



Prevalence of Cardio-metabolic disorders among Dental Clinic attendees in a Tertiary Hospital, South East, Nigeria

Henry Uyi Igbinedion¹, Chidiebere Valentine Ugwueze^{2&3*}, Maris Unoma Ugwueze⁴, Elizabeth Chiamaka Nwigwe¹

¹Department of Dentistry, Alex-Ekwueme Federal University Teaching Hospital, P.M.B, 102, Abakaliki, Ebonyi State, Nigeria.

²Department of Medicine, David Umahi Federal University of Health Sciences, P.M.B 211 Uburu, Ebonyi State, Nigeria.

³Department of Medicine, Alex-Ekwueme Federal University Ndufu Alike- Ikwo, P.M.B 1010, Abakaliki, Ebonyi State, Nigeria.

⁴Department of Nursing Sciences, David Umahi Federal University of Health Sciences, P.M.B 112, Uburu, Ebonyi State, Nigeria.

Abstract

Background: Cardio-metabolic disorders are associated with dental diseases and they may affect the quality of life of patients with dental disorders.

Objective: The aim of the study was to determine the prevalence of diabetes mellitus, obesity and hypertension among patients attending dental clinic at Alex-Ekwueme Federal University Teaching Hospital, Abakaliki.

Materials and Methods: The study was a cross-sectional descriptive design carried out among 239 participants. The anthropometric, blood pressure, fasting/random blood sugar ((FBS/RBS) measurements were carried out on the participants. The data were analysed using Statistical Package for Social Sciences version 23.

Results: The study subjects were 111 males and 128 females. The average age of participants was 38.3 ± 13.9 years. The mean weight, height and body mass index (BMI) of participants were 70.7 ± 13.9 kg, 1.6 ± 0.1 m and 26.8 ± 5.4 kg/m² respectively. The mean waist circumference, hip circumference and waist: hip ratio were 59.3 ± 25.4 cm, 55.5 ± 22.1 cm and 1.07 ± 0.3 respectively. The prevalence of obesity using BMI and waist circumference were 25.1% and 21.8% respectively. The prevalence of hypertension was 19.2%. The mean systolic and diastolic blood pressures were 113.4 ± 14.7 mmHg and 70.2 ± 9.7 mmHg with ranges of 101 mmHg and 51 mmHg respectively. Impaired fasting blood glucose was noted in 21.2% of participants. The prevalence of diabetes using FBS and RBS were 14.4% and 4.3% respectively. The mean FBS and RBS were 101.6 ± 41.3 mg/dl and 112.9 ± 52.7 mg/dl with ranges of 286 mg/dl and 440 mg/dl respectively.

Conclusion: With the established prevalence of these non-communicable diseases among dental clinic attendees, it has become imperative to advocate for the use of dental clinic in hospital settings as screening centres for such non-communicable diseases.

Corresponding Author:

Chidiebere Valentine Ugwueze

Department of Medicine, David Umahi Federal University of Health Sciences, P.M.B 211 Uburu, Ebonyi State & Department of Medicine, Alex-Ekwueme Federal University Ndufu Alike-Ikwo, P.M.B 1010, Abakaliki, Ebonyi State, Nigeria.

valenchidi@gmail.com

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Introduction

Non-communicable diseases (NCDs) constitute a major concern to health regulatory agencies including World Health Organisation¹. The NCDs with significant cardio-metabolic sequelae include

diabetes mellitus, hypertension, obesity, coronary artery diseases, dyslipidemia among others². The cost of treatment of these chronic cardiovascular diseases and their known complications is becoming unbearable especially in developing countries.³ This is because in most developing countries, per capita income is grossly low and most patients pay out of pocket thus, many persons cannot afford adequate treatment for the chronic diseases as reported by Odunyemi et al⁴.

The prevalence of overweight in Nigeria using a systematic study by Chukwunonye et al⁵, ranged from 20.3%-35.1% while that of obesity ranged from 8.1% to 22.2%. Obesity is rapidly evolving in developing nations due to sedentary lifestyles, physical inactivity and poor feeding habits⁶. With rising prevalence of obesity in developing countries, timely diagnosis and management is very important. In a study by Adeyemo et al,⁷ which was localized to the Maxillofacial clinic, in Lagos, South West, Nigeria the prevalence of obesity was reported as 11.4% and overweight as 27.7% among 271 patients. In a retrospective study carried out from the records of 3443 adult patients with periodontal diseases, it was shown that severe periodontal disease was present in 32 % of obese, 31% of overweight and 21% of normal weight patients.⁸ Similarly, a study which involved 100 adult patients by Chandrahas et al⁹, reported a strong correlation between obesity and periodontal disease.

