

# Factors Influencing Dental Caries Status among Undergraduate Dental Students in Selected Nigerian Universities

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## ABSTRACT

**Objective:** Dental caries is the most common dental disease. Factors influencing dental caries status approximate the determinants of oral health status. Today's dental students will provide dental services in the future and will be responsible for the public's oral health education and status. Hence the objective of this study was to identify the factors influencing dental caries status among undergraduate dental students in Nigerian Universities.

**Methods:** The study was a cross sectional survey involving the use of a multi-stage sampling technique to select 812 undergraduate dental students from six institutions. Information on socio-demographic characteristics and oral health-related knowledge, attitudes and practices of the students were collected using a well-structured questionnaire. The DMFT index was used to assess the dental caries status. Data were analyzed using descriptive statistics, Chi-square test and binary logistic regression at 5% level of significance.

**Results:** The mean age of the respondents was 22.0±3.0 years. The overall prevalence of dental caries was 24%. The DMFT range was 0.0 – 8.0 with median DMFT score of 0.0. The students' dental caries status was influenced by location of study ( $p<0.0001$ ), and parents' highest educational level ( $p<0.05$ ). Obafemi Awolowo University, Ile-Ife students were 3 times less likely to have dental caries compared to Bayero University, Kano students (OR = 0.34, 95% CI: 0.15 – 0.76). Participants whose fathers had no formal education were 13 times more likely to have dental caries compared to participants whose fathers had tertiary education (OR = 13.308, 95% CI: 2.25 – 78.87).

**Conclusion:** The dental caries status of the dental students was good, but bad oral health practices are likely to worsen it. As part of their curriculum therefore, dental students should start learning about preventive aspects of oral health as early as their first undergraduate year.

**Keywords:** Dental caries status, Dental students, Factors

## INTRODUCTION

Dental caries is the most common disorder affecting the teeth (Heng, 2016; Zou et al., 2018). The prevalence of dental caries has decreased with improvements in oral hygiene and a decrease in the consumption of sugar products (Yildiz & Dogan, 2011). This general favourable trend in reducing dental caries, however, has not been seen in many developing countries like Nigeria. Instead, the prevalence of oral diseases is on the increase in Nigeria (Umesi & Savage, 2002).

One of the main objectives of dental education is to train students who can motivate patients to adopt good oral hygiene (Cortes et al., 2002). They are more likely to be

able to do this if they themselves are motivated (Cortes et al., 2002).

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A study of dental students' dental caries status and oral health-related knowledge, attitudes and practice during their training could be of great value, since they are the ones who will apply their knowledge to patients and improve the treatment process during their own practices (Nadeem et al., 2011).

There is paucity of studies on dental caries status among undergraduate dental students in Nigeria. This study was designed to identify the factors influencing dental caries status among undergraduate dental students in Nigeria.

## MATERIALS AND METHODS

**Study design/ setting:** The study was an analytical cross-sectional survey involving 812 undergraduate dental students from 6 accredited dental institutions in Nigeria: University of Benin (UNIBEN), University of Ibadan (UI), University of Lagos (UNILAG), Obafemi Awolowo University (OAU), University of Port Harcourt (UNIPORT) and Bayero University, Kano (BUK).

**Sampling/ sample size:** A sample size of 700 was calculated using the formula for cross-sectional study for quantitative outcome (Lemeshow et al., 1990):

$$n = \frac{z^2 \alpha S^2}{d^2}$$

The standard deviation of the mean DMFT score (S) was gotten from a study of dental caries status among undergraduate dental students (Umerubab et al., 2013). However, this 700 was adjusted to 875 to compensate for possible non-response rate of 20%.

A multi-stage sampling technique was used to select 875 students from 6 accredited dental institutions in Nigeria.

**Stage-1:** Six out of eight Universities where dentistry is studied in Nigeria were selected through purposive sampling technique. The schools were: UI, UNIBEN, UNILAG, OAU, UNIPORT and BUK. Population of students in all the six schools (N) was 1171.

**Stage-2:** Stratified sampling technique was used to divide the selected population into six strata by the schools. Using equal sampling ratio (proportional allocation), the sample size in each school ( $n_s$ ) was calculated from:  $n_s = n/N (N_s)$ , where:  $N_s$  = Number of Students in each school and  $n/N$  = Sampling ratio = 875/1171.

