Relationship between Nutritional Status, Sweetened Foods Consumption and Prevalence of Cariogenicity with Associated Level of Risk in Adolescents- Case of Sabongari LGA Zaria, Kaduna State Nigeria

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*Abstract:-*The Nutritional status, frequency of sweetened foods consumption and prevalence of cariogenicity with its associated level of Risk in adolescents of Zaria, Kaduna Nigeria was investigated. The prevalence of malnutrition among the adolescents of the sampled population was 25.4%, while the Prevalence of dental caries was discovered to be 23.4%, with mean DMFT 0.39 and Significant Caries (SiC) Index of 0.66, presented as low with decayed tooth component found to be highest, reflecting high levels of Untreated caries, with 16.9% at Low Risk, 68.7% Moderate Risk and 14.3% High Risk of dental caries. More than half (76.6%) of the students were caries-free and the majority of those with dental caries experience were aged 16–19 (14.03%) and females (14.6%), Multiple logistic regression analysis revealed a negative and very weak correlation (R<0.2), between nutritional status, sweetened foods consumption and caries occurrence. P- values (0.916 >0.05), with highest untreated cases recorded among Females (53.75%) and older adolescents 16-19 years (51.2%).

In conclusion, although the frequency of sweetened foods consumption may not be significantly linked to nutritional status and the prevalence of cariogenicity, a portion of the adolescents are still at high and moderate risk levels of dental caries and malnutrition.

Keywords -Nutritional Status, Cariogenicity, Sweetened foods, Adolescent Malnutrition, Dental Caries, DMFT

I. INTRODUCTION

Cariogenicity refers to the potential for the formation of dental caries [1]. Malnutrition during tooth development may lead to an increased susceptibility to Dental caries (tooth decay) which is the pathological process of break down and destruction of the tooth structure [2]. Leading the pace as the most common disorder affecting the teeth, caries has overtime been attributed to several factors among others such as oral bacteria (Streptoccocci mutans, lactobacilli), lack of proper dental care and fluoride consumption [3], frequency of sweetened foods consumption [4], causing a high impact on nutritional status by altering the essential ability to chew, cut and grind foods, which is needed for good nutrition and essential in the rapid growth stages of childhood and adolescence. Dental caries in childhood and adolescence can be due to defects in teeth formation (deciduous and permanent), delayed eruption and change in composition of the salivary glands, causing a higher susceptibility to tooth decay [5]. This may impede the achievement of dietary requirements, as the risk of malnutrition increases when oral status is compromised [6], as well as excessive ingestion of fermentable carbohydrates, which is often a common cause shared by both obesity and dental caries [7].

When free sugars (empty calories) are increasingly consumed, above 30 times a week (approximately four times a day) [8], deficiencies in protein and micronutrients such as vitamins, zinc and iron may occur and can influence the amount and composition of saliva, limiting its protective effects in the oral cavity [9]. A high level of free sugar intake is of concern due to its association with poor dietary quality, obesity and risk of non-communicable diseases [8].

Adolescents have a tendency to seek independence in their daily lives, especially in decision making, which can affect their lifestyle, dietary habits and food choices as adolescence is a period of rapid growth and development when nutritional demand is increased and dietary habit is established [10]. The most common relationships between oral health and poor nutrition habits or deficiencies involve caries associated with frequency of sugar and high carbohydrate intake, which is associated with a variety of systemic illnesses [11]. Irritability attributed to caries has been associated with reduced or altered food intake, disturbed sleeping habits and impaired secretion of growth hormones [12] An estimated 60–90% of school children worldwide and most young adults have experienced dental caries [13].

Dental caries a leading cause of dental pain accounts for the highest number (49.8%) of irreversible oral diseases in parts of northern Nigeria ([14]. It is also the most common cause of

tooth loss in young age 5-19 years, reaching its peak at ages 20-29 years in other parts of Nigeria [15][16][17]

II. MATERIALS AND METHOD

2.1 Sampling

Considering prevalence of cariogenicity and allowable absolute error (Precision) of 5%, Dobson's formula (n=t$^2\frac{(pXq)}{d^2}$) was used for sample size determination. The study population comprised of 342 adolescents attending 12 randomly selected public and private secondary schools in parts of Sabon Gari Local Government Area of Kaduna State, Nigeria. A multistage and random sampling technique was used in selecting the required sample size

