – p; d is the desired precision (set at 0.05). Thus, the computed minimum sample size was 384 women. This was increased to account for attrition.

All patients available in the clinic when the researcher was present were approached and informed verbally about the study. The women were informed that non-participation would not affect their care. Those who agreed to participate were included in the study after signing a written informed consent form. Illiterate women had the form read to them and marked the form if they consented to participate. Those agreeing to participate were interviewed about their medical history and those who were suffering from any mental or physical disease were excluded.

After refusals and ineligibility to participate were excluded, 420 pregnant women from the prenatal clinic of Omdurman maternity hospital were enrolled in the study over a period of 8 weeks to reach the required sample size (June–July 2010).

Data collection

The research is composed of two parts; face-to-face interview and clinical examination.

Face-to-face interview

All the participants were interviewed by the first author and a questionnaire (of 32 questions) was completed. The questionnaire was adapted by the research team from standard questionnaires used in other studies (16–18). It was translated into Arabic by postgraduate students (Division of Preventive and Community Dentistry, University of Khartoum) and back translated into English by the staff of the Division of Preventive and Community Dentistry, University of Khartoum. This criterion validation step was supported by the research team's expertise and collective judgement on the final refined version of the questionnaire. To assess reliability, the questionnaire was pilot-tested on a group of 35 women. This pilot process revealed the optimal time for questionnaire completion by participants, while the statistical analysis revealed a good agreement with kappa statistics result ranging from 0.75% to 100%.

The questionnaire had 5 parts: 1) Sociodemographic data (age, nationality, educational level, occupation, number of current pregnancy, average of family income, medical insurance); 2) Perceived oral health (current and last dental pain, gum problem); 3) Dental practice (tooth-brushing, other oral hygiene methods, dental visit before and during pregnancy); 4)

Attitude before and during pregnancy (dental care behaviour during pregnancy, behaviour towards dental pain during pregnancy); 5) Knowledge about the cause of tooth decay, gum disease and how they can be prevented, and the source of knowledge.

The Registrar General's classification of social classes groups for the United Kingdom (UK) was used in this study as it is widely used in medical research (19). This system of classification is based on occupation. It groups occupations into social classes according to their skill level and general social standing in the community. Unemployed women are allocated on the basis of their husband's occupation (19).

After completing the interview, the knowledge, attitude and practice questions were evaluated and scored. For knowledge, the scoring system was: high knowledge = a score of 13–17, average knowledge = 7–12, and low = 0–6. For attitude, the scoring system was: positive attitude = a score of 6–12 and negative attitude = 0–5 score. Finally, for practices: good practices = a score of 19–27, average = 10–18, and bad = 0–9. The relationships between these 3 main variables were examined.

Clinical examination

The second part of the research was the clinical examination which was performed by the first author. A full mouth examination was done for all the women who finished the interview using the Community Periodontal Index (CPI) and decayed, missed and filled teeth (DMFT) according to World Health Organization (WHO) criteria (20). For CPI the highest score of the clinical examination was taken for every subject. The DMFT were modified from the WHO descriptions based on age (21). The clinical status scores were compared with scores of knowledge, attitude and practice.

After examination, 5 women were randomly selected each day and asked to return before they left so as to be re-interviewed and re-examined for test–re-test purposes.

Data analysis

STATA software, version 8 was used for statistical analysis. Descriptive statistics were used for data classification; the chi-squared test was used to evaluate the differences between different categorical variables (knowledge and attitude; knowledge and practice; knowledge and oral health status; attitude and oral health status; and practice and oral health status). Statistical significance was set at $P < 0.05$.

Ethical clearance

Ethical approval for the study protocol was obtained from the Research Board, Faculty of Dentistry, University of Khartoum. An approval letter was also obtained from the Academic Department of the hospital to conduct the research and every patient participating in the study signed a written informed consent form. Code numbers were used instead of names to ensure anonymity and confidentiality.

Results

Sociodemographic background

The response rate was 89% (48 women declined to participate and 4 were ineligible according to our exclusion criteria). Table 1 shows the sociodemographic characteristics of the 420 pregnant women who were eligible and agreed to participate in this study. The age range of the participants was 16–44 years with a mean and standard deviation (SD) of 27.1 (SD 5.8) years. Of the 420 participants, 10.7% were illiterate, 36.9% had up to primary-school education, 30.2% had high-school education and 22.2% had higher education. The majority of the women (92.9%) were housewives and only 13.6% had medical insurance. According to the Registrar General's classification of social classes (19), the largest proportion were from intermediate class II (27.4%) based on their husband's occupation. For 30.5% of the women, this was their first pregnancy.