**Stage-3:** In each of the schools, stratification was made into 6 strata by the study level and the required number of students from each study level ( $n_L$ ) was again

calculated using equal sampling ratio from  $n_L = n_s/N_s (N_L)$ , where:  $N_L$  = Number of Students in each level and  $n_s/N_s$  = Sampling fraction in each school (which also equals the general sampling ratio).

The summary of the total (N) and the required (n) number of students in each of the study levels in all the six schools is presented in table-1.

**Stage-4:** The final selection was done using convenience sampling technique. The questionnaires were administered to any student seen in each class until the required number of subjects from that class was reached.

**Data collection procedures:** Information on socio-demographic characteristics and oral health-related knowledge, attitudes and practices of the students were collected using a well-structured, self-administered questionnaire. Twenty questions were used to assess knowledge of oral health graded as poor, fair, and good, for scores 0-9, 10-14 and 15-20 respectively. Thirteen questions were used to assess attitudes towards oral health graded as negative and positive for scores 0-7 and 8-13 respectively. Sixteen questions were used to assess oral health practices graded as bad and good for scores 0-7 and 8-16 respectively. The inter-examiner variability in each of the six sets of examiners was not statistically significant. This means that there was agreement among the examiners in each of the six schools.

**Study variables:** The study variables include one outcome variable (dental caries status) and several explanatory variables including socio-demographic factors as well as oral health-related knowledge, attitudes and practices.

**Data analysis:** Chi-square test was used to investigate associations between variables and all variables were entered into binary logistic regression model to further predict the strength of the association at 5% level of significance.

**Ethical approval:** Ethical approval was obtained from University of Ibadan/University College Hospital Ethics Committee.

Table-1: Summary of the total (N) and the selected (n) number of students in each of the study levels in all the six schools of study.

STUDY LEVEL	UI		UNIBEN		UNILAG		OAU		UNIPORT		BUK	
	N	n	N	n	N	n	N	n	N	n	N	n
100	28	21	23	17	50	37	26	19	20	15	67	50
200	32	24	20	15	52	39	32	24	27	20	50	37
300	33	25	20	15	77	58	32	24	33	25	26	19
400	28	21	20	15	66	49	13	10	23	17	25	19
500	35	26	40	30	49	37	33	25	16	12	7	5
600	33	25	32	24	55	41	38	28	10	7	0	0
Total	189	142	155	116	349	261	174	130	129	96	175	130

UI=University of Ibadan, UNIBEN=University of Benin, UNILAG=University of Lagos, OAU=Obafemi Awolowo University, UNIPORT=University of Port Harcourt, BUK=Bayero University Kano,

## RESULTS

Out of 875 questionnaires administered, 841 (96%) students responded and 812 (93%) duly completed questionnaires were analyzed.

### Socio-demographic characteristics of respondents

Table-2 shows the socio-demographic characteristics of respondents. The ratio of male to female respondents

was about 3:2. The mean age of the respondents was  $22.0 \pm 3.0$  years. Many of the students (57.9%) were between 20 and 24 years, 28.1% were from UNILAG and 17.7% were 300 level students. More than half of the respondents' fathers (56.6%) and mothers (50.6%) were senior civil servants and majority of their fathers (77.4%) and mothers (71.4%) had tertiary level of education.

Table 2: Socio-demographic characteristics of respondents

Variable	Frequency (n = 812)	Percent (%)
<b>Gender</b>		
Male	471	58.0
Female	341	42.0
<b>Age (years)</b>		
<20	175	21.6
20-24	470	57.9
>24	167	20.5
<b>School</b>		
UI	162	20.0
UNIBEN	138	17.0
UNILAG	228	28.0
OAU	150	18.5
UNIPORT	73	9.0
BUK	61	7.5
<b>Study level</b>		
100	120	14.8
200	140	17.2
300	143	17.7
400	136	16.7
500	135	16.6
600	138	17.0
<b>Father's occupation</b>		
Senior civil servant	453	56.6
Junior civil servant	49	6.1
Small scale self employed	115	14.4
Large scale self employed	156	19.5
Unemployed	27	3.4
<b>Mother's occupation</b>		
Senior civil servant	408	50.6
Junior civil servant	76	9.5
Small scale self employed	174	21.6
Large scale self employed	109	13.5
House wife	26	3.2
Unemployed	13	1.5
<b>Highest educational level of father</b>		
No formal education	15	2.0
Primary school	45	5.6
Secondary school	120	15.0
Tertiary school	625	77.4
<b>Highest educational level of mother</b>		
No formal education	22	2.8
Primary school	55	6.8
Secondary school	153	19.0
Tertiary school	575	71.4