2.2 Data Collection

Pretested semi-structured questionnaire was administered to the participants, data on Anthropometry, oral examination for caries and self-reports on sugar and other food consumption by frequency and types collected over a period of three weeks. A risk assessment of cariogenicity was carried out using the "WHO, (2010) guideline for the risk assessment of dental caries" [18]. Using the World Health Organization (WHO) diagnostic criteria [19], the number of decayed, missing and filled teeth (DMFT) was recorded and when the examiner was in doubt no caries was recorded. For analysis students were categorized according to their caries experience, those without caries experience (DMFT = 0; absence of a decayed, missing tooth/teeth due to caries, or filled tooth/teeth) or those with a caries experience (D M F T ≥ 1.

2.3 Statistical Analysis

Socio demographic data is presented as descriptive statistics of percentages and frequencies using Statistical Package for Social Sciences (SPSS) software version 20.0. Multi variable regression and CHI square with correlations were used to ascertain the influence of cariogenicity in relation to other variables and statistical significance recorded as p value less than or equal to 0.05.

2.4 Ethical Clearance

Consent forms were given to each adolescent, for their parents' approval and Ethical clearance was obtained from the Primary Health Care Department Ethical Committee of Sabon Gari Local Government Secretariat, Kaduna State and Schools access permit from the Director, Ministry of Education zonal office Zaria Kaduna State.

III. RESULTS and DISCUSSION

3.1 Demographic Characteristics of Adolescents

There were a total of 342 adolescents in the study, of which 50.3% attended public schools, 49.7% attended private schools. 57.6% were in senior secondary school while junior secondary was 42.4%. 59.9% more female respondents than male respondents (40.1%). Age group 16-19 years as majority

(49.1%) of the respondents, while age group 10-12 years were the lowest (9.1%) respondents.

Table 1Demographic Characteristics of Adolescents Sampled in Sabon Gari LGA, Zaria of Kaduna State

Variable	Frequency	Percentage (%)
SCHOOL		
Public	172	50.3
Private	170	49.7
Total	342	100
CLASS		
JSS	145	42.4
SSS	197	57.6
Total	342	100
SEX		
Male	137	40.1
Female	205	59.9
Total	342	100
AGE (Years)		
10-12	31	9.1
13-15	143	41.8
16-19	168	49.1
Total	342	100

3.2 Nutritional Status and Prevalence of Malnutrition across the adolescents

The prevalence of malnutrition is 25.7%, with 4.7% severe thinness, 15.2 % Thinness, 74.3% normal weight, 4.3% overweight and 1.5% obese.

Table 2

Nutritional Status and Prevalence of Malnutrition across the Sampled Adolescents

Body Mass Index	Male (%) n=137	Female (%) n=205	All (%) n= 342
Severe Thinness (< - 3SD)	2.0	2.6	4.7
Thinness (< -2SD)	3.8	11.4	15.2
Normal (< -2SD)	33.0	41.2	74.3
Overweight (> 1SD)	0.9	3.5	4.3
Obese (>2SD)	0.3	1.2	1.5
Total	40.1	59.9	100

Prevalence of Malnutrition

Undernutrition	19.9%
Overnutrition	5.8%
Total	25.7%

3.3 Prevalence of Dental Caries among the Adolescents

Only 23.4% of the respondents had dental caries while 76.6% of the adolescents had none of their teeth affected of all the categories of DMFT, adolescents with one (1) tooth affected had the highest percentage of 13.4%, the lowest percentage of 0.6% had at most five (5) teeth being affected.
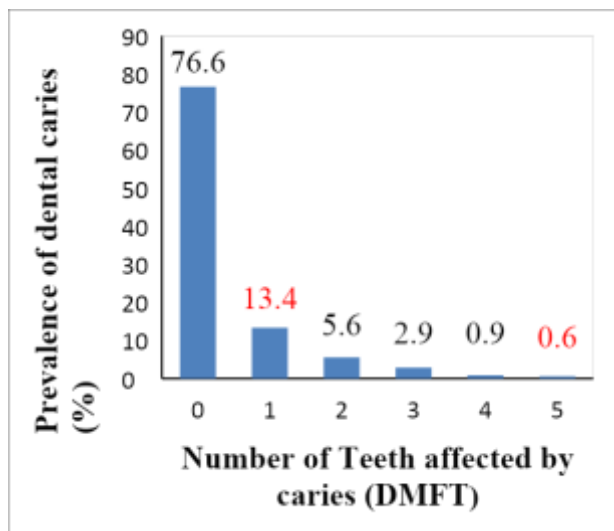

