

**PREVALENCE OF HALITOSIS AMONG TRADERS AT OLUKU MARKET, OVIA
NORTH EAST LGA, BENIN CITY.**

BY

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**A PROJECT SUBMITTED TO THE DEPARTMENT OF COMMUNITY DENTISTRY,
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**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE
DEGREE OF BACHELOR IN DENTAL SURGERY (BDS)**

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CERTIFICATION

This is to certify that the research study titled “**PREVALENCE OF HALITOSIS AMONG TRADERS AT OLUKU**” was carried out by Oluka Damilola Isaac, Olotu Osayuwamen Kelvin, Omonode Joy Ufuoma, Osakue Stephanie Ejehi and Osayande Christabel Aiwansosa with matriculation number DEN1702343, DEN1502134, DEN1602081, DEN1602083 and DEN1602084 respectively under supervision in the Department of Community Dentistry, School of Dentistry, University of Benin as part of the requirements for the award of Bachelor of

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DECLARATION

We hereby declare that this project work titled “**PREVALENCE OF HALITOSIS AMONG TRADERS AT OLUKU**” has been conducted under the supervision of **PROF. ALICE A. UNWENI** and has neither been presented nor published anywhere else in part or in full for any other purpose.

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DEDICATION

This work is dedicated to Almighty God, whose guidance, wisdom, and blessings have been the foundation of our endeavors. We also dedicate this research to our beloved families, whose unwavering support, encouragement, and love have inspired us throughout this journey.

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TABLE OF CONTENTS

CONTENTS	PAGES
Title page - - - - -	i
Certification- - - - -	ii
Declaration- - - - -	iii
Dedication- - - - -	iv
Acknowledgements- - - - -	v
Table of contents- - - - -	vi
List of tables- - - - -	x
List of figures-- - - - -	xi
List of abbreviations- - - - -	xii
Definition of terms- - - - -	xiii
Abstract- - - - -	xv

CHAPTER ONE

Background- - - - -	1
Epidemiology- - - - -	2

Aetiology-	-	-	-	-	-	-	-	-	-	-	3
Effect of halitosis	-	-	-	-	-	-	-	-	-	-	5
Treatment of halitosis -	-	-	-		-	-	-	-	-		7
Justification-	-	-	-	-		-	-	-	-	-	9
Research objectives	-	-	-		-	-	-	-	-		10

CHAPTER TWO

Literature review-	-	-	-	-	-	-	-	-	-	-	11
--------------------	---	---	---	---	---	---	---	---	---	---	----

CHAPTER THREE

Study area-	-	-	-	-	-	-	-	-	-	-	14
Study design-	-	-	-	-	-	-	-	-	-	-	15
Study population	-	-	-	-	-	-	-	-	-	-	15
Study duration-	-	-	-	-	-	-	-	-	-	-	15
Selection criteria-	-	-	-	-	-	-	-	-	-	-	15
Sampling technique-	-	-	-	-	-	-	-	-	-	-	16

Method of data collection-	-	-	-	-	-	-	-	-	-	16
Statistical analysis-	-	-	-	-	-	-	-	-	-	17
Ethical consideration-	-	-	-	-	-	-	-	-	-	18

CHAPTER FOUR

Results-	-	-	-	-	-	-	-	-	-	19
----------	---	---	---	---	---	---	---	---	---	----

CHAPTER FIVE

Discussion-	-	-	-	-	-	-	-	-	-	46
Conclusion-	-	-	-	-	-	-	-	-	-	50
Recommendations-	-	-	-	-	-	-	-	-	-	51
References-	-	-	-	-	-	-	-	-	-	52
Appendix I -	-	-	-	-	-	-	-	-	-	55
Appendix II -	-	-	-	-	-	-	-	-	-	58

LIST OF TABLES

Table 1: Sociodemographic characteristics of respondents--	-	-	-	21
Table 2: Determinants of potential risk factors of halitosis- -	-	-	-	28
Table 3a: Awareness of halitosis among traders	-	-	-	37
Table 3b: Association between halitosis and other dental and medical condition	-			44

LIST OF FIGURES

Figure 1: In the last month has your breath affected your life at workplace -	-	-24
Figure 2: Prevalence of perception of bad breath - - - -		-25
Figure 3: Prevalence of good oral hygiene among respondents- - - -		-31
Figure 4: Has halitosis impacted business and social activities- - - -		-34
Figure 5: Impact of halitosis on traders- - - - - - -		-42

LIST OF ABBREVIATIONS

BANA:	Benzoyl-DL-Arginine-Naphthylamide
CI:	Confidence Interval
HTN:	Hypertension
LGA:	Local Government Area
OR:	Odds Ratio
SPSS:	Statistical Package for the Social Sciences
VSC:	Volatile Sulfur Compounds

DEFINITION OF TERMS

Antiseptic Mouthwash: A liquid solution designed to be used for rinsing the mouth, containing agents that kill or inhibit the growth of microorganisms, particularly bacteria, to help reduce oral infections and maintain oral hygiene.

Dry Mouth (Xerostomia): A condition characterized by a reduction in the flow of saliva, leading to oral discomfort, increased risk of oral infections, difficulty swallowing, and a higher incidence of dental decay and bad breath.

Extraoral Halitosis: Halitosis (bad breath) originating from sources outside the oral cavity, such as respiratory or gastrointestinal diseases, metabolic disorders, or systemic illnesses.

Flossing: The use of dental floss or similar material to mechanically remove food particles, plaque, and bacteria from between the teeth and below the gumline to prevent dental plaque buildup, gingivitis, and bad breath.

Gingivitis: Inflammation of the gingiva (gums), typically caused by the accumulation of plaque on the teeth, resulting in redness, swelling, bleeding, and potential bad breath if left untreated.

Halitosis: A medical condition characterized by persistent or chronic bad breath, which may be caused by poor oral hygiene, systemic diseases, or bacterial activity in the mouth.

Intraoral Halitosis: Bad breath originating from the mouth, usually caused by bacterial decomposition of food particles, dead cells, and saliva on the tongue, teeth, or gums.

Mouthwash: An aqueous solution containing active ingredients, typically antimicrobial agents, used for rinsing the mouth to reduce bacteria, improve breath freshness, and support oral hygiene.

Oral Hygiene: The practice of maintaining cleanliness and health of the mouth, including regular brushing, flossing, and other oral care routines, to prevent dental decay, gum disease, and bad breath.

Plaque: A soft deposit that adheres to teeth and consists of bacteria embedded in an extracellular matrix.

Saliva: A watery secretion produced by the salivary glands that helps to maintain oral health by moistening the mouth, neutralizing acids, aiding in digestion, and controlling bacterial growth.

Sulfur Compounds: Volatile compounds, including hydrogen sulfide and methyl mercaptan, produced by bacteria in the mouth as they break down food particles, which contribute to the foul odor associated with halitosis.

Tongue Cleaning: The process of using a tongue scraper or toothbrush to remove bacteria, dead cells, and debris from the surface of the tongue, which can reduce the bacterial load in the mouth and alleviate bad breath.

ABSTRACT

Background: Halitosis, or bad breath, affects social interactions and quality of life. While prevalent globally, its determinants and impacts are under-researched in specific communities, such as traders in Nigeria.

Objective: This study aimed to evaluate the prevalence, risk factors, and impacts of halitosis among traders at Oluku Market, Benin City, and assess their awareness and oral hygiene practices.

Methodology: A cross-sectional study involving 100 traders was conducted using structured questionnaires to collect data on sociodemographics, oral hygiene habits, awareness, and halitosis-related impacts. Statistical analyses included logistic regression to identify potential determinants.

Results: The prevalence of self-reported halitosis was 22%. Good oral hygiene practices were reported by 91% of respondents, but only 35% had ever visited a dentist. Awareness of halitosis was high (87%), primarily sourced from informal networks. No significant associations were found between halitosis and underlying medical or dental conditions.