### Oral health-related knowledge, attitudes and practices

Of the 20 questions used to assess the knowledge of oral health of the students, the mean knowledge score was  $15.0 \pm 3.6$ . Of the 13 questions used to assess the students' attitudes toward oral health, the mean attitude score was  $10 \pm 1.8$ . Of the 16 questions used to assess the students' oral health practices, the mean practice score was  $8.7 \pm 1.9$ .

### Dental caries status

Figure-1 shows that the overall prevalence of dental caries among the participants was 24%. The mean DMFT score was  $0.54 \pm 1.17$ . The median DMFT score was 0.0 and the

range was 0.0 – 8.0. The frequency distribution of the DMFT scores among the participants is shown in table-2.

### Factors influencing dental caries status

Tables 4 and 5 show the association between respondents' characteristics and dental caries status. There was a significant variation in the dental caries status with study location of the students. Students of OAU had the best (13.3%) while students of UNIBEN had the poorest (38.4%) dental caries status ( $p < 0.0001$ )

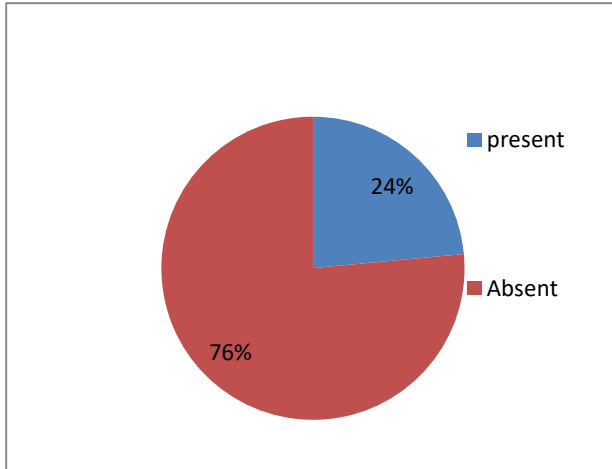


Figure-1: Prevalence of dental caries among the participants

Table-3: Frequency distribution of DMFT scores among the students

DMFT Score	Frequency (n = 812)	Percent (%)
0	621	76.5
1	61	7.5
2	68	8.4
3	29	3.6
4	22	2.7
5	5	0.6
6	3	0.4
7	2	0.2
8	1	0.1

Table-4: Association between respondents' characteristics and dental caries status

Variable	Dental caries status		P-value
	Absent n (%)	Present n (%)	
<b>Gender</b>			
Male	362 (77.2)	107 (22.8)	0.686
Female	256 (76.0)	81 (24.0)	
<b>Age (years)</b>			
<20	130 (74.3)	45 (25.7)	0.660
20-24	360 (76.6)	110 (23.4)	
>24	131 (78.4)	36 (21.6)	
<b>School</b>			
UI	134 (82.7)	28 (17.3)	0.205
UNIBEN	85 (61.6)	53 (38.4)	
UNILAG	181 (79.4)	47 (20.6)	
OAU	130 (86.7)	20 (13.3)	
UNIPORT	50 (68.5)	23 (31.5)	
BUK	41 (67.2)	20 (32.8)	
<b>Study Level</b>			
100	82 (68.3)	38 (31.7)	
200	103 (73.6)	37 (26.4)	
300	113 (79.0)	30 (21.0)	
400	109 (80.1)	27 (19.9)	
500	105 (77.8)	30 (22.2)	
600	109 (79.0)	29 (21.0)	

Table-5: Association between respondents' characteristics and dental caries status