Figure 1 Prevalence of Dental Caries among the Adolescents

3.4 Mean, Decayed, Missing, Filled teeth DMFT Components and Significant Caries Index

Table 3 Mean DMFT, Decayed, Missing, Filled teeth Components and Significant Caries Index

DMFT Components	
Decayed Teeth	1.8 ± 0.48
Missing Teeth	1.29 ± 0.70
Filled Teeth	1.01 ± 0.12
DMFT	0.39
Significant Caries Index of caries active subjects	0.66 (Mean DMFT for one-third

Values are presented as MEAN ± SD

Of the students (23.4%) with dental caries experience (DMFT), the majority (20.2%) had one or more decayed tooth/teeth (D-component), few (6.4%) had one or more teeth missing due to caries (M-component), and a small number (1.5%) had one or more teeth filled due to caries (F-component). The students mean DMFT was 0.39, with mean D-component of 1.8, mean M-component of 1.29, and mean F-component of 1.01. The number of decayed teeth per person ranged from 1 to 4, the number of missing teeth ranged from 1 to 2, and the number of filled teeth ranged from 0 to 1 and significant caries index (Sic) was observed as 0.66.
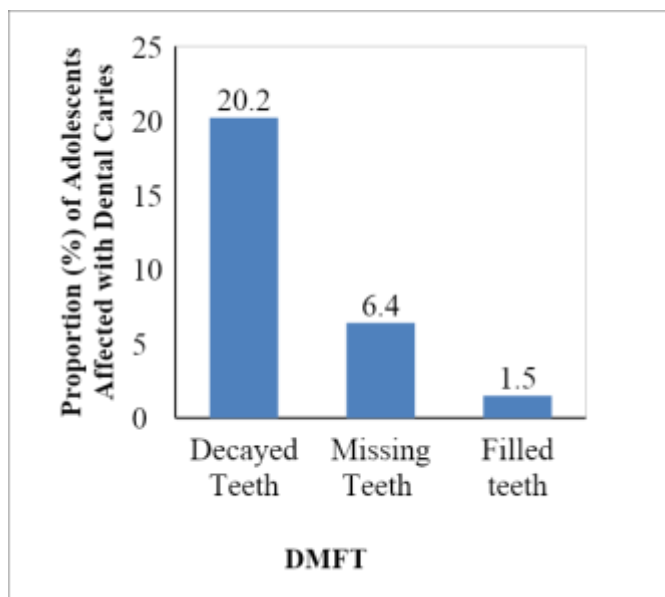

Figure 2 Proportions (%) of Adolescents with a Decayed, Missing or Filled Tooth Component

3.5 Risk of Cariogenicity among the adolescents

Results show that adolescents at moderate risk of cariogenicity were the majority (68.7%) and those at high risk were least (14.3%).
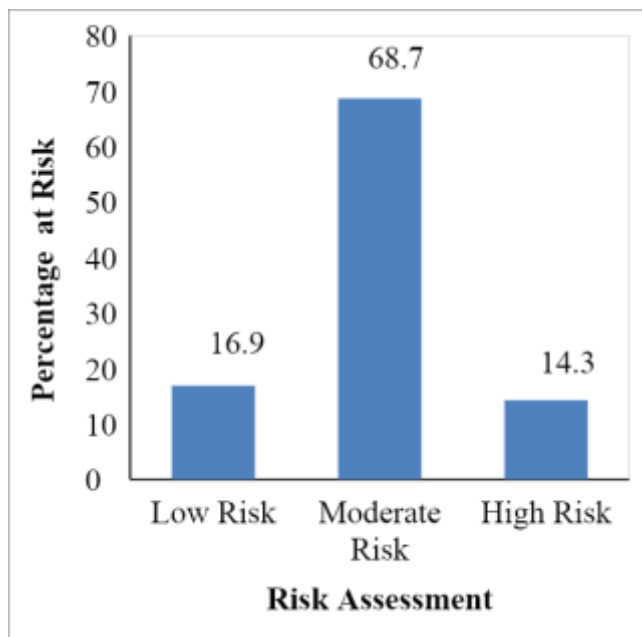

Figure 3 Risk of Cariogenicity among the adolescents.