Conclusion: While halitosis prevalence was relatively low, the study highlighted gaps in professional dental care access and reliance on informal awareness channels. Strengthening healthcare outreach and education programs can further mitigate halitosis impacts.

Keywords: Halitosis, oral health, prevalence, risk factors, market traders, Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The term "halitosis" originates from the Latin "halitus" and Greek "osis," describing an unpleasant odor from the oral cavity. Dating back to ancient Egypt, remedies like toothpaste and breath mints were documented over 3,000 years ago. Historical practices include mouthwash with red wine and spices, while advancements in the 1860s led to the use of antiseptics like Listerine. Dr. Joseph Lawrence and Robert Wood Johnson, founder of Johnson & Johnson, promoted antiseptics as a means of protecting patients in the 1870s. Fifty percent of people worldwide perceive themselves as having halitosis, with 90% of cases originating intraorally.³

In Nigeria, a study by dentists revealed varying perceptions of halitosis etiology. The dentists attributed halitosis to poor oral hygiene, caries, periodontal diseases, psychogenic causes, and systemic diseases. A majority of dentists conducted investigations to diagnose halitosis, acknowledging the role of psychological factors in its etiology. The study highlights the multifactorial nature of halitosis and underscores the importance of comprehensive assessment and management strategies.

Halitosis, also known as bad breath or malodor, can have significant social and psychological impacts on individuals, leading to discomfort and embarrassment^[1] While ancient civilizations utilized herbal remedies and mouthwashes to combat bad breath, modern advancements in antiseptics and oral hygiene products have contributed to improved management strategies^[2] The study of halitosis in Nigeria sheds light on cultural and regional variations in perceptions and

approaches to oral health. Overall, understanding the historical context and contemporary research findings is crucial for effectively addressing halitosis and promoting oral health worldwide.

1.2 EPIDEMIOLOGY

Halitosis, affecting approximately 1 in 4 people globally, presents a significant public health concern. Epidemiological research indicates a prevalence of around 2.4% in adults, with studies conducted worldwide. ^[3] A meta-analysis synthesizing data from various databases, including Pubmed and SCOPUS, revealed a combined prevalence of 31.8%. Methodological factors such as publication year and socioeconomic status influenced the prevalence rates.

Prevalence of halitosis tends to increase with age, particularly in adults over 40 years, attributed to factors like dry mouth, impaired immunity, and oral infections such as gingivitis and periodontitis. ^[4] Studies in Nigeria revealed a prevalence of 14.5% among patients at the University College Hospital and 13% among tertiary institution students in Lagos. Additionally, a study at the University of Benin Teaching Hospital identified 68 cases of delusional halitosis, predominantly among students aged 20-29 years, ^[5] highlighting the social and academic implications of the condition within the university community. These findings underscore the need for heightened awareness and comprehensive management strategies for halitosis, particularly among vulnerable populations.

1.3 AETIOLOGY

Halitosis, commonly known as bad breath, arises from volatile molecules of various origins, either physiological or pathological. [6] These molecules include sulfur compounds, aromatic compounds, nitrogen-containing compounds, amines, fatty acids, alcohols, phenyl compounds, aliphatic compounds, and ketones [7]. Intraoral halitosis, primarily caused by volatile sulfur compounds like hydrogen sulfide and methyl mercaptan, accounts for 90% of cases. [8] Extraoral halitosis, attributed to compounds like indole, dimethyl selenide, skatole, and urea, presents additional challenges. [9]

Multiple factors contribute to intraoral halitosis, with temperature, [10] humidity, [11] and reduced saliva flow playing significant roles. Reduced saliva flow, often due to medications, salivary gland diseases, or mouth breathing, creates an environment conducive to bacterial growth. [12] Poor oral hygiene exacerbates halitosis by allowing bacterial plaque accumulation, leading to gingival and periodontal diseases, carious lesions, and denture-related issues. Even in healthy individuals, bacteria retention on the tongue surface can produce odorous compounds.

Understanding the multifactorial origins of halitosis underscores the importance of comprehensive oral hygiene practices and addressing underlying systemic conditions to effectively manage this prevalent condition.

The Bacteria responsible for halitosis in relation to the volatile compounds produced:

Volatile sulphur compounds

These compounds and bacteria responsible are [13];

Hydrogen sulfide from cysteine:

Peptostreptococcus anaerobius, Micros Prevotii, Eubacterium, Limosum, bacteroides spp.
Centipedia periodontii.

Hydrogen sulfide:

Prevotella intermedia, Prevotella loescheii, Porphyromonas gingivalis (BANA positive),
Treponema denticola (BANA positive) Selenomonas artermidis.

Methionine:

Fusobacterium nucleatum, Fusobacterium periodonticum, Eubacterium spp, Bacteroides spp.

Others:

Prevotella melaninogenica, Tanerella forsythensis, Eikenella corrodens, Solobacterium
moorei, Treponema forsythensis, Centipeda periodontii, Atopobium parvulum.

Halitosis originating from extraoral sources accounts for approximately 8% of cases and can stem from systemic conditions or external factors. Systemic conditions include respiratory diseases such as sinusitis, bronchitis, and lung infections, gastrointestinal issues like reflux esophagitis and malabsorption syndromes, endocrine disorders like uncontrolled diabetes, hepatic diseases, metabolic disorders, hematological conditions, and kidney diseases. External causes of halitosis include consumption of certain foods like garlic and onions, intake of substances such as alcohol and tobacco, and use of certain drugs like chloral hydrate and phenothiazines. These factors contribute to transient unpleasant odors or halitosis.

1.4 EFFECT OF HALITOSIS

Halitosis have various effects on individuals, both socially and psychologically. Here are some effects:

SOCIAL IMPACT: ^[14]

Persistent bad breath can result in social discomfort and embarrassment for individuals. The fear of being judged or ridiculed for their breath odor may cause individuals to withdraw from social interactions, leading to feelings of isolation and loneliness. People with halitosis may also find themselves avoiding close conversations or maintaining a distance from others, fearing that their breath odor will be noticed and negatively perceived. This can have detrimental effects on their personal relationships, as well as their professional ones, as colleagues and clients may be put off by the offensive odor. Additionally, social activities such as meetings, gatherings, and public speaking engagements may become sources of anxiety and stress for individuals with bad breath, as they worry about the impact of their breath odor on others' perceptions of them.

PSYCHOLOGICAL EFFECT: ^[15]

Halitosis contributes to negative emotions and attitudes, such as self-consciousness and low self-esteem. Individuals may feel judged or rejected due to their bad breath, leading to heightened levels of anxiety and depression. This fear of social stigma can result in social withdrawal and avoidance behaviors, further exacerbating feelings of isolation and loneliness.

INTERPERSONAL RELATIONSHIPS: ^[16]

Bad breath can strain interpersonal relationships, causing friction and misunderstandings among friends, family members, and romantic partners. People with halitosis may encounter social stigma and discrimination, leading to feelings of isolation and alienation

The quality of professional connections and networking opportunities may be compromised due to the perceived negative impression caused by bad breath

IMPACT ON DAILY LIFE: ^[17]

Maintaining proper oral hygiene becomes challenging for those grappling with halitosis. Despite their efforts, individuals may struggle to combat plaque buildup and gum disease, as the persistent presence of bad breath can dampen their motivation to adhere to oral health practices.

PROFESSIONAL CONSEQUENCES

In professional settings, halitosis can have detrimental effects on career advancement and success, as colleagues and supervisors may perceive individuals with bad breath negatively

Job performance and productivity may be affected due to the psychological distress and distraction caused by concerns about breath odour

Individuals with halitosis may face challenges in networking and building professional relationships, impacting their opportunities for career growth and development

1.5 TREATMENT OF HALITOSIS^[18]

Maintaining fresh breath involves more than just using mouthwash. It requires a holistic approach to oral hygiene and lifestyle habits. Here's how you can effectively combat bad breath:

Good oral hygiene is the cornerstone of preventing and treating bad breath. This means brushing your teeth at least twice a day, flossing daily to remove plaque and food particles between teeth, and cleaning your tongue to eliminate bacteria and residue. Regular dental check-ups and professional cleanings are also crucial to address underlying oral health issues like gum disease or tooth decay, which can contribute to bad breath.