Perceived oral health

Almost a quarter of the 420 women (22.6%) felt that their current oral health was poor, 45% felt it was average, 18.6% good, 5.5% very good and 8.3% excellent. At the time of the interview, 151 (36%) of the women felt dental pain and 82 (19.5%) were found to have gingival/periodontal problems.

Oral health knowledge

With regard to oral health knowledge scores among the pregnant women, 82% had an average score indicating medium level of knowledge, 12% high scores and 6% low.

Table 2 shows the oral health knowledge of the participants. The majority of the women (88.1%) agreed that tooth-brushing prevents tooth decay, gum diseases and a bad smell. Only 2.6% thought that brushing is just a habit. Most of the women (69.5%) believed that the main cause of tooth decay was sugar and 31.9% thought that the cause was bacteria. Just over half (52.4%) of the women thought that tooth decay could be prevented by tooth cleaning and brushing, while 22.1% thought it could be prevented by avoidance of sweets and sugar. A

majority of the women (58.3%) thought that the cause of gum disease was unclean teeth and food debris and 71.7% thought that gum disease could be prevented by tooth cleaning and brushing while 17.9% did not know.

The main sources of oral health knowledge were: television (cited by 59.0% of the women), radio (51.9%), family (49.0%) and the dentist (42.4%).

Oral health attitude

With regard to oral health attitude among the pregnant women, 21% had a positive attitude, i.e. expressing a willingness to take care of their oral health and to change towards a better oral health care and showing an openness to new practices, ideas and concepts.

Only 20.0% of the sample planned to visit a dentist and 26.2% said that pregnancy affected their attitude towards oral health. Of these 110 women, 20.0% considered this change as bad, 23.6% as average, 33.6% as good, 13.6% as very good and 9.1% as excellent. About 89% of the 26.2% whose attitude had changed, changed their behaviour by brushing their teeth more frequently, 2% by visiting the dentist for a check-up and by 3% visiting the dentist when they felt pain; the other 6% exhibited other changes such as using mouth wash, decreasing sugar intake and drinking milk. However, 73.8% did not change their attitude during pregnancy.

Oral health practices

Evaluation of oral health practices among the pregnant women showed that 66% had bad oral practices and 34% average oral health practices; none of the women had good oral health preactices

Table 3 shows the oral health practices of the participants. The majority of the women (85.5%) reported that they brushed their teeth more than once a day, while 14.5% brushed once a day. Only 9.5% used other oral hygiene methods such as dental floss, tooth pick, miswak and mouth wash. A small majority (58.1%) of the women reported that they had visited a dentist before pregnancy; their main reason was dental pain (84%). A large proportion of the women (42%) had never visited a dentist in their life. Only 10.2% of the pregnant women had visited a dentist during pregnancy; the main reason for the visit was toothache. Of the 377 women who had not visited the dentist during pregnancy, 62.1% did not do so because they did not think that they needed dental care, and 27.9% thought that they and their baby might be harmed by dental treatment.

Relationships between sociodemographic characteristics, knowledge, attitude and practice

The chi-squared test showed that there was a significant relationship between the age and attitude to oral health (P = 0.045) and age and oral health practice (P = 0.044). There was also a significant relationship between education and oral health knowledge (P = 0.001) and education and oral health practice (P = 0.003). Similarly, a significant relationship was found between current pregnancy and oral health practice (P = 0.003) (Table 4).

Pearson correlation indicated that there was no relationship between oral health knowledge and practice (P = 0.8962), oral health knowledge and attitude (P = 0.6393), and between oral health attitude and practice (P = 0.1729).

Clinical examinations

The clinical examination indicated that 246 (58.6%) of the study sample had healthy gum, 51 (12.1%) had bleeding, 96 (22.9%) had calculus, 8 (1.9%) had pockets and 19 (4.5%) were excluded (the index tooth was not found, e.g. it was unerupted or extracted).

Only 24.5% of the women were free from dental caries. The mean DMFT was 1.16 in the age group 16–19 years and 3.49 in age group ≥ 20 years.

The chi-squared test indicated that there was no statistically significant relationship between CPI and oral health knowledge (P = 0.712) and CPI and oral health attitude (P = 0.203), but there was a statistically significant relationship between CPI and oral health practice (P = 0.003) (Table 5).

The chi-square test showed that there was no statistically significant relationship between DMFT and oral health knowledge (P = 0.249), and DMFT and oral health attitude (P = 0.065); however there was a statistically significant relationship between DMFT and oral health practice (P < 0.001) (Table 5).

