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Do maternal factors influence the dental health status of Nigerian pre-school children?

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Objective. This study was designed to investigate the relationship between maternal related factors and the dental health status of pre-school children in Lagos State, Nigeria.

Methods. A cross-sectional study of 404 pairs of mothers and their pre-school children was conducted at two selected primary health centres in Lagos State Nigeria. An interviewer administered questionnaire recorded the mother's socio-demographic characteristics and assessed her perception of her child's dental needs, attitude to oral disease prevention, level of dental health knowledge and attitude to oral health. The child's dental status was assessed using the dft index (caries status) and the simplified oral hygiene index. Data analysis tools included Spearman's correlation coefficient and multivariate logistic regression.

Results. Maternal age, maternal education, location of residence, maternal knowledge, and attitudes were all positively correlated with the child's caries and oral hygiene status. There were statistically significant correlations between maternal attitude and the oral hygiene index ($P = 0.01$) and dft score ($P = 0.001$). Maternal age also had a significant relationship with the child's caries status ($P = 0.003$).

Conclusion. This study concluded that maternal age and attitude were important determinants of caries experience whereas the mother's attitude was an important determinant of oral cleanliness in pre-school children in Lagos State Nigeria.

Introduction

The importance of oral health to the general well being of individuals and its role in the assessment of an individual's wellbeing is well established. The oral health status and oral health habits have been positively correlated with the dental status and behaviour at the pre-school period[1]. Thus, the dental health status of the pre-school child is often viewed as the first step in an ongoing process because preventive practices established during the first year of life is an important determinant of dental health several years later[1]. Indeed, the adoption of good oral health habits in childhood often takes place at home with the parents, especially the mother, providing the primary model for behaviour[2]. Studies have focused on the impact, association and correlation of the mother's oral health, habits, attitudes and knowledge on the child's dental health because mothers are traditionally regarded as the main caregivers of their children. Therefore, mothers may play an important role in shaping the oral health, attitudes and behaviour of their children or wards[2,3].

Studies on dental diseases continue because previous studies have shown that the cost of its management has significant economic impact; oral disease is the fourth most expensive disease to treat[4]. In children, the study of dental caries is important as this is the most commonly reported dental disease[1]. Periodontal disease is also reported to be prevalent among Nigerians including pre-school children[5].

Several factors such as diet and nutrition, as well as societal norms and culture may affect the oral health status of pre-school children[1,6,7]. Maternal influences are of significant

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importance at this age, because pre-school children are unable to care for themselves and are dependent on their caregivers for their day to day care. The caregiver then becomes a major possible modifier of factors that could impact the oral health of the child in the short and long-term. Several studies have shown an association between maternal knowledge and attitude towards oral health and the dental health status of their children[3,6–8]. Although reports abound of low awareness and poor attitudes towards dental health among Nigerian mothers,[9–11] the impact of this on the oral health status of their children or wards has not been established.

In addition, the oral health status is dependent on the interplay of multiple aetiological and pre-disposing factors, which have varying ability to cause diseases. Studies by Nicolau *et al.*[12,13] points to the integral role of biological, behavioural, socio-economical, and psychological variables in the caries experience of children. For pre-school children, maternal variables may equally impact on the aetiology of oral diseases like caries and periodontal diseases[1]. Although a previous study in the same environment as this study has identified that the pre-school child's oral health status is strongly associated with the mother's caries status[14], little is known about the factors that impact on the expression of this pre-disposing factor.

The purpose of this study was, therefore, to determine the influence of maternal related social characteristics on the oral health status of Nigerian pre-school children. Specifically it assessed how maternal factors (age, educational level, and location of residence, oral health knowledge and attitude) influenced the dental caries and oral hygiene status of the child. In addition, the study sought to determine which maternal factors could have the most profound effect on the dental caries and oral hygiene status of the pre-school child.

Materials and methods

Study location

The study was conducted in Lagos State, the former capital state and the current economic nerve centre of Nigeria. The state comprises 20 Local Government Areas (LGA's), which is the smallest unit of administration. There were 17 urban and three rural LGA's in Lagos State at the time of the study.

Sample size determination

Children under 5 years of age routinely receive immunisations against childhood diseases at primary health centres. The subjects included all children aged 18–60 months and their mothers visiting the health centres for routine immunisations over a 6 month period. Sample size calculation was based on a 50% prevalence rate (since there was no data on prevalence of dental diseases in Nigerian pre-school children), 5% error and 95% confidence interval resulting in a minimum sample size of 384 subjects.