Mouthwashes play a role in controlling bad breath. Antiseptic mouthwashes containing ingredients like chlorhexidine or cetylpyridinium chloride can reduce oral bacteria, while oxygenating mouthwashes with chlorine dioxide or hydrogen peroxide neutralize volatile sulfur compounds (VSCs) responsible for odor.

Cleaning your tongue is often overlooked but essential for fresh breath. Tongue scrapers or cleaners remove bacteria, debris, and dead cells from the tongue's surface, reducing the risk of halitosis. Regular tongue cleaning, ideally done twice a day, should be part of your oral hygiene routine.

Diet also affects breath freshness. Avoiding foods and beverages known to contribute to bad breath, such as garlic, onions, coffee, and alcohol, can help minimize odor. Increasing water intake and chewing sugar-free gum or mints stimulate saliva production, naturally washing away bacteria and food particles.

Sometimes, bad breath indicates underlying oral health issues like gum disease, tooth decay, dry mouth (xerostomia), or oral infections. Treating these conditions is crucial for managing halitosis. Consulting with a dentist or healthcare provider can help identify and address any underlying issues contributing to bad breath, ensuring long-term oral health and freshness.

By adopting these strategies and maintaining a consistent oral care routine, you can effectively combat bad breath and enjoy lasting freshness and confidence in your smile.

JUSTIFICATION FOR RESEARCH

The investigation into the prevalence of halitosis among traders at Oluku Market in Ovia North East LGA, Benin City, Nigeria, is of paramount importance due to its multifaceted implications. Halitosis, or bad breath, is a widespread oral health issue globally, affecting individuals of all demographics, and understanding its prevalence among traders provides crucial insights into the community's oral health status. Moreover, halitosis can have profound social and psychological impacts, leading to embarrassment and diminished self-esteem, particularly relevant in a market where traders interact with a diverse clientele daily. Identifying specific risk factors contributing to halitosis within the trading environment is essential for implementing targeted preventive measures and oral health promotion strategies tailored to the market's needs.

Furthermore, a study on halitosis prevalence can empower the community by raising awareness about oral hygiene and dental care practices, ultimately improving traders' oral health and overall quality of life. Additionally, addressing research gaps by focusing on halitosis prevalence among specific population groups, such as traders in local markets, contributes to a more comprehensive

understanding of oral health disparities and informs evidence-based interventions. In conclusion, research on halitosis prevalence among traders at Oluku Market serves as a vital step towards improving public health outcomes, social dynamics, community empowerment, and scholarly contributions to oral health research.

RESEARCH OBJECTIVES

- To determine the severity and frequency of halitosis among the traders.
- To identify potential risk factors contributing to halitosis among the traders, such as dietary habits, tobacco use, and access to dental care.
- To assess the oral hygiene practices among the traders.
- To determine the impact of halitosis on their social interactions and business activities.
- To determine their level of awareness of halitosis and its impact on oral health.
- To assess the association between halitosis and any underlying dental or medical condition among the traders.
- To provide education on how the traders can improve their oral health and treat halitosis.

2.0

LITERATURE REVIEW

2.1 HALITOSIS OVERVIEW

Halitosis, commonly referred to as bad breath, plays a significant role in social communication, often serving as a negative factor that affects interpersonal interactions^[19]. Despite its prevalence, only a limited number of studies have reported on the occurrence of halitosis in the general population. Given the social and health consequences of halitosis, there is a critical need for comprehensive epidemiological, etiological, and measurement studies aimed at understanding the global prevalence of this condition. Such research should also identify the key factors associated with halitosis, including age, gender, socioeconomic status, oral health, and general health. Understanding these factors is crucial for addressing this condition and mitigating its impact on individuals' social and psychological well-being.

2.2 Aetiology of Halitosis

Halitosis is a multifactorial condition that arises from a combination of oral and non-oral factors. However, research indicates that over 70% of cases of halitosis are attributed to oral conditions, commonly referred to as oral malodour^[20]. The primary cause of oral malodour is the presence of volatile sulfur compounds (VSCs) produced by the metabolic activities of bacteria in the mouth. These bacteria typically reside on the tongue, gums, and teeth, and they break down food particles, proteins, and other organic matter, producing foul-smelling gases^[21]. Additionally,

non-oral factors such as systemic diseases, gastrointestinal issues, and certain medications can also contribute to the development of halitosis, though these cases are less common^[22].

2.3 Methods of Measuring Halitosis

Accurate assessment of halitosis is essential for diagnosis and effective treatment. Several methods are used to measure halitosis, each offering unique insights into the condition.

One of the most traditional approaches is **organoleptic measurement**, which involves the subjective assessment of breath odour by trained individuals. This is considered a gold standard for detecting and quantifying various malodorous substances, offering a high degree of accuracy and precision^[24]. These assessors use their sense of smell to evaluate the intensity of malodour, often employing standardized scales to quantify its severity. While this method remains widely used due to its simplicity, it is inherently subjective and prone to variability^[23].

Gas chromatography is another sophisticated method that separates and detects volatile compounds present in exhaled breath. By analyzing the composition of these compounds, this technique provides a detailed profile of the specific molecules responsible for halitosis. A related method, **sulphide monitoring**, focuses specifically on measuring volatile sulfur compounds such as hydrogen sulfide and methyl mercaptan, which are commonly associated with halitosis. Specialized instruments are used to assess the levels of these compounds in breath samples, providing an objective measure of malodor severity and its potential correlation with oral health status^[24].

In addition to these primary methods, alternative approaches have been developed to further enhance our understanding of halitosis and its underlying causes. One such method is the **BANA test** (benzoyl-DL-arginine-naphthylamide), a biochemical assay that detects the presence of specific bacteria associated with halitosis^[25]. **Chemical sensors** are another innovative tool for halitosis assessment. These sensors utilize selective receptors to detect specific volatile compounds in breath samples, offering a rapid and non-invasive means of evaluating halitosis. The convenience and speed of this method make it particularly suitable for point-of-care settings^[25].

Another technique is the **salivary incubation test**, which involves incubating saliva samples under controlled conditions to monitor the production of volatile sulfur compounds over time. This method can be particularly useful for diagnosing and monitoring halitosis, as it reflects the activity of bacteria in the oral cavity^[25].

Moreover, **β -galactosidase activity quantification** has been explored as a way to gain insights into the metabolic processes of oral bacteria. Since these bacteria play a crucial role in the development of halitosis, measuring their enzymatic activity can provide valuable information about the severity of malodour and the potential treatment strategies^[25].

Other techniques, such as **ammonia monitoring**, focus on detecting ammonia gas in breath samples, which may indicate underlying oral health issues such as gum disease or tooth decay. Similarly, the **ninhydrin method** detects amino acids like lysine and arginine, which are metabolized by oral bacteria to produce malodorous compounds^[26]. Finally, **polymerase chain reaction (PCR)** is a molecular-level approach that amplifies and detects specific DNA

sequences from oral bacteria associated with halitosis. This technique offers a more precise and detailed diagnosis, enabling researchers and clinicians to identify the exact microbial species responsible for halitosis^[26].

In summary, a range of methods is available to assess halitosis, each with its strengths and limitations. While subjective measures like organoleptic assessment remain common, more sophisticated techniques such as gas chromatography, sulfur monitoring, and PCR provide valuable insights into the biological and microbial factors contributing to halitosis. As research continues to evolve, the development of more accurate, non-invasive, and rapid diagnostic tools will be essential for improving our understanding and management of this condition.