The prevalence of diabetes as reported by International Diabetes Federation (IDF) shows that 540 million persons are living with diabetes and 783 million persons may develop diabetes by 2045.¹⁰ Uloko et al¹¹ reported a pooled prevalence of diabetes in Nigeria as 5.77% respectively from a systematic analysis. Further analysis from the study by Uloko et al¹¹ revealed that the prevalence of diabetes was South East (4.6%), South West (5.5%), South South (9.8%), North East (5.9%), North West (3.0%) and North Central (3.8%) The staggering figures make diabetes mellitus a public health concern. The prevalence of prediabetes and diabetes in a dental clinic was reported as 47.48% and 11.23% respectively¹². This shows a high prevalence with a far-reaching health implications. A study on the bi-directional relationship between diabetes and periodontitis demonstrated a higher risk of incident

type 2 diabetes mellitus (T2DM) among those with periodontitis compared to those without periodontitis¹³. It has been reported that periodontal disease is one of the prominent causes of tooth loss and diabetes is an established risk factor for periodontal disease¹⁴⁻¹⁶.

Another NCD with a high prevalence is hypertension which is regarded as a 'silent killer' and the overall age-standardized prevalence of hypertension in Nigeria according to a survey by Odili et al¹⁷, in 2017 was reported as 38.1% with variation across different geopolitical zones: North central, 20.9%, North East, 27.5%, North West, 26.8%, South East 52.8%, South South 44.6%, South West 42.1%.

Systemic hypertension has also been recorded in patients with dental pathologies such as periodontitis. In a pilot study among 40 patients diagnosed to have periodontitis, 15% had hypertension, 67.5% had high normal blood pressure while 17.5% were normotensive¹⁸. The prevalence of hypertension among 273 participants in a dental clinic was 50.1% while 49.8% had normal blood pressure readings.(14)(19). Nnawuihe et al²⁰, also reported the prevalence of hypertension as 29.9%, though obtained from patients' history with its associated limitations. Various complications are recorded among patients with hypertension which affect quality of life negatively. Screening for this 'silent killer' is a very important health intervention strategy. Similarly, the complications of obesity are enormous.

What is the link between dental diseases and cardiometabolic diseases? Dental diseases can result in cardiometabolic disease. Likewise, cardiometabolic diseases can also lead to dental diseases. One of the prominent dental complications of diabetes is periodontitis²¹. Periodontitis can as well increase the risk of developing diabetes mellitus through the inflammatory cascade^{21,22}.

In view of the rising prevalence of cardio-metabolic diseases and the emphasis of health care teams on prevention of these diseases, screening of individuals for diabetes mellitus, hypertension and evaluating for obesity at strategic locations in the hospital such as dental clinic has become a veritable tool in stemming the tide of NCDs in our environment. Most studies focused on the prevalence of one of the cardio-metabolic

components however, the study aimed at evaluating the prevalence of obesity, diabetes and hypertension among the study participants.

Materials and Methods

Study design

The study was a cross-sectional descriptive design.

Study setting

The study was carried out at the Dental Clinic of Alex-Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria for a period of 4 months (January 2025 – April, 2025). The Dental clinic serves as a referral centre for dental cases in Ebonyi State and other adjoining states such as Cross River, Benue and Enugu state.

The Ethical approval was obtained from the Research and Ethics Committee of Alex-Ekwueme Federal University Teaching Hospital, Abakaliki (AEFUTHA). The approval number was NHREC/16/05/22/442 obtained on 13th November, 2024.

Study population

The study population were patients attending dental clinic who satisfy the inclusion criteria.

Inclusion criteria

1. Participants included adults from 20 years and above.
2. Participants attending Dental clinic of AEFUTHA who gave consent.
3. Those participants who were already diagnosed to have diabetes or hypertension or on drugs for these diseases.

Exclusion criteria

Participants who were in painful or respiratory distress.

Sample Size Determination

The sample size formula as described by Cochran²³ $n = Z^2pq/e^2$ where n = sample population, $Z=1.96$, p =prevalence, $q=1-p$, e = standard error of 0.05. So using 11.23% as the prevalence of diabetes mellitus which was reported by Chinnasamy et al¹², the sample size, $n = 1.96 \times 1.96 \times 0.1123 \times (1 - 0.1123) / (0.05 \times 0.05) = 153$. With 10% non-response, gives 153 plus 15.3= 168.3 ie a minimum

of 169 participants. Two hundred and thirty nine participants were finally recruited.

Sampling Technique

A simple random sampling technique was used to select 3 patients per day with approximately 15 patients selected per week. Eligible participants were to pick from a non-transparent box containing six folded papers bearing 3 (YES) and 3 (NO) written on them. Those who picked 'YES' were recruited for the day. The recruitment of participants continued for four months until the sample size was achieved. The interns in Dental clinic were trained and used as research assistants.