Sample selection

Sampling for the study was performed in two stages; two LGA's (one rural and one urban) were selected by simple random method based on the states' classification of LGA's. Only 2 LGA's were included because of limited funds available for the conduct of the study. Two primary health centres in each LGA were then selected by simple random method from a list of primary health centres obtained from the State Ministry of Health. All consenting mothers attending the health facilities with children between the ages of 18 months and 60 months during the period of the study were enrolled. Consent was sought from the local health authorities and individual consent (verbal) to participate in the study was sought from the mothers after explaining the nature of the study. Ethical approval to conduct the study was obtained from the Lagos University Teaching Hospital prior to the commencement of the study.

A total of 500 mothers were approached to participate in the study, however, 96 mothers declined participation and 404 pairs of mothers and their pre-school children consented to participate in the study. The mothers who declined to participate did so because they could not give the needed time to respond to

questions. Some of those who participated commented on using the opportunity to receive an oral health evaluation for their children.

Questionnaire

A semi-structured questionnaire was administered and completed by a trained interviewer for all participants to ensure validity and reliability of the results. The questionnaire was pre-tested at the Child Dental Health clinic of the Lagos University Teaching Hospital using 30 subjects and modifications made based on the results before the study commenced. The questionnaire included socio-demographic characteristics, such as maternal age, location of residence, and children's ages (computed from their dates of birth for accuracy).

The socio-economic status for this study was obtained through a scoring index combining a woman's level of education and the occupation of the child's father. This allocates each child to a social class I–V with social class V being the lowest[15]. Classes I and II were then graded as low socio-economic group, class III into medium and classes IV and V into high socio-economic groups, respectively. The suitability and applicability of this social classification system for Nigeria has been tested and found valid and reliable[15]. A multiple item index such as this, which based the social class stratification of the child on the employment status of the father and the educational level of the mother has increased validity[16]. Also the use of occupation as an item in stratifying the social class further increases the validity of the stratification[16].

Questions testing maternal dental health knowledge as well as questions on their attitudes to dental health, which had been validated were adapted from previous studies[7,9,10]. Scoring for knowledge and attitude were based on the system these studies used. In assessing the level of knowledge, 15 items were utilised. Correct responses were scored as 1 whereas incorrect responses were scored as 0. Scores were allocated for each response and a total score calculated for each participant. The maximum possible score obtainable was 15. The mean knowledge score was 7.3 ± 2.0 thus a score of 5 and below was graded poor knowledge, 6–10 fair and 11–15 good dental health knowledge, respectively.

Maternal attitude to dental health was assessed using a three point Likert scale and the maximum possible score was 42. Maternal attitude was measured using three components: K1 = mothers attitude to her own dental needs (total possible score = 12); K2 = mothers attitude to her child's dental needs (total possible score = 24); K3 = mothers attitude towards prevention (total possible score = 6). Mean attitude score was 23.8 ± 1.7 thus, attitude was graded as good if the mother scored 22 and above (out of 42 marks) and poor for those who scored below 22.

Clinical examination

A dental examination was conducted for the children using dental mirrors in a well lit area by one of the authors (AAA). The dental caries status was assessed using the dft index according to WHO guidelines[17] whereas the oral hygiene was assessed using the debris component of the simplified oral hygiene index (OHI-S)[17]. The examiner received training from an experienced community dentist and the training ended with double examination of 20 children yielding an intra-examiner kappa value of 0.8 (intra-examiner reliability). A plane dental mirror was used to examine the children with the mother and the examiner sitting in a knee-to-knee position and the examination was conducted using natural light.

Caries was recorded as present only when there were obvious cavitations based on WHO guidelines. This was because the frequent occurrence of power outages especially in the rural areas makes the use radiographic examinations in such circumstances difficult. The cleanliness of the mouth was evaluated by assessing the plaque and debris accumulation using the simplified OHI index. The facial and lingual surfaces of the following index teeth 51, 55, 65, 71, 75, and 85 were examined where they were present because of the young age group involved. The debris and calculus scores were added and divided by the number of surfaces examined to give the OHI score as recommended. The OHI-S score was then

graded, a score of 3.0 and above was rated as poor oral hygiene and 0–2.9 was graded as good oral hygiene. All children with dental pathologies were referred to a dental clinic in close proximity to their residential location with a referral letter written to a colleague.

Data analysis

Data were analysed using the SPSS for windows (version 11.0; SPSS Inc., Chicago, IL, USA) statistical software package. Frequency tables were generated for all variables and mean scores computed for numerical variables. To compute the correlation coefficient the location of residence was recoded to a numerical variable rural = 1 urban = 2, caries was recoded to a dichotomous variable caries absent = 0 and caries present = 1 whereas OHI-S was recoded as good oral hygiene = 0 and poor oral hygiene = 1. Other data analysis tools included chi-squared tests, Spearman's correlation coefficient and binary logistic regression. Associations and differences were considered significant when the *P*-values were less than 0.05.

