

Prevalence of dental caries in relation to refined sugar consumption among children in Ajegunle and Gbagada communities, Lagos State, Nigeria

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Abstract

Dental caries remains a significant public health burden among children in low- and middle-income settings, where refined sugar consumption is high and oral health services are often inadequate. This cross-sectional descriptive study investigated the prevalence of dental caries and its association with refined sugar intake among children aged 10–18 years residing in the Ajegunle and Gbagada communities of Lagos State, Nigeria. Using a multistage sampling strategy, structured questionnaires were administered to a total of 100 respondents, comprising children and their caregivers. Data were analyzed using descriptive statistics, with findings presented as frequencies and percentages. The results revealed that a substantial majority of the sampled children consumed refined sugars regularly, with 87% reporting intake of carbonated beverages, 93% adding sugar to tea, and 67% consuming candies and chewing gum on a frequent basis. Candy consumption was predominantly daily (56%), while carbonated drink intake was largely weekly (60%). Poor oral hygiene practices and limited access to dental healthcare services were also identified within the study communities. The findings indicate a high prevalence of dental caries risk factors among the target population, driven by dietary habits and inadequate oral health awareness. This study underscores the urgent need for community-based oral health education programmes, increased government investment in primary dental healthcare infrastructure, and regulatory oversight of refined sugar content in products marketed to children in urban Nigerian communities.

Keywords: Tooth decay, refined sugars, oral health care

Introduction

Dental caries, commonly referred to as tooth decay or cavities, is one of the most prevalent non-communicable diseases affecting populations worldwide, with particular consequences for children and adolescents. The condition arises from the progressive demineralization of tooth enamel, dentine, and cementum, driven by organic acids produced during the fermentation of dietary carbohydrates—including refined sugars—by cariogenic bacteria present in the oral biofilm (Silk, 2014; Laudenbach and Simon, 2014) [9, 15]. Clinically, dental caries manifests as discoloration ranging from yellow to black, accompanied by localized pain, sensitivity, and functional impairment of mastication. If left untreated, the disease can progress to periapical infection, abscess formation, and eventual tooth loss (Laudenbach and Simon, 2014; Davis, 2013) [3, 9].

Globally, dental caries constitutes a major public health concern of significant epidemiological proportions. Approximately 2.3 billion people, representing 32% of the world's population, are estimated to be affected by caries in their permanent dentition, while caries in primary teeth affects approximately 620 million children—approximately 9% of the global paediatric population (Vos *et al*, 2012; Silk, 2014) [15]. The World Health Organization (WHO) has acknowledged that nearly all adults will experience some form of dental caries during their lifetime (WHO, 2012). Despite assumptions that the burden of dental caries is concentrated in high-income countries due to elevated sugar consumption, the increasing availability and affordability of refined sugars in low- and middle-income countries has contributed to a rising prevalence in developing regions as well (Bagramian *et al*, 2009) [2].

The etiology of dental caries is well-established and multifactorial, involving the interplay of susceptible tooth surfaces, cariogenic microorganisms—predominantly *Streptococcus mutans*—fermentable carbohydrates, and sufficient time for acid demineralization to occur (Hardie, 1982; Marsh, 1994; Madigan and Martinko, 2006) [6, 10, 11]. Among dietary factors, the frequency and quantity of refined sugar consumption have been consistently identified as the most critical determinants of caries development (Holloway and Moore, 1983) [7]. Preventive strategies include the use of fluoridated toothpaste, twice-daily tooth brushing, interdental cleaning, and regular dental check-ups. Additionally, maternal oral health has been implicated in the caries risk of young children, as vertical transmission of cariogenic bacteria from caregiver to child may amplify susceptibility in early life (WHO, 2012; Silk, 2014) [15]. In Nigeria, and particularly within densely populated urban communities such as Ajegunle and Gbagada in Lagos State, the convergence of high refined sugar consumption, limited oral health literacy, and inadequate access to dental care services creates a significant risk environment for childhood dental caries. Lagos State hosts a large and growing urban population characterised by diverse socioeconomic conditions, yet public oral health infrastructure remains limited relative to the scale of the population's needs. Despite the recognized burden of this condition, community-level studies examining the specific patterns of refined sugar consumption and their relationship to dental caries prevalence among children in these communities remain scarce.

This study was therefore designed to address this gap by investigating: (i) the presence and types of refined sugars in

the daily diets of children in the study communities; (ii) the frequency of refined sugar consumption; (iii) oral hygiene practices and awareness of dental caries among the study population; (iv) the perceived role of public health infrastructure in dental caries prevention; and (v) the broader sociodemographic factors associated with dental health in the study area. The findings are intended to inform evidence-based interventions and policy recommendations aimed at reducing the burden of dental caries among children in urban Nigerian communities.