3.6 Percentage Consumption of each Food Group, in relation to BMI.
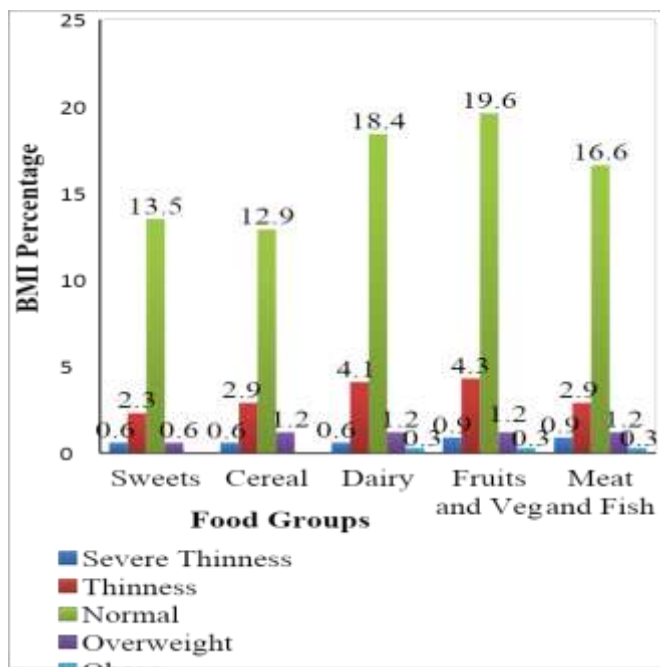
Figure 4 Percentage Consumption of Each Food Group (>3 times/week) in Relation to BMI

Normal weight individuals ranked highest in sweetened foods consumption of more than 3times/week (13.5%) and across all other food groups, next to Thin (2.3%) and least being obese (0%).

3.7 Association between Sweetened Foods Consumption and Change in Nutritional Status (BMI)

Caries activity was found to be highest (44%) among normal weight adolescents who had sugary foods/snacks every day and anytime, more than 3 times/week, while (0.9%) of obese adolescents were found to have frequent consumption of sweetened foods.
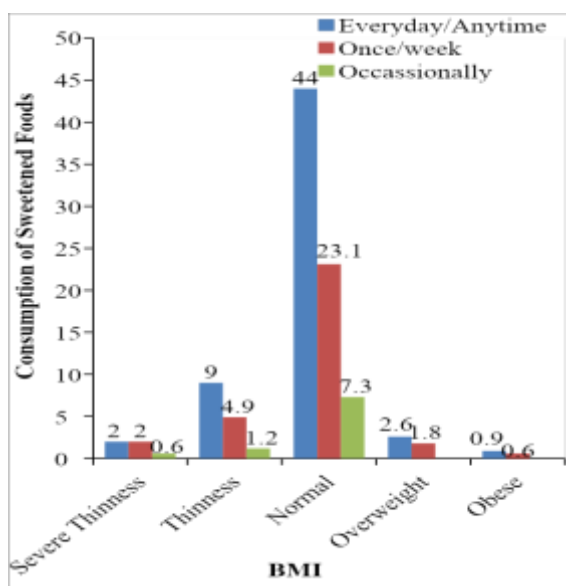