CHAPTER 3

3.0 RESEARCH METHODOLOGY

3.1 STUDY AREA

The study was conducted in Oluku, Benin City, Edo State, Nigeria. Oluku is a community within Ovia North-East Local Government Area, Edo State. It has emerged as a hub for commerce in Benin City and serves as a residential area for many people in the locality. Situated along the Benin-Lagos Expressway and the Oluku Eastern Bypass in Benin City, it is surrounded by several communities, including Ekiadolor, Okunmwum, Ogheghe, Utekon, Iduowina, and Isiohor. Oluku serves as a major gateway into Benin City from Lagos and Ondo States.

The community features key establishments such as a major market, the Seven-Up Bottling Company Oluku plant, Oluku Primary School (a public school), and several private and public healthcare centres. The marketplace in Oluku, managed by a community leader, was historically focused on food items but has since expanded to offer a wide variety of goods that reflect the local culture. This transformation has enhanced the market's success, attracting people not only for trade but also for social interaction, storytelling, and the celebration of traditions. The Oluku Market has become more than a commercial centre; it plays a vital role in preserving local traditions and supporting indigenous crafts, maintaining its importance as a cultural cornerstone of Benin City.

3.2 STUDY DESIGN

A cross-sectional study design was adopted for this study. The study aimed to describe the prevalence of halitosis among traders at Oluku Market, Ovia North-East LGA, Benin City.

3.3 STUDY POPULATION

The study will consist of Oluku market traders who sell provisions, food-stuffs/ingredients, wears, and consumable foods.

3.4 STUDY DURATION

The study spanned approximately one year, from April 2023 to May 2024.

3.5 SELECTION CRITERIA

3.5.1 Inclusion Criteria

The eligible participants for this study included market Traders:

- Who sold one or more items from the target group of traders.

- Who were involved in direct contact with customers while working.
- Who were willing to participate in the study
- Who were available at the time of the study.

3.5.2 Exclusion Criteria

Market workers who did not partake in selling goods were excluded due to differing risk factors from those of traders who had direct contact with customers.

Traders who were unavailable at the time of the study were excluded.

Customers patronizing the traders were excluded from the study.

3.6 SAMPLING TECHNIQUE

3.6.1 Selection of Traders

A list of traders by their group in Oluku market was obtained from the market leader with the help of the delegates sent to the market.

Sampling procedures play a pivotal role in ensuring the representation of the study sample. Employing both convenience and stratified sampling techniques, the research aims to capture a diverse range of traders categorized by their education levels. This stratification facilitates a nuanced analysis of how educational background may influence halitosis prevalence among traders.

3.7 METHOD OF DATA COLLECTION

Data collection procedures were tailored to accommodate the diverse educational backgrounds of Oluku market traders. For non-educated traders, assistance is provided to ensure comprehension and accurate completion of the questionnaire, while educated traders independently respond to the questionnaire, fostering autonomy and minimizing potential biases.

A quantitative data collection tool will be used to collect information in line with objectives of the study. The tool is a structured self-administered questionnaire which will consist of questions. The questions will be grouped into the following sections to gather the necessary information.

3.8 STATISTICAL ANALYSIS

QUANTITATIVE DATA ANALYSIS

Data entry and management was conducted using the SPSS software program. After data collection, all questionnaires were checked for completeness to minimize missing data.

Socio-demographic characteristics: Age, level of Education, profession, LGA and years of trading.

- 1) Age of respondents was entered as at the last birthday and grouped in the result section.
- 2) Level of Education was grouped into primary, secondary, tertiary and no formal Education.
- 3) Group of Trader
- 4) Years of Trading, ranging from <5 to >20 years.

3.9 ETHICAL CONSIDERATIONS

Institutional Consent:

Ethical clearance to conduct this research was obtained from the University of Benin Teaching Hospital Ethics and Research Committee.

Permission was obtained from the Dean of student affairs, University of Benin, Benin City.

Individual Consent:

Written informed consent was obtained from each respondent before conducting interviews. Confidentiality and privacy of the respondents was guaranteed during the interviews. In order to ensure confidentiality, serial numbers rather than names were used to identify the respondents. Respondents were given oral health education on how to deal with Halitosis.

4.0

CHAPTER FOUR

RESULTS

A total of 100 responses were recorded in the study, giving a response rate of 100%. The results are presented in the following sections in line with the specific objectives.

SECTION A: Socio-demographic characteristics of respondents

SECTION B: To determine the severity and frequency of halitosis among the traders.

SECTION C: To identify potential risk factors contributing to halitosis among the traders, such as dietary habits, tobacco use, and access to dental care.

SECTION D: To assess the oral hygiene practices among the traders.

SECTION E: To determine the impact of halitosis on their social interactions and business activities.

SECTION F: To determine their level of awareness of halitosis and its impact on oral health.

SECTION G: To assess the association between halitosis and any underlying dental or medical condition among the traders.

SECTION A:
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Table 1a: Socio-demographic characteristics of respondents

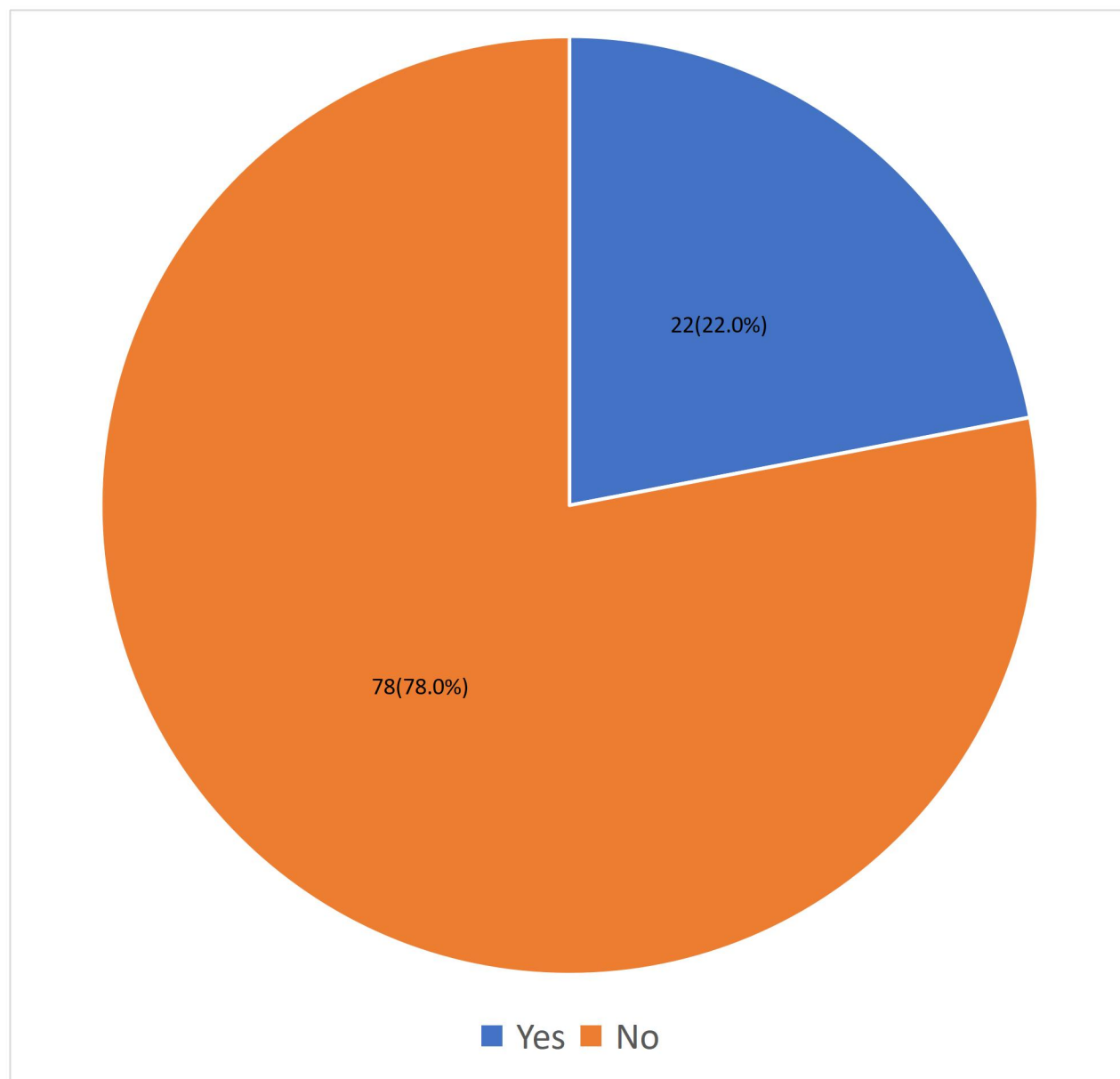
Variable	Frequency (n = 100)	Percent
Age (years)		
10 – 20	11	11.0
21 – 30	36	35.3
31 – 40	21	20.6
41 – 50	17	16.7
51 – 60	11	10.8
61 –70	3	2.9
71 -- 80	2	2.0
Sex		
Male	29	29.0
Female	71	71.0
Level of education		
No formal education	8	8.0
Primary	18	18.0
Secondary	47	47.0
Tertiary	27	27.0
Mean age: 35.500 ± 13.709 years,		