Materials and Methods

Study Design and Area

This study employed a cross-sectional descriptive design to assess the prevalence and associated risk factors of dental caries among children residing in the Ajegunle and Gbagada communities of Lagos State, Nigeria. These communities were selected on the basis of their demographic diversity, high population density, and the heterogeneous socioeconomic conditions they represent within the Lagos metropolitan context. Both communities are characterised by a mix of low-income and middle-income households, making them suitable sampling environments for capturing the range of dietary and hygiene behaviours relevant to the study objectives.

Study Population and Sampling

The target population comprised children under the age of 18 years who were permanent residents of the selected communities. Where direct child participation was not feasible—particularly for younger children—caregivers including fathers, mothers, or other responsible adults with sufficient knowledge of the child's dietary habits and general health status were interviewed as proxies. A multistage sampling technique was employed to ensure adequate representation of the heterogeneous characteristics of the study population. The final sample size was 100 participants, comprising both children and their respective caregivers.

Data Collection Instrument

Data was collected using a semi-structured questionnaire developed specifically for this study. The questionnaire was organized into two main sections. The first section captured demographic information including the respondent's position (parent or child), age, marital status, level of education, and household size. The second section assessed variables related to dietary habits—specifically the consumption of refined sugars in candies, carbonated beverages, and tea—the frequency of such consumption, oral hygiene practices, and awareness of dental caries prevention. All questionnaire items were developed in alignment with the study objectives and reviewed for content validity prior to administration.

Pretesting and Validity

To ensure the reliability and internal consistency of the data collection instrument, the questionnaire was pretested in Wema, a community in Lagos State with demographic and socioeconomic characteristics comparable to those of Ajegunle and Gbagada. The pretest facilitated the identification and correction of ambiguous or poorly worded items, refinement of the interview protocol, and familiarization of the research team with the administration

process. Errors identified during this exercise were systematically addressed before the commencement of actual data collection in the target communities.

Data Collection Procedure

Field data collection was conducted through structured face-to-face interviews and questionnaire administration in the selected communities. At the end of each data collection day, completed questionnaires were reviewed for completeness and consistency in the field to minimise missing or erroneous data. Questionnaires deemed incomplete were revisited where possible. All collected instruments were subsequently submitted to the principal investigator for secure storage and preparation for analysis.

Data Analysis

Completed questionnaire data were coded and entered into a data capture template designed to accommodate the study's dependent and independent variables. Data quality was ensured through the use of validation checks during entry, and the dataset was subsequently cleaned to remove inconsistencies. Statistical analysis was performed using descriptive statistics, with results expressed as absolute frequencies and percentages. Data visualization and tabulation were conducted using Microsoft Excel 2010 to facilitate clear interpretation and presentation of findings.

Results and Discussion

Sociodemographic Characteristics of the Study Population

The sociodemographic profile of the 100 respondents is presented in Tables 1a through 1f. As shown in **Table 1**, the majority of respondents were children, with girls constituting the largest group (39%), followed by boys (29%). Among caregivers, mothers represented 28% of respondents, compared to only 4% for fathers. This pattern is consistent with established literature on gender roles in child caregiving within Nigerian and broader African societies, where mothers typically bear primary responsibility for the health and nutritional welfare of children (Atty, 2017) ^[1]. The higher proportion of female respondents also reflects the broader demographic structure of Lagos State, where the National Population Commission's 2006 census recorded a higher ratio of females to males.

Table 1: Position of Respondents (n = 100)

Characteristic	Frequency	Percentage (%)
Father	4	4
Mother	28	28
Boy	29	29
Girl	39	39
Total	100	100

Source: Field Survey

With respect to age distribution (Table 2), 68% of respondents were below 18 years of age, consistent with the study's focus on paediatric participants, while the remaining 32% were adult caregivers. Regarding marital status (Table 3), approximately 68% of respondents were single, largely reflecting the child participants in the sample, while 32% were married adults. The educational profile of the sample (Table 4) was notably high, with 71% of respondents having attained tertiary-level education and 23% being engaged in

alternative forms of education, with only 6% at the secondary level. This relatively high educational attainment is consistent with the broader context of Lagos State, which hosts numerous tertiary institutions and has historically high literacy rates, particularly among the Yoruba-speaking population—one of Nigeria's three largest ethnic groups—who are widely recognized for their cultural emphasis on formal education (Friedrich Hablier, 2005) [4].