Data collection

The fasting and random blood glucose were measured using Accu check glucometers (Roche diagnostics, German). Participants with symptoms of diabetes such as polyuria or polydipsia and fasting blood glucose values ≥ 126 mmHg or random blood glucose ≥ 200 mg/dl and those already on anti-diabetic drugs were also regarded as having diabetes mellitus²⁴. However, those without symptoms of diabetes, but have elevated fasting or random blood glucose were regarded as suspected cases. The participants with elevated blood glucose were referred to Diabetes Clinic in the same hospital for further reviews and management.

A stadiometer (Seca; Steindham, Hamburg-Germany, 2013) with an attached weighing scale was used to measure the height and weight of participants. The waist and hip circumferences were measured using a flexible measuring tape. The circumference at the midpoint of the lowermost palpable rib and iliac crest was regarded as the waist circumference while the circumference between the widest part of the gluteus maximus and the midpoint anteriorly was regarded as the hip circumference. Waist circumference ≥ 94 cm for males and ≥ 80 cm for females were regarded as central obesity²⁵. Normal body mass index (BMI) ranged from 18kg/m² to 24.9kg/m². The other BMI categories are as follows: Overweight (25- 29.9) kg/m², Obesity Class 1(30- 34.9)kg/m², Obesity Class 2 35-39.9 kg/m², Morbid Obesity ≥ 40 kg/m²²⁶.

The blood pressure was measured using Accosson mercury sphygmomanometer with the patient in a sitting position after resting for at least 5 minutes.

Two readings were taken 2 minutes apart to obtain the actual blood pressure of the participants. Participants with blood pressure greater than 140/90 mmHg were regarded as suspected cases while those already on anti-hypertensive drugs were diagnosed to have systemic hypertension²⁷. The participants diagnosed to have hypertension or suspected cases were referred to Cardiology clinic for further evaluation.

The data obtained from the study were analysed using the Statistical Package for Social Sciences (SPSS) version 23.

Ethical consideration

The Ethical approval was obtained from the Research and Ethics Committee of Alex-Ekwueme Federal University Teaching Hospital, Abakaliki (AEFUTHA). The approval number was NHREC/16/05/22/442 obtained on 13th November, 2024. Written informed consent was obtained from all the participants. The patients who declined to participate in the study were allowed to receive adequate dental care in the centre.

Strengthening Reporting of Observational Studies in Epidemiology (STROBE)

This study followed the STROBE guidelines for observational research, ensuring transparency and robustness in study design, data collection and reporting.

Results

Socio-demographic characteristics

The study participants consisted of 111 males and 128 females with mean age of 38.3±13.9 years. Majority of the participants were married and accounted for 60.7% of the participants while approximately 38% of the participants were single. Thirty two percent of participants were civil

servants, 25.9% were traders, 13.4% were students while 9.6% were farmers.

The various tables below show anthropometric indices (Table 1), Prevalence of obesity (Table 2), Prevalence of hypertension (table 3) and Prevalence of diabetes (table 4)

Table 2. Prevalence of obesity among attendees in dental clinic at AEFUTHA

Variable	Frequency N=239	Percent
Body weight (WHO* classification)		
Underweight	6	2.5
Normal weight	93	38.9
Overweight	80	33.5
Class 1 obesity	36	15.1
Class 2 obesity	19	7.9
Class 3 (morbid) obesity	5	2.1
Waist circumference (IDF**)		
Normal (male: <94cm or female: <80cm)	187	78.2
Centrally obese (male: ≥94cm or female: ≥80cm)	52	21.8
Waist-hip ratio (WHO classification)		
Below moderate	62	25.9
Moderate (male: 0.96 – 1.0 or female: 0.81 – 0.85)	20	8.4
High (male: >1.0 or female: ≥0.86)	157	65.7

*World Health Organization, **International Diabetes Federation; Underweight: BMI <18kg/M²; Normal weight: BMI = 18.5–24.9kg/M²; Overweight: BMI = 25–29.9kg/M²; Class 1 obesity: BMI = 30–34.9kg/M²; Class 2 obesity: BMI = 35–39.9kg/M²; Class 3 obesity: BMI ≥40kg/M²

Table 3: Prevalence of hypertension among attendees in dental clinic at AEFUTHA

Blood pressure category	Frequency N=239	Percent
Systolic BP		
Normal	219	91.6
High	20	8.4
Diastolic BP		
Normal	221	92.5
High	18	7.5
Combined BP		
Normal	231	96.7
High	8	3.3

High Systolic BP: >140mmHg; High Diastolic BP: >90mmHg; High Combined BP: >140/90mmHg