Results

Socio-demographic characteristics

The maternal age ranged from 18 to 48 years with mean of 31.0 (± 5.8) years, whereas the children's ages ranged from 18 to 60 months with a mean of 39.1 (± 13.0) months (Table 1). With respect to location of residence, 181 (44.8%) mothers resided in the rural area whereas 223 (55.2%) mothers resided in the urban area. There were slightly more boys than girls, 208 (51.5%) and 196 (48.5%) respectively. Mothers in the low social class accounted for 35.6% (n = 144) of the sample whereas 32.7% (n = 132), and 31.7% (n = 128) were in the middle and high classes, respectively.

The child's dental status

The prevalence of caries and poor oral hygiene was observed to increase with the child's age (Table 2).

Table 1. Distribution of study population by age of mother and child.

Age category	*n* (%)
Maternal age (years)	
Unspecified	28 (6.9)
16–20	24 (5.9)
21–25	48 (11.9)
26–30	94 (23.3)
31–35	133 (32.9)
36–40	58 (14.4)
>40	19 (4.7)
Childs age (months)	
18–23	34 (8.4)
24–29	53 (13.2)
30–35	57 (14.1)
36–41	86 (21.3)
42–47	28 (6.9)
48–53	66 (16.2)
54–60	80 (19.9)
Total	404 (100.0)

Table 2. Caries occurrence and OHI score by child's age category.

Childs age category (months)	Caries		OHI-S	
	Present (%)	Absent (%)	Poor (%)	Good (%)
18–23	2 (5.9)	33 (94.1)	6 (17.6)	28 (82.4)
24–29	0 (0.0)	53 (100.0)	13 (24.5)	40 (75.5)
30–35	3 (5.3)	54 (94.7)	14 (24.6)	43 (75.4)
36–41	14 (16.3)	72 (83.7)	20 (23.3)	66 (76.7)
42–47	2 (7.1)	26 (92.9)	8 (28.6)	20 (71.4)
48–53	10 (15.4)	55 (84.6)	19 (29.2)	47 (70.8)
54–60	13 (16.3)	67 (83.8)	32 (40.0)	48 (60.0)
Total	44 (10.9)	360 (89.1)	291 (72.2)	113 (27.8)

Relationship between maternal socio-demographic features and oral health knowledge and attitude

Maternal age, location of residence, and social class showed weak correlation with maternal oral health knowledge and attitude (Table 3). Nevertheless, although their correlations with maternal age was not statistically significant ($P > 0.05$) the correlations between location of residence and level of education were statistically significant ($P = 0.000$).

Maternal factors and child's dental caries status

Of the maternal factors examined only maternal age ($P = 0.012$), attitude to her child's dental needs ($P = 0.014$) and overall maternal attitude ($P = 0.01$) were significantly correlated to caries occurrence in this study

Table 3. Correlations between maternal socio-demographic characteristics and the level of knowledge and attitude.

	Knowledge		Attitude	
Maternal factors	**Correlation coefficient (Spearman's)**	***P*-value**	**Correlation coefficient (Spearman's)**	***P*-value**
Mothers age	0.044	0.394	0.103	0.047
Mothers educational level	0.190	0.000	0.342	0.000
Mothers social class	0.233	0.000	0.367	0.000
Location of residence*	0.178	0.000	0.282	0.000

*Location of residence rural = 1, urban = 2.

(Table 4). Following logistic regression analysis, maternal age and attitudes were observed to significantly affect the odds of a child developing dental caries (Table 5). For every year increase in the mother's age the odds of caries increases by 1.095 ($P = 0.005$). Although for every unit increase in maternal attitude the odds of caries reduces by 15% (Table 5, $P = 0.004$).

Maternal factors and child's oral hygiene status

On the other hand location of residence ($P = 0.000$), level of maternal education ($P = 0.006$) maternal social class ($P = 0.017$), and her attitude to oral health ($P = 0.001$) were significantly correlated to her child's oral hygiene status (Table 4). Only overall maternal attitude was observed to significantly affect the child's oral hygiene status (Table 6). For every unit increase in maternal attitude score the odds of a child having poor oral hygiene reduces by 15% ($P = 0.000$).

Discussion

Several long-term trends in dental health begin in the pre-school period, and the child's attitude towards dental health starts with the pre-school experience. One of the factors identified as probably influencing dental health and diseases in children is the knowledge and attitudes of their care providers[12,13,19,20] especially maternal dental health knowledge, attitude and practices[3,6,8,12,15]. This is because pre-school children are usually unable to think and make decisions about their dental health. In the Nigerian environment, where the mother plays a significant role in the care and health of the child, it is important to explore the opportunities this relationship could bring to bear on ensuring good oral health in the child.