Variable	Dental caries status		P-value
	Absent n (%)	Present n (%)	
<b>Father's Occupation</b>			
Senior civil servant	348(77.0)	104(23.0)	0.133
Junior civil servant	44(89.8)	5(10.2)	
Small scale self employed	82(71.3)	33(28.7)	
Large scale self employed	118(75.6)	38(24.4)	
Unemployed	22(81.5)	5(18.5)	
<b>Mother's Occupation</b>			
Senior civil servant	308(75.5)	100(24.5)	0.183
Junior civil servant	67(88.2)	9(11.8)	
Small scale self employed	126(72.4)	48(27.6)	
Large scale self employed	84(77.1)	25(22.9)	
House wife	20(76.9)	6(23.1)	
Unemployed	10(76.9)	3(23.1)	
<b>Highest Educational Level of Father</b>			
No formal education	9(60.0)	6(40.0)	0.379
Primary school	34(75.6)	11(24.4)	
Secondary school	89(74.2)	31(25.8)	
Tertiary school	485(77.6)	140(22.4)	
<b>Highest Educational Level of Mother</b>			
No formal education	18(81.8)	4(18.2)	0.228
Primary school	45(81.8)	10(18.2)	
Secondary school	108(70.6)	45(29.4)	
Tertiary school	444(77.2)	131(22.8)	
<b>Knowledge of oral health</b>			
Good	373(79.0)	99(21.0)	0.113
Fair	213(72.4)	81(27.6)	
Poor	35(76.1)	11(23.9)	
<b>Attitudes toward oral health</b>			
Positive	566(76.6)	173(23.4)	0.811
Negative	55(75.3)	18(24.7)	
<b>Oral health Practices</b>			
Bad practice	164(78.5)	45(21.5)	0.431
Good practice	457(75.8)	146(24.2)	

Tables 6 and 7 show the multivariable analysis using binary logistic regression of respondents' factors on dental caries status. The analysis revealed that some of the categories of three variables show statistical significance. The variables and corresponding categories were school (UI and OAU); highest educational level of father (no formal education) and highest educational level of mother (primary school). UI students were 2.3 times less likely to have dental caries compared to BUK students (OR = 0.44, 95% CI: 0.20 – 0.94). OAU students were 2.9

times less likely to have dental caries compared to BUK students (OR = 0.34, 95% CI: 0.15 – 0.76). Participants whose fathers had no formal education were 13.3 times more likely to have dental caries compared to participants whose fathers had tertiary education (OR = 13.308, 95% CI: 2.25 – 78.87). Participants whose mothers had primary education as highest educational level were 3.5 times less likely to have dental caries compared to participants whose mothers had tertiary education (OR = 0.29, 95% CI: 0.08 – 0.99).

Table-6: Binary logistic regression of respondents' factors on dental caries status

Variable	OR	(SE)	95% CI	P-value
<b>Gender</b>				
Male	0.72	0.206	0.48-1.08	0.11
Female (ref)				
<b>Age (years)</b>				
<20	1.00	0.420	0.44-2.27	0.99
20-24	1.19	0.287	0.68-2.08	0.56
>24 (ref)				
<b>School</b>				
UI	0.43	0.393	0.20-0.94	0.03
UNIBEN	1.51	0.375	0.73-3.16	0.27
UNILAG	0.59	0.379	0.28-1.25	0.17
OAU	0.34	0.410	0.15-0.76	0.01
UNIPORT	1.00	0.432	0.43-2.33	1.00
BUK (ref)				
<b>Study level</b>				
100	1.57	0.460	0.64-3.86	0.33
200	0.99	0.416	0.44-2.24	0.99
300	0.87	0.384	0.41-1.84	0.71
400	0.84	0.349	0.42-1.66	0.61
500	1.17	0.322	0.62-2.20	0.63
600 (ref)				
<b>Father's Occupation</b>				
Senior civil servant	1.62	0.656	0.45-5.87	0.46
Junior civil servant	0.45	0.825	0.09-2.28	0.34
Small-scale self-employed	1.82	0.694	0.47-7.11	0.39
Large-scale self-employed	1.51	0.680	0.40-5.73	0.54
Unemployed (ref)				

Ref=Reference, OR=Odd Ratio, CI=Confidence

Table-7: Binary logistic regression of respondents' factors on dental caries status