Discussion

Our study showed that the majority of our sample of pregnant Sudanese women (81.9%) had

average oral health knowledge, but they were unaware of the relationship between oral health and pregnancy. Similarly, in Iowa, United States of America (USA) Hubashna et al. 2005 showed that women had limited knowledge of the possible relationship between oral health and pregnancy outcome (18). In addition, it has been reported that women are not aware that the health of their gums may also affect the health of their babies (6). It has been shown that periodontal disease increases the risk of adverse pregnancy consequences (18).

Women in our study mainly acquired their oral health knowledge from television and radio. These media may be useful and suitable for the dissemination of oral health education messages in Sudan. This was in contrast to a study conducted in the UK where the main source of knowledge of mothers who were aware of dental care was the general practitioner (19) while in Kuwait, 65% of female students at a health science centre reported that they received tooth-brushing instructions from the dentist (22).

Most of our sample (78.8%), which had different age groups, educational levels and social classes, had a negative attitude to oral health during pregnancy. About 90% did not visit a dentist; of those, more than half did not feel they needed to, and a considerable proportion thought that dental treatment should be avoided during pregnancy as it might harm their baby or themselves. Likewise, a survey in the USA revealed that half of the women who reported oral problems did not seek care because they believed that poor oral health during pregnancy was routine and feared that dental treatment might harm their baby (10).

The majority of the studied sample had good tooth-brushing habits (brushing more than once a day), but only about 10% used adjunct oral hygiene methods. However, in a study in the UK, only 75% of the pregnant women brushed their teeth more than once a day and 51% used mouth wash (19). Likewise, in Australia the dental utilization rate of pregnant women was only about 30% (23). Also in a study in Kuwait a large proportion of the pregnant women had oral health problems; however, half of the women had not seen a dentist during pregnancy (22).

In our study, there was a statistically significant relationship between women’s educational level and oral health knowledge. Higher educated women had greater oral health knowledge than lower educated or uneducated women. While education increased knowledge, surprisingly, no statistically significant relationship was found between oral health knowledge and attitude, and also between oral health knowledge and practice. This may be due to fear, cultural factors and wrong beliefs. In contrast, in the Islamic Republic of Iran in 2008, Hajikazemi et al. found a statistically significant relationship between oral health knowledge and attitude, and knowledge and practice (11).

The clinical examination results indicated that over a third (36.9%) of the women in the present study had gum problems while only about a fifth complained of gum problems. This result suggests that about 15% of the women had gum problems but did not recognise it. Furthermore, of the women complaining of gum problems, only 15% had visited a dentist. The California Dental Association recommends that all women who are pregnant or planning a pregnancy visit a dentist for a periodontal examination and maintain good oral hygiene during pregnancy (24).

A large proportion of the women in our study experienced dental caries (75%), but fortunately only 2.2% had high caries levels. However, only 5% of the affected population had fillings, indicating that almost 95% had no dental treatment for some reason. Studies reveal that dentists are sometimes reluctant to treat pregnant women for various reasons, such as the fear of harming the fetus, fear of litigation or patient safety concern (14,25).

We found a statistically significant relationship between oral health status and oral health practice, i.e. between CPI and practice, and DMFT and practice. That oral health is affected by oral practice is to be expected, i.e. the better the practice, the better the oral health. Vasiliauskien et al. in 2007 found that a preventive programme in Lithuania among pregnant women led to a 56% reduction in the dental caries increment of the study group in comparison with the control group (26). The oral hygiene index also decreased from 1.48 to 0.94 in the study group indicating an improvement in periodontal status (26).

This is the first study conducted in Sudan assessing oral health status, knowledge, attitude and behaviour among pregnant women. Although most pregnant women in Khartoum state receive a comprehensive form of antenatal care from maternity care centres, they do not receive instructions concerning oral health care during pregnancy. A pregnant woman’s knowledge and actions concerning her oral health are critical to the oral health of her children and play a vital role in childhood caries prevention (27), and some countries have adopted a strategy of maternal oral health promotion through antenatal care providers (28).

Our study showed that the oral health status of the pregnant women was at a middling level but that the majority had negative attitudes towards oral health and had poor oral health practice. Oral health knowledge therefore needs to be enhanced and oral health preventive programmes should be developed for pregnant women. These would encourage good oral practice and a positive attitude toward oral health and lead to better oral health status. Pregnant women should be a priority group for oral health education and this should be an integral part of antenatal or

postnatal care programmes.

This study was conducted among a sample of pregnant women from one maternity hospital. As such the sample cannot be considered to be representative of all pregnant women in Sudan and the results cannot be generalized to a wider population. Nonetheless, our study points to the need for preventive programmes, including oral health education during prenatal care, to increase awareness of oral health among pregnant women and improve oral health practice.

Acknowledgements

We are grateful to all the pregnant women who participated in this study.

Funding: None.

Competing interests: None declared.

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