The sociodemographic characteristics of the respondents for age distribution revealed that the highest proportion of respondents (35.3%) were aged 21–30 months, followed by 31–40 months (20.6%) and 41–50 months (16.7%). Smaller proportions were found in the 10–20 months age group (11.0%), 51–60 months (10.8%), 61–70 months (2.9%), and 71–80 months (2.0%) with a Mean age: 35.500 ± 13.709 months. Regarding sex, a high proportion of respondents were female 71 (71.0%), while males accounted for 29 (29.0%). Also, level of education of the respondents reveals a good number of 47(47.0%) have attained secondary education, 27 (27.0%) tertiary education, and 18 (18.0%) primary education. A small proportion of respondents (8.0%) reported having no formal education.

This distribution highlights a predominantly female population with diverse educational backgrounds and a concentration in the younger age brackets.

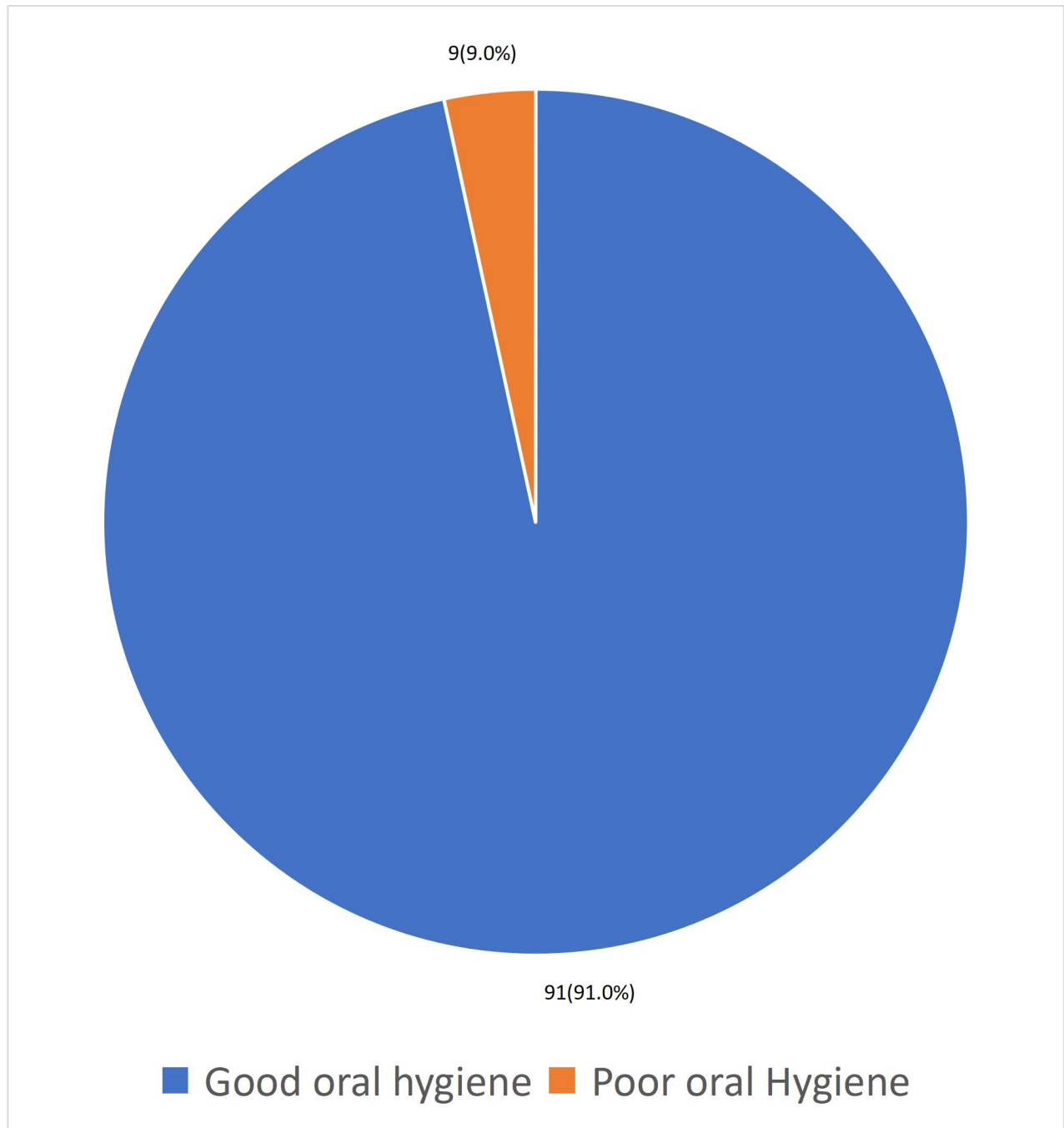
SECTION B

TO DETERMINE THE SEVERITY AND FREQUENCY OF HALITOSIS AMONG THE
TRADERS



IN THE LAST MONTH HAS YOUR BREATH AFFECTED YOUR LIFE AT WORKPLACE

About eighty-one (81.0%) of the respondents affirmed that workplace environment has not been affected by their breath, while a few 19 (19.0%) agreed that their breath has affected their workplace environment.



Do You Think You Have Bad Breath

About 78(78.0) of the respondents agreed that they don't have halitosis while a few 22(22.9) of the respondents agreed to have halitosis

SECTION C:

TO IDENTIFY POTENTIAL RISK FACTORS CONTRIBUTING TO HALITOSIS
AMONG THE TRADERS, SUCH AS DIETARY HABITS, TOBACCO USE, AND
ACCESS TO DENTAL CARE.