Variable	OR	(SE)	95% CI Lower-Upper	P-Value
<b>Mother's Occupation</b>				
Senior civil servant	1.03	0.87	0.19-5.61	0.97
Junior civil servant	0.40	0.93	0.06-2.49	0.33
Small-scale self-employed	0.94	0.86	0.17-5.03	0.94
Large-scale self-employed	0.82	0.88	0.15-4.61	0.82
House wife	1.13	0.92	0.19-6.87	0.89
Unemployed(ref)				
<b>Highest Educational Level of father</b>				
No formal education	13.31	0.91	2.25-78.87	0.004
Primary School	2.97	0.60	0.92-9.63	0.07
Secondary School	1.25	0.35	0.63-2.48	0.52
Tertiary School (ref)				
<b>Highest Educational Level of mother</b>				
No formal education	0.18	0.94	0.03-1.13	0.07
Primary School	0.29	0.63	0.08-0.99	0.049
Secondary School	1.24	0.33	0.65-2.38	0.51
Tertiary School (ref)				
<b>Knowledge of oral health</b>				
Good	1.17	0.45	0.48-2.84	0.73
Fair	1.72	0.43	0.75-3.98	0.20
Poor (ref)				
<b>Attitudes toward oral health</b>				
Positive	1.06	0.33	0.55-2.03	0.87
Negative(ref)				
<b>Oral health practices</b>				
Good	0.72	0.22	0.47-1.11	0.14
Bad (ref)				

Ref=Reference, OR=Odd Ratio, CI=Confidence

## DISCUSSION

Dentists play an important role in the improvement of the public's oral health education. Therefore, acquiring knowledge and attitudes related to dental health and the prevention of oral disease is very important during the future dentists' training period (Bertolami, 2001).

The overall caries experience observed in this study was low and much better than those observed in many other studies among undergraduate dental students in different Universities in other countries where the values observed range from  $1.38 \pm 0.54$  to  $8.5 \pm 6.8$  (Al-Mashhadani & Hashim, 2006; Umerubab, 2013).

The bivariate analysis revealed that only one of the predictive factors (location of study) significantly influenced the dental caries status. Students of OAU had the best dental caries status while students of UNIBEN had the poorest. The reason(s) for this difference is not exactly clear for now, as both institutions are located in the southern part of the country where there is considerable level of literacy and oral health awareness. A further study may be needed to elucidate the possible reasons for this observed difference.

However, the multivariable analysis revealed that some of the categories of three variables show statistical significance. The variables and corresponding categories were school (UI and OAU); highest educational level of father (no formal education) and highest educational level of mother (primary school). UI and OAU students were less likely to have dental caries compared to BUK students. This could be explained by the lower level of educational status in the northern part of Nigeria which serves as catchment area for BUK compared to the southern part of the country where UI and OAU are situated.

Respondents whose fathers had no formal education were more likely to have dental caries compared to participants whose fathers had tertiary education. This may be due to the fact that educational level of the fathers correlated positively with the care received by their children, which includes dental health care. The latter has been attributed to increased awareness and efforts at securing dental care as a result of improved affordability associated with people of higher socio-economic status. This finding corroborates those of previous reports (Schwendicke et al, 2015; Trohel et al., 2016). This was however not the case with the educational level of respondents' mothers.

Respondents whose mothers had primary education as highest educational level were less likely to have dental caries compared to participants whose mothers had tertiary education. This finding is in contrast to several other studies which have reported an inverse relationship between mothers' educational level and the caries experience in children (Cianetti et al., 2017; Kato et al., 2017). This unexpected but interesting result could be as a result of the fact that the higher the educational level of mothers, the less the time they spend with their children

and thereby less care received by their children from them, including dental health care. This should not be surprising in a survey of University students who are no longer receiving such care from their mothers, since the DMFT index used in assessing the dental caries status measures the total lifetime caries experience of an individual or a population (Jordan et al., 2019). This implies that the present dental caries status of the students might just be a reflection of their caries status as children.

## CONCLUSION

the dental caries status of the students was good. The status was significantly influenced by location of study and highest educational level of parents. Although the dental caries status was good, bad oral health behaviour is likely to worsen the status. Therefore, we wish to recommend that dental students should start learning about preventive aspects of oral health as early as their first year in the University.

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## Conflict of interest

The authors declare that they have no conflicts of interest.

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