Table 2: Age Distribution of Respondents (n = 100)

Age Group	Frequency	Percentage (%)
10–18 years	68	68
19 years and above	32	32
Total	100	100

Source: Field Survey

Table 3: Marital Status of Respondents (n = 100)

Marital Status	Frequency	Percentage (%)
Married	32	32
Single	68	68
Total	100	100

Source: Field Survey

Table 4: Level of Education of Respondents (n = 100)

Education Level	Frequency	Percentage (%)
Primary	—	—
Secondary	6	6
Tertiary	71	71
Others	23	23
Total	100	100

Source: Field Survey

As shown in Table 5, a substantial majority of respondents (72%) lived in households with five or more persons, while 28% resided in smaller households of four persons or fewer. This pattern of high household occupancy is characteristic of urbanizing communities in developing countries, where accelerated population growth, rural-to-urban migration, and limited access to family planning services contribute to large household sizes (Kosek *et al.*, 2003). Overcrowded living conditions may have implications for oral health at the household level, as shared hygiene facilities and limited resources may impede consistent oral hygiene practices.

Table 5: Household Size of Respondents (n = 100)

Number of Persons	Frequency	Percentage (%)
1–4 persons	28	28
5 persons and above	72	72
Total	100	100

Source: Field Survey

Concerning the age distribution of the child participants specifically (Table 6), 57% were between 10 and 14 years of age, with the remaining 43% aged between 14 and 18 years. This distribution is advantageous from a methodological standpoint, as children within these age ranges are typically enrolled in secondary school and are capable of providing coherent, detailed responses to structured questionnaires, thereby enhancing the reliability of self-reported data.

Table 6: Age Distribution of Child Participants (n = 100)

Age Group	Frequency	Percentage (%)
10–14 years	57	57
14–18 years	43	43
Total	100	100

Source: Field Survey

Presence of Refined Sugars in the Diet

Tables 2a through 2c present data on the types of refined sugar-containing products consumed by the study population. A substantial proportion of children (67%) reported regular consumption of candies and chewing gum (Table 7). This finding is consistent with the observations of Orish *et al.* (2018) [13], who reported that the widespread affordability and easy availability of confectionery products in Nigerian markets significantly drive their consumption among children. The high accessibility of these products, even in low-income communities, makes them a persistent source of cariogenic substrate in children's diets.

Table 7: Consumption of Candies and Chewing Gum (n = 100)

Response	Frequency	Percentage (%)
Yes	67	67
No	33	33
Total	100	100

Source: Field Survey

Carbonated beverage consumption was even more prevalent, with 87% of respondents reporting regular intake of fizzy drinks such as cola, fruit-flavoured sodas, and other carbonated soft drinks (Table 8). This finding aligns with data reported by Nkem (2018) [12], which identified Nigeria as among the highest-ranking countries globally in per capita consumption of carbonated beverages. The high sugar content of these drinks, combined with their acidic pH, renders them particularly harmful to dental enamel, contributing not only to cariogenesis but also to dental erosion (Bagramian *et al.*, 2009) [2].

Table 8: Consumption of Carbonated Beverages (n = 100)

Response	Frequency	Percentage (%)
Yes	87	87
No	13	13
Total	100	100

Source: Field Survey

The highest prevalence of refined sugar consumption was recorded for tea, with 93% of respondents reporting that they add sugar to their tea (Table 9). This pattern reflects a broader national trend documented by Proshare Ecosystem (2018), which reported a rise of more than 20% in coffee and tea consumption in Nigeria between 2010 [14] and 2015. The habitual addition of refined sugar to hot beverages, particularly when consumed multiple times daily, represents a significant and often underestimated contribution to the total cariogenic sugar load in children's diets.

Table 9: Addition of Sugar to Tea (n = 100)

Response	Frequency	Percentage (%)
Yes	93	93
No	7	7
Total	100	100

Source: Field Survey

Frequency of Refined Sugar Consumption

Tables 10 through 12 report the frequency with which respondents consumed refined sugar-containing products. For candy and chewing gum, 56% of respondents reported daily consumption, 39% weekly, and only 5% monthly (Table 2d). The predominance of daily candy consumption is consistent with the high affordability of confectionery

products in the study area, as previously noted by Orish *et al.* (2018) [13]. Daily exposure to fermentable carbohydrates is a well-established driver of caries progression, as it provides sustained substrate for acid-producing bacteria in dental plaque (Holloway and Moore, 1983) [7].