The results from this study indicate that good maternal attitude is associated with better caries and oral hygiene status in Nigerian pre-school children. This corroborates the results from previous studies, which had noted that, the better the mothers attitude the fewer carious lesions the child had[2,7] and the better the child's gingival health[2,12,15]. These results support the value of emphasising the development of good dental health attitudes among mothers as a tool for influencing not only their own dental health but

Table 4. Correlations between the maternal variables and the child's dental caries and oral hygiene level.

	Dental caries status		Oral hygiene status	
Maternal factor	**Correlation coefficient (Spearman's)**	***P*-value**	**Correlation coefficient (Spearman's)**	***P*-value**
Mothers age	0.130	0.012	−0.046	0.371
Location of residence	−0.084	0.090	−0.176	0.000*
Mothers educational level	−0.016	0.745	−0.138	0.006*
Mothers social class	0.017	0.728	−0.119	0.017*
Maternal knowledge	−0.52	0.301	−0.033	0.510
Mothers attitude to her own dental needs	−0.79	0.113	−0.158	0.002*
Mothers attitude to her child's dental needs	−0.122	0.014*	−0.154	0.002*
Mothers attitude towards prevention	−0.039	0.439	−0.213	0.000*
Overall maternal attitude	−0.123	0.014*	0.158	0.001*

*Statistically significant result.

Table 5. Influence of maternal factors on dental caries status among pre-school children using multivariate regression analysis.

Maternal factor	Odds ratio	*z*-value	*P*-value
Maternal age	1.095	2.80	0.005*
Maternal social class	1.389	0.78	0.437
Location of residence	0.509	−1.81	0.070
Level of oral health knowledge	0.929	−0.07	0.947
Level of oral health attitude	0.853	−2.92	0.004*

*Statistically significant result.

Table 6. Influence of maternal factors on the oral hygiene status of the children using multivariate regression analysis.

Maternal factor	Odds ratio	*z*-value	*P*-value
Maternal age	1.005	0.21	0.831
Maternal social class	1.248	0.62	0.535
Location of residence	0.642	−1.69	0.091
Level of oral health knowledge	1.548	0.69	0.477
Level of oral health attitude	0.855	−3.99	0.000*

*Statistically significant result.

that of their children. The relationship between maternal knowledge and attitudes and the child's dental health is, however, not a straightforward cause and effect relationship[21,22]. Good dental health knowledge is thought to be the antecedent of good attitudes and this in turn serves as the forerunner for good dental health behaviour. Other factors are, however, recognised as having an impact on the maternal dental health knowledge and attitudes such as cultural beliefs, social norms and pressure[2,3,7]. Many factors are also thought to impact the child's oral health status including nutrition, oral hygiene behaviour, presence, and strain of Strep mutans and genetics[23]. The possible roles of these factors in the aetiology of dental and periodontal diseases in pre-school children were, however, not evaluated in this study.

This study identified maternal age as a factor influencing the pre-school child's caries status, this is an interesting finding. It was observed that the children of older mothers had more carious lesions than children of younger mothers. This is at variance with the results of earlier studies[6–8]. This result may be related to the fact that many of the older mothers in this study resided in the urban area where refined carbohydrates are more readily available. The reason for this pattern is, however, not clear and further research to explore this relationship is suggested.

There are some limitations to generalisation of this data for the general Nigerian populace. First, in Nigeria, there are wide disparities between social classes, which is often not reflected when occupation and education are used as proxy for determining social class. As personal income is, however, considered a sensitive issue among Nigerians including such questions would have further reduced participation in the study. Secondly, identified statistical associations are limited to this study because of the cross sectional design. The study design has the possibility of introducing recall and interviewer bias and there was also the possibility of disease presence in children affecting maternal response to the questions asked. The fact that the study was conducted in a health facility could have introduced potential social bias into the study as mothers whose children receive routine immunisation are likely to have better attitudes to health care than those who do not. In addition was the potential for confounding between maternal age and the selected markers for socio-economic status. Nonetheless, the results provide an overview of the relationship between maternal variables and dental health status of Nigerian pre-school children.

What this paper adds

- Maternal attitude to dental health is the most important maternal factor associated with the Nigerian pre-school child's dental caries and oral hygiene status.
- Maternal age was also observed to be associated with their dental caries status.

Why this paper is important to paediatric dentists

The importance of maternal attitudes to dental health should be considered and advocated by paediatric dentist in developing community-based oral health promotion programmes for pre-school children. Maternal attitudes must also be addressed in the clinic when instituting preventive therapy for pre-schoolers.

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