Table 2a: Determinants of potential Risk factors of Halitosis

Factors	B (regression co-efficient)	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Smoking					
Ever smoked	-0.208	0.812	0.185	3.567	0.783
Never smoked		1			
Dental visit					
Ever visited	-0.931	0.394	0.077	2.021	0.264
Never visited		1			
Do you take raw onion	0.433	1.542	0.385	6.168	0.541

		1			
Use local Cocortion	-0.857	0.424	0.155	1.159	0.094
Do you use raw garlic	-0.617	0.539	0.127	2.294	0.403

R² = 8.1 – 12.1%, p <0.05 is statistically significant; ** = Reference category

CI = Confidence interval; OR = Odds Ratio

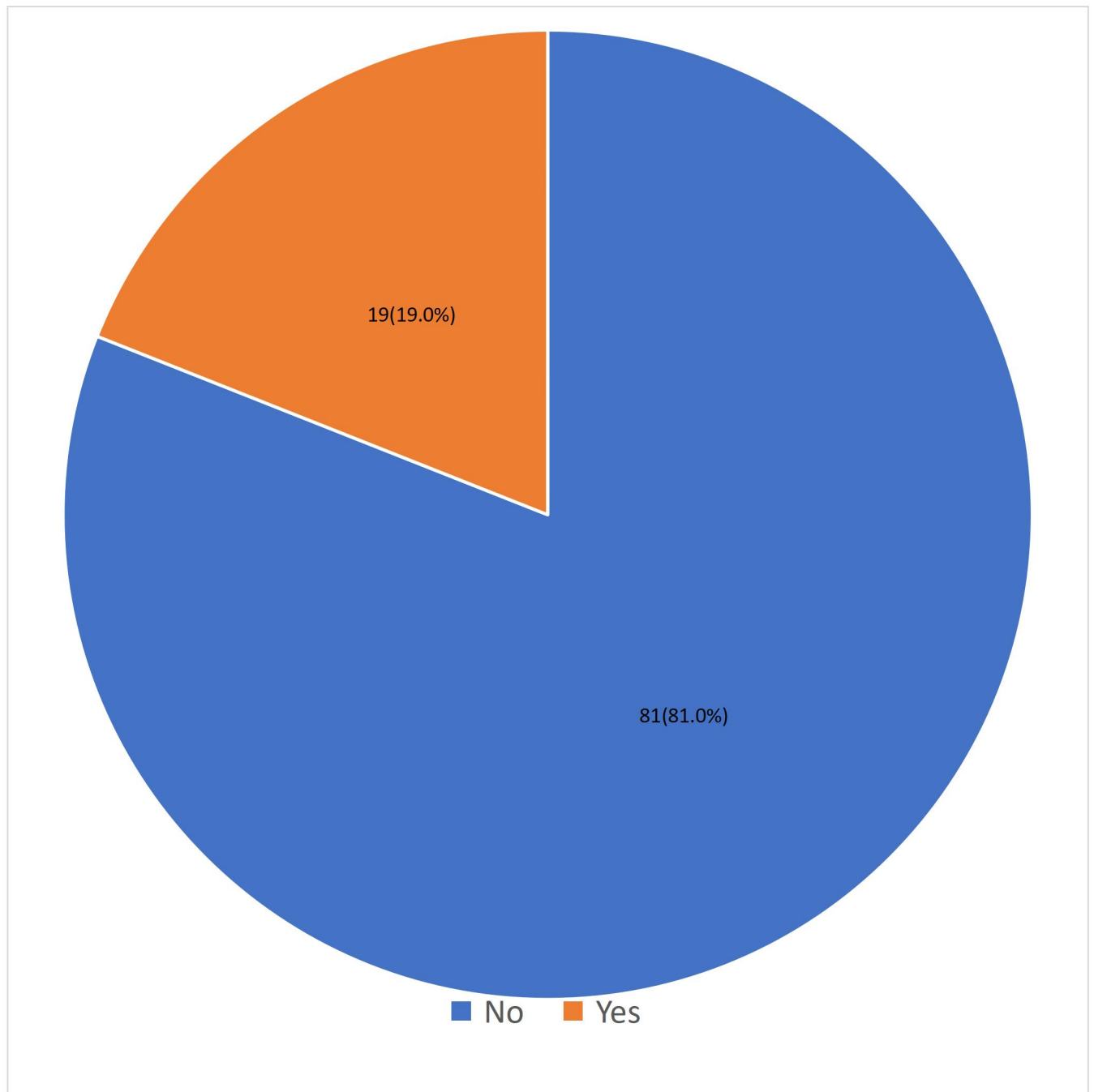
A logistic regression analysis was conducted to identify potential risk factors associated with halitosis. The results, indicate no statistically significant predictors ($p < 0.05$) among the factors analyzed. However, certain trends were observed which are for smoking history, respondents who had ever smoked were less likely to be associated with halitosis compared to those who had never smoked (Odds Ratio [OR] = 0.812; 95% Confidence Interval [CI]: 0.185–3.567, $p = 0.783$). However, this association was not statistically significant.

Individuals who had ever visited a dentist were less likely to be associated with halitosis compared to those who had never visited a dentist (OR = 0.394; 95% CI: 0.077–2.021, $p = 0.264$). While this factor showed a possible protective trend, it did not achieve statistical significance. Consumption of raw onions was associated with a slightly increased likelihood of halitosis (OR = 1.542; 95% CI: 0.385–6.168, $p = 0.541$). Despite this, the result was not statistically significant. Respondents who used local concoctions were less likely to be associated with halitosis compared to those who did not (OR = 0.424; 95% CI: 0.155–1.159, $p = 0.094$). While this result showed a trend toward significance, it did not meet the threshold for statistical significance. Consumption of raw garlic was associated with a reduced likelihood of halitosis (OR = 0.539; 95% CI: 0.127–2.294, $p = 0.403$). However, this association was not statistically significant. The logistic regression model explained between 8.1% and 12.1% (R^2) of

the variance in halitosis. None of the analyzed factors were statistically significant predictors of halitosis, as all p-values exceeded 0.05. The findings suggest that while certain behaviors, such as smoking, dental visits, and dietary habits (raw onion and garlic consumption), show potential trends in their relationship with halitosis, none demonstrated significant associations in this analysis. Further studies incorporating larger sample sizes and additional variables are recommended to better understand the risk factors for halitosis.

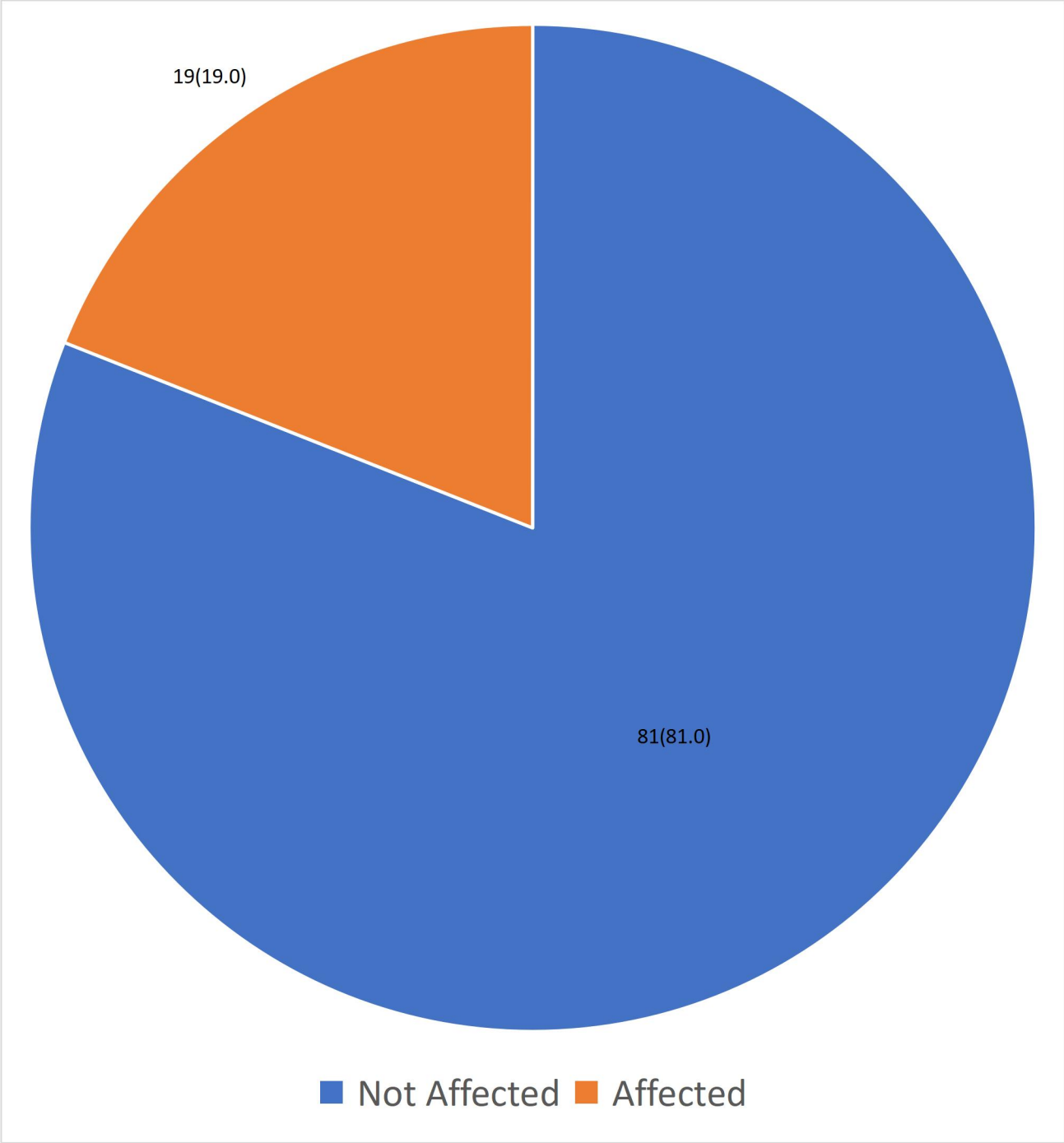
SECTION D:

TO ASSESS THE ORAL HYGIENE PRACTICES AMONG THE TRADERS.



The oral hygiene assessment among the respondents revealed that the majority demonstrated good oral practices, of the total participants, 91 individuals, representing 91.0%, were found to have good oral hygiene, indicating a strong adherence to proper oral care routines. Conversely, 9 respondents (9.1%) exhibited poor oral hygiene, reflecting a minority who may require targeted interventions or education to improve their oral health practices. These findings underscore the overall positive oral hygiene habits within the population, while also highlighting the need to address gaps in hygiene for a small segment of the respondents.

SECTION E:
TO DETERMINE THE IMPACT OF HALITOSIS ON THEIR SOCIAL INTERACTIONS
AND BUSINESS ACTIVITIES.



IMPACT OF HALITOSIS ON SOCIAL INTERACTION AND BUSINESS ACTIVITIES

The impact of halitosis on social interactions in the workplace was evaluated among the respondents. The majority, 81 respondents (81.0%), reported that halitosis has had little or no effect on their social life or interactions at work. However, a notable minority, 19 respondents (19.0%), acknowledged that halitosis has negatively impacted their workplace social interactions. This highlights that while most individuals do not perceive bad breath as a barrier in their work environment, a smaller group experiences its social repercussions, suggesting the need for targeted interventions to address and mitigate such challenges.

SECTION F:
TO DETERMINE THEIR LEVEL OF AWARENESS OF HALITOSIS AND IT'S IMPACT
ON ORAL HEALTH

Table 1a: Awareness Of Halitosis among Traders

Variable	Frequency (n = 100)	Percent
Have You Heard about Halitosis		
Yes	87	87.0
No	13	13.0
Source Of Information		
Television/Radio	36	36.0
Friends/ colleagues	56	56.0
Internet/social media	31	31.0
Books	23	23.0
Family members	41	41

A significant majority of the respondents (87%) reported having heard about halitosis, indicating a relatively high level of awareness among traders. However, 13% of respondents stated they were unaware of the condition, underscoring the need for further education and awareness campaigns. Sources of Information, respondents were allowed multiple choice in this section.

Among those who were aware of halitosis, the most common source of information was through friends or colleagues, cited by 56% of respondents. This highlights the role of interpersonal relationships and informal networks in disseminating knowledge about halitosis. Other notable sources of information included television and radio, mentioned by 36%, and family members,

referenced by 41% of respondents. Additionally, 31% of respondents credited the internet and social media as their source of information, reflecting the growing influence of digital platforms in health education. Books were the least common source, with 23% of respondents reporting obtaining information about halitosis through reading materials. While the awareness of halitosis among traders is relatively high, the findings indicate that informal networks such as friends and family play a critical role in spreading information about the condition. However, leveraging mass media and digital platforms could further increase awareness, particularly among those who remain uninformed. This data underscores the need for comprehensive and targeted public health education strategies to ensure accurate and widespread knowledge about halitosis and its implications.

Table 3b: Association between Awareness and sociodemographic characteristics of respondents

Variable	Awareness Of Halitosis		Test statistic	p-value
	Yes Freq (%)	No Freq (%)		
Age (years)				
10 – 20	3(15.3)	8(9.9)	6.053	0.417
21 – 30	4(21.1)	32(39.5)		
31 – 40	3(15.8)	18(22.2)		
41 – 50	3(15.8)	13(16.0)		
51 – 60	4(21.1)	7(8.6)		
61 – 70	1(5.3)	2(2.5)		
71 -- 80	1(5.3)	1(1.2)		

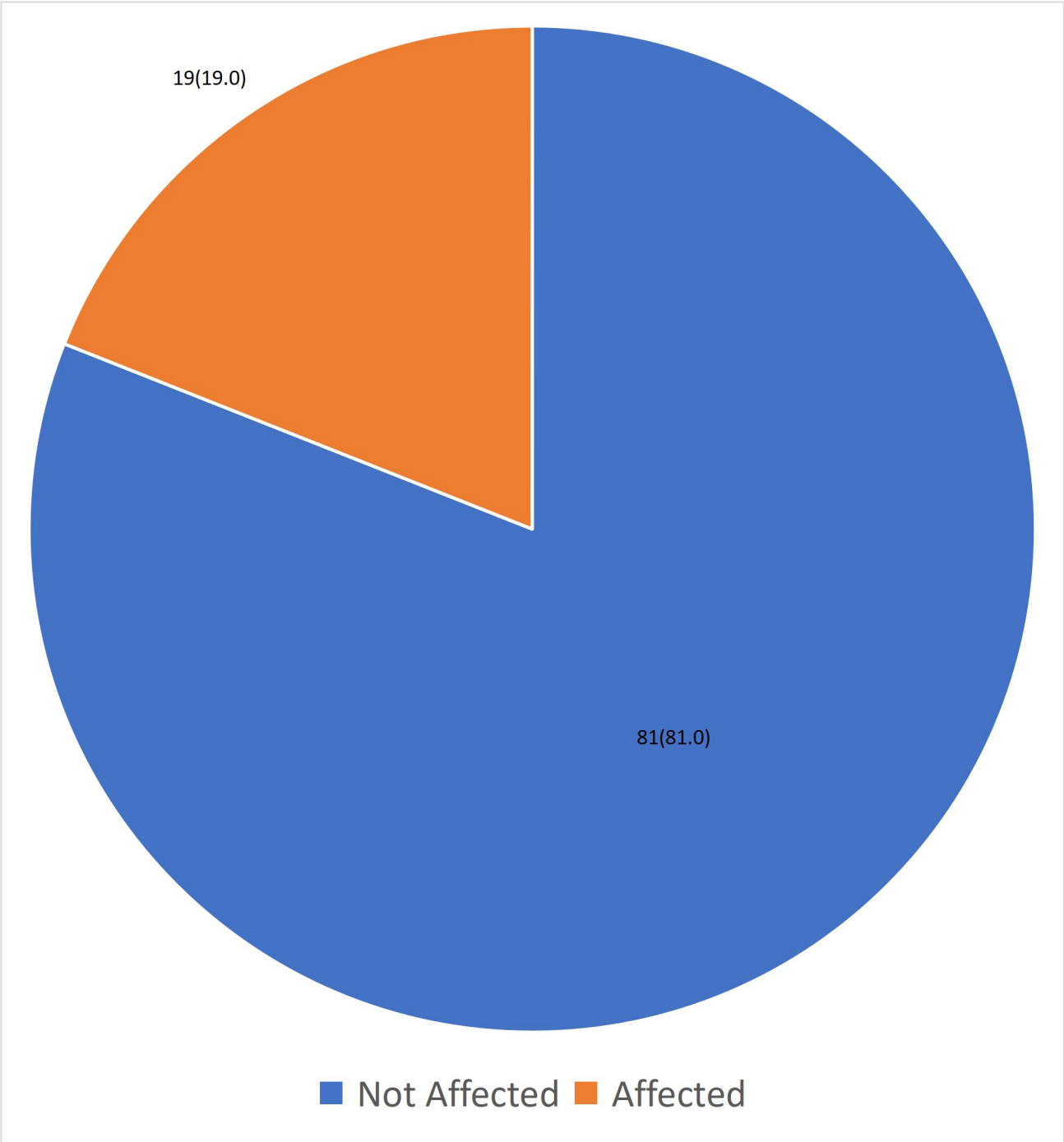
Sex

Male	9(47.4)	20(24.7)	3.844	0.050
Female	10(52.3)	61(75.3)		
Level of education				
No formal education	2(10.5)	6(7.4)	6.420	0.093
Primary	7(36.8)	11(13.6)		
Secondary	7(36.8)	40(49.4)		
Tertiary	3(15.8)	40(49.4)		

* = Chi-square test, ** = Fisher's exact test, $p < 0.05$

The study explored the association between awareness of halitosis and its perceived impact and the respondents' sociodemographic characteristics, including age, sex, and level of education. The findings are presented below. Age: The impact of halitosis awareness varied slightly across age groups. Among respondents aged 10–20 months, 15.3% reported being affected by halitosis, while 9.9% in this age group indicated no awareness of its impact. Respondents aged 21–30 months reported the highest rate of awareness and impact at 21.1%, compared to 39.5% who were not affected. The pattern for other age groups showed no clear trend, with those aged 31–40 months (15.8% affected, 22.2% not affected) and 41–50 months (15.8% affected, 16.0% not affected) demonstrating similar levels of awareness. There were minimal responses among those aged 51–80 months, with proportions ranging from 5.3% to 21.1% affected and 1.2% to 8.6% not affected. The association between age and awareness of halitosis was not statistically significant ($p = 0.417$). Sex A slightly higher proportion of females (52.3%) than males (47.4%) reported being affected by halitosis awareness and its impact. Conversely, a greater percentage of females (75.3%) than males (24.7%) indicated no awareness of halitosis or its impact. The association between sex and awareness of halitosis reached borderline statistical significance ($p = 0.050$), suggesting potential sex-related differences in awareness. Level of Education

Education levels appeared to influence halitosis awareness and its perceived impact. Among those with no formal education, 10.5% reported being aware of halitosis and its impact, compared to 7.4% in the same group who were not affected. For respondents with a primary education, 36.8% reported awareness, while 13.6% did not. Similarly, among respondents with secondary education, 36.8% reported awareness, while 49.4% did not. Interestingly, among those with a tertiary education, only 15.8% reported awareness, while 49.4% indicated no awareness. Despite these variations, the association between level of education and halitosis awareness did not reach statistical significance ($p = 0.093$). The analysis revealed some differences in halitosis awareness and its impact based on sociodemographic factors such as age, sex, and education level. While females were slightly more likely to report being aware of halitosis and its impact than males, and primary-educated respondents showed lower levels of awareness than those with secondary or tertiary education, none of these associations were statistically significant, except for a borderline effect related to sex. These findings highlight the need for targeted educational interventions to raise awareness of halitosis and its potential implications across various demographic groups.



Impact of Halitosis on Traders

The study assessed the perceived impact of halitosis (bad breath) on respondents' lives, with results indicating that the majority of participants were unaffected by the condition. Findings on Impact. A significant proportion of respondents (81%) reported that halitosis had no impact on their social interactions, daily activities, or general well-being. This suggests that, for most individuals, halitosis is not perceived as a significant barrier to personal or professional engagements. However, 19% of respondents stated that halitosis had affected them in some way. This minority highlights the potential for halitosis to influence social interactions, self-confidence, and possibly professional relationships, particularly in settings where close communication is necessary. Although the majority of respondents did not perceive halitosis as having a negative impact, the experiences of the affected minority underscore the importance of addressing this condition. Public health initiatives focusing on awareness and prevention of halitosis, such as promoting good oral hygiene practices and regular dental checkups, could help mitigate its impact, particularly for individuals who feel affected by it.

SECTION G:

TO ASSESS THE ASSOCIATION BETWEEN HALITOSIS AND ANY UNDERLYING
DENTAL OR MEDICAL CONDITION AMONG THE TRADERS.

Table 3b: Association between Halitosis and other dental and medical condition

Variable	Halitosis		Test statistic	p-value
	Present Freq (%)	Absent Freq (%)		
Any medical condition				
Diabetes	2 (2.0)	98 (98.0)	0.932	0.334
Asthma	16 (16.0)	84 (84.0)	0.117	0.732
HTN	6 (6.0)	94(94.0)	0.106	0.745
Arthritis	3 (3.0)	97 (97.0)	0.231	0.630
Toothache	2(2.0)	98(98.0)	0.932	0.334
Ulcer	8(8.0)	92(92.0)	0.046	0.841
Malaria	1(1.0)	99(99.0)	0.285	0.594

* = Chi-square test, ** = Fisher's exact test, $p < 0.05$

The study explored the relationship between halitosis and various medical or dental conditions among respondents Diabetes: Only 2.0% of respondents with halitosis reported having diabetes, compared to 98.0% without halitosis. However, this association was not statistically significant ($p = 0.334$). Asthma: Among respondents with halitosis, 16.0% had asthma, while 84.0% of those without halitosis also reported asthma. This association was not significant ($p = 0.732$).

Hypertension (HTN): A small proportion of respondents with halitosis (6.0%) reported having hypertension, compared to 94.0% without halitosis. No significant association was observed ($p = 0.745$). Arthritis: Similarly, only 3.0% of those with halitosis reported having arthritis, while 97.0% without halitosis had the condition, with no significant relationship ($p = 0.630$).

Toothache: Among respondents with halitosis, 2.0% reported experiencing toothaches, compared to 98.0% without halitosis. This relationship was not statistically significant ($p = 0.334$). Ulcer: Ulcers were reported by 8.0% of respondents with halitosis and 92.0% of those without halitosis. No significant association was found ($p = 0.841$).

Malaria: Only 1.0% of respondents with halitosis reported a history of malaria, compared to 99.0% without halitosis. This association was also not significant ($p = 0.594$).

Overall, the study did not find statistically significant associations between halitosis and any of the assessed medical or dental conditions, including diabetes, asthma, hypertension, arthritis, toothache, ulcers, or malaria. While some conditions showed minor differences in frequency, these were not significant enough to indicate a meaningful relationship.

DISCUSSION

Almost all respondents displayed behaviours or conditions that could potentially influence halitosis. However, the analysis revealed no statistically significant predictors among key risk factors such as dietary habits, tobacco use, and access to dental care. More than half (56%) of the traders reported consuming foods like raw onions, which are known to temporarily exacerbate oral malodor, while less than one-tenth (9%) admitted to using tobacco products. Conversely, the low tobacco usage rate may reflect a cultural preference or health awareness. The lack of statistical significance in these associations might be attributed to the relatively small sample size or homogeneity within the population.

Similarly, almost two-thirds (65%) of the respondents had never visited a dentist, highlighting the limited access to dental care in this population. This finding is in contrast to a study conducted in 2015 in Iran, where over two-thirds of respondents had visited a