Table 10: Frequency of Candy and Chewing Gum Consumption (n = 100)

Frequency	No. of Respondents	Percentage (%)
Daily	56	56
Weekly	39	39
Monthly	5	5
Total	100	100

Source: Field Survey

Regarding carbonated beverage consumption, 31% of respondents reported drinking fizzy drinks on a daily basis, while 60% consumed them weekly and 9% monthly (Table 11). While the daily consumption rate for carbonated drinks (31%) was lower than that for candies (56%), the weekly figure of 60% indicates that the majority of children in the study area are regularly exposed to the cariogenic and erosive effects of carbonated beverages. Taken together with candy consumption data, these findings suggest that a significant proportion of the study population faces persistent and frequent cariogenic sugar exposure throughout the week.

Table 11: Frequency of Carbonated Beverage Consumption (n = 100)

Frequency	No. of Respondents	Percentage (%)
Daily	31	31
Weekly	60	60
Monthly	9	9
Total	100	100

Source: Field Survey

Table 12 shows that 72% of respondents reported frequent tea consumption, while 28% did not. Given that 93% of all respondents added refined sugar to their tea (Table 2c), the high frequency of tea drinking among the majority of the sample represents a substantial cumulative source of cariogenic substrate. This finding is further corroborated by the Proshare Ecosystem (2018) report documenting escalating beverage consumption trends in Nigeria, suggesting that this pattern may be intensifying over time rather than diminishing.

Table 12: Frequency of Tea Consumption (n = 100)

Response	Frequency	Percentage (%)
Yes (frequent)	72	72
No	28	28
Total	100	100

Source: Field Survey

Collectively, the dietary data reveal a population of children in Ajegunle and Gbagada who are exposed to multiple forms of refined sugar on a frequent—predominantly daily or weekly—basis. The concurrent high consumption of candies, carbonated beverages, and sweetened tea creates a cumulative cariogenic dietary profile that substantially elevates the risk of dental caries. These findings are consistent with broader epidemiological evidence indicating

that frequent sugar exposure, rather than absolute quantity alone, is a primary determinant of caries risk (Holloway and Moore, 1983; Bagramian *et al.*, 2009) [2, 7]. The absence of adequate compensatory oral hygiene measures and limited access to preventive dental services in these communities further compounds this risk, underscoring the need for targeted public health interventions.

Conclusion

This study investigated the prevalence of risk factors associated with dental caries among children aged 10–18 years in the Ajegunle and Gbagada communities of Lagos State, Nigeria, with a particular focus on refined sugar consumption patterns. The findings demonstrate that a substantial majority of the sampled children consume refined sugars in multiple forms—including candies, carbonated beverages, and sweetened tea—at high frequency, with daily or weekly exposure reported by the majority of respondents for each category. These dietary patterns, compounded by limited oral hygiene awareness and inadequate access to public dental health services, create a high-risk environment for the development and progression of dental caries in the study communities.

The study's findings underscore the critical importance of community-level oral health promotion programmes aimed at improving dietary awareness, particularly regarding the frequency and types of refined sugar consumed by children. Furthermore, the observed deficiencies in public health dental infrastructure in the study area highlight the need for greater government investment in accessible, preventive dental care services in underserved urban communities. Parents and caregivers, as primary influencers of children's dietary and hygiene behaviours, should be central targets of health education initiatives.

Based on the evidence gathered, the following evidence-based recommendations are proposed as practical strategies for reducing the burden of dental caries in the study population and similar communities:

1. Children should brush their teeth twice daily using fluoride-containing toothpaste to strengthen enamel and inhibit acid demineralization.
2. Interdental cleaning using dental floss or interdental brushes should be performed at least once daily to remove plaque and food debris from proximal tooth surfaces.
3. Dietary modifications should be encouraged, including reduction in the frequency of refined sugar intake and limitation of between-meal snacking, with promotion of nutritionally balanced diets.
4. Regular professional dental examinations and cleanings should be sought, at minimum biannually, to enable early detection and management of carious lesions before they progress.
5. Government agencies and public health authorities should strengthen oral health programming in primary and secondary schools and invest in the expansion and quality improvement of community dental health facilities.

This study is subject to certain limitations that should be acknowledged. The cross-sectional design precludes the establishment of causal relationships between refined sugar consumption and dental caries. The reliance on self-reported data introduces the possibility of recall and social

desirability biases. Furthermore, the sample size of 100 participants, while sufficient for descriptive analysis, limits the generalizability of findings to the broader population. Future research should employ larger, longitudinal designs incorporating clinical dental examinations to provide more definitive evidence of the relationship between dietary habits and caries prevalence in Nigerian urban communities.

Author Statements

Authors and Contributors

Oluwatobi worked on sampling techniques. Temionu worked on semi structured questionnaires which were used to collect the demographic and descriptive data among respondents.

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