Figure 5 Relationship between Frequency of Sweetened foods Consumed and BMI

3.8 Association between Frequency of Sweetened Foods Consumed and Dental Caries

Increased frequency of sweetened foods consumption was highest (58.5%) among the adolescents, recorded as every day and anytime consumers, more than 3 times/week of which 14.6% were caries active and caries was lowest (2.04%) in those who only had sugary foods occasionally especially at parties as presented in Figure 6
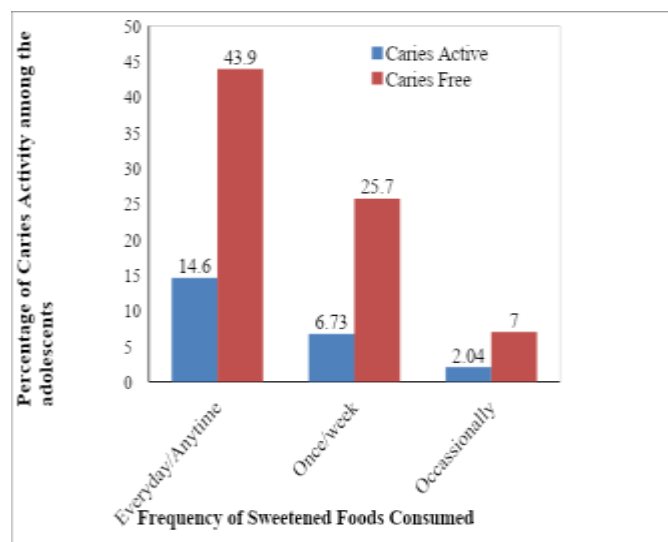

Figure 6 Association between Frequency of Sweetened Foods Consumed and Dental Caries

3.9 Statistical Correlation between frequency of Sweetened foods consumption, Nutritional Status (BMI) and Dental Caries Showing a weak correlation (R<0.2)

Table 4 Regression Correlation of Sweetened foods consumed with Body Mass Index and Caries Experience

Sweetened foods	R	R square	P-value
Consumption(>3 times/wk)			
Body Mass Index	- .028	0.001	0.608
Caries Experience	- .006	0.000	0.916
Strength of Correlation is very weak when R< 0.2			

Discussion

Although the statistics for Nutritional status (prevalence of Malnutrition) 25.7% and prevalence of Cariogenicity (23.4%) across the sampled adolescent population may be low, the fact remains that dental caries and malnutrition still exists. Percentage consumption of each food group, in relation to BMI showed Normal weight individuals ranked highest in sweetened foods consumption of more than 3times/week (13.5%) and across all other food groups, next to Thin and least being obese.

In this study the proportion of females with dental caries was observed to be higher than males. This portrays that females carry the biggest burden of dental caries that may be explained by their easier access to food supplies and frequent snacking during food preparation. The higher prevalence of dental caries among the females (14.6%) may also be attributed to their self-reports of preferring junk foods and sweetened snacks when available, compared to their male counterparts who preferred to have a whole cooked meal of energy dense foods. Similar findings have been reported by other researchers in Tanzania, [20][21] Nigeria [22] Although modified, the World Health Organization (WHO) Oral Health diagnostic criteria and caries risk assessment form [18] used allow for comparisons of findings with other studies. Also the prevalence of dental caries was only assessed in adolescents of one Local Government Area, therefore the results may not be generalized to the whole of northern Nigeria.

The significant caries index (Sic) for severity was observed as 0.66, referring to the mean one-third of the population with the highest DMFT. This score corresponded to the 'very low' category of the WHO (2013) [23] classification of caries severity, within the sampled population [24]. Mean DMFT in this study was reported as 0.39, which is in the low category and contrast to the mean DMFT of 4.5-5.3 recorded in the caries annual report of the dental oral and craniofacial data resource centre [25]. However, it compares with several studies [22][26] done in Nigeria and other parts of Africa, who have reported low mean DMFT of 0.65 and 1.26 respectively.

Caries activity was found to be highest (14.6%) among adolescents who had sugary foods/snacks every day and anytime, more than 3 times/week and found lowest (9.04%) in those who only had sugary foods occasionally especially at parties.

The multiple regression analysis used in this study showed how much Body Mass Index (BMI) varies with, DMFT and high intake of sweetened foods. The study revealed that there was a negative and very weak correlation, showing that neither the frequency of sweets consumed nor caries activity, supported a change in nutritional status, (R<0.2) and P values (0.916 >0.05) which means that these variables were not direct predictors of nutritional status.

IV. CONCLUSION

Existing levels of malnutrition and dental caries may be further mitigated by adopting cost effective preventive measures directed particularly at this age group. Mini clinics (sickbays) can be setup by the state Ministries of Education and Health especially in public schools as they could be a first point for health education, screening, and referrals as part of comprehensive patient care in early diagnosis of dental caries and nutrient deficiencies.

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