Table 4: Prevalence of DM among attendees in dental clinic at AEFUTHA

Variable	Frequency	Percent
FBS (mg/dl)		
N=132		
Normal (70-100)	85	64.4
Impaired fasting glucose (101-125)	28	21.2
Diabetes Mellitus (≥126)	19	14.4
RBS (mg/dl)		
N=93		
Normal (<200)	89	95.7
Diabetes Mellitus (≥200)	4	4.3
Blood sugar status (FBS or RBS)		
N=225		
Normal (FBS <126 OR RBS <200)	202	89.8
Diabetes Mellitus (FBS ≥126 OR RBS ≥200)	23	10.2

Table 1. Anthropometric profile of attendees in dental clinic at AEFUTHA

Variable	Mean ± SD* N=239	Range
Weight (kg)	70.7±13.9	35.0-117.0
Height (cm)	1.6±0.1	1.3-2.0
Body Mass Index(kg/m ²)	26.8±5.4	15.6-41.8
Waist circumference (cm)	59.3±25.4	29.0-123.6
Hip circumference (cm)	55.5±22.1	24.0-119.0
Neck circumference (cm)	23.6±10.3	12.0-51.0
Waist-hip ratio	1.07±0.3	0.50-2.80
Systolic BP (mmHg)	113.4±14.7	70.0-171.0
Diastolic BP (mmHg)	70.2±9.7	50.0-101.0

*Standard Deviation

Discussion

The cardio-metabolic non-communicable diseases including obesity, hypertension and diabetes were remarkably noted among dental patients involved in the study.

In a systematic study by Chinnasamy et al¹², the prevalence of undiagnosed diabetes and pre-diabetes in a dental clinic was reported as 11.23% and 47.48%. The finding is similar to the prevalence of diabetes (14.4%) but far higher than the prevalence of prediabetes (21.2%) deduced in this study. This goes to establish an inter-link between diabetes or prediabetes and dental pathologies. Chinnasamy and colleagues¹² recommended that targeted opportunistic screening can help reduce the prevalence of undiagnosed T2DM and prediabetes. Similarly, a study done in dental clinic in Saudi Arabia by Hadlaq et al²⁸, reported the prevalence of diabetes and hypertension among 283 participants as 10.2% and 44.8% respectively. The findings of Hadlaq and co-authors agreed with the prevalence of diabetes mellitus in this study. However, the prevalence of hypertension is higher than that (19.2%) from this study.

The prevalence of diabetes in dental clinic by Opeodu & Adeyemi²⁹, about 9 years ago, at the University College Hospital, Ibadan Nigeria reported a prevalence of diabetes mellitus among 203 dental clinic attendees as 4.4%. This shows an upward trend when compared to the finding of 11.47% in this study which also corroborates the increasing prevalence of diabetes worldwide⁴. The prevalence of systolic and diastolic hypertension by Opeodu & Adeyemi²⁹, was 13.3% and 18.2% respectively which was unexpectedly higher than that of 8.4% and 7.5 % respectively as demonstrated in this study.

Ojehanon & Akhionbare³⁰ reported the prevalence of hypertension as 19.7% among patients attending dental clinic in a tertiary hospital in Edo state, Nigeria which is similar to the finding from this study. This may be explained by the similarity of environmental factors in both study areas. However, Hadlaq et al,²⁸ have reported a higher prevalence. Nnawuihe et al²⁰, have also reported a prevalence of hypertension as 29.9% among 231 dental attendees in a Nigerian dental clinic which is slightly higher than the finding from this study but it was a patient-reported prevalence which has some limitations of

either over-reporting or under-reporting.

The prevalence of obesity in a study group in Saudi Arabia by Hadlaq et al²⁸, was 35.7% which was higher than the finding from this study. The authors opined that dental clinic constitute a potential area for screening of cardio-metabolic diseases in a given population. Several studies have reviewed the link between obesity and dental disease^{31,32}. The prevalence of obesity was higher in this study (25.1%) but that of overweight (21.7%) was similar to the findings of Adeyamo et al⁷. Dental surgeries similar to other surgeries present with multiple complexities such as anaesthetic complications and venous thrombosis in obese individuals compared to those with normal weight³³, thus, the need for evaluation of obesity among those with dental diseases³⁴.

Limitations

The study did not use glycated hemoglobin but relied only on fasting blood sugar and random blood sugar for the diagnosis of diabetes which may reduce the reported prevalence of diabetes mellitus. The diagnosis of obesity can be objectively done using a dual-energy-ray absorptiometry (DEXA) but the study was done in a poor resource setting which relied only on anthropometry.

Conclusion

The prevalence of cardio-metabolic diseases is high in this cohort of dental patients thus, emphasizing the need for regular screening and evaluation of these patients who present to hospital for dental evaluation. This is very important as the mortality associated with cardio-metabolic diseases is very high globally and particularly in sub-Saharan African countries.

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through the manuscript and agreed on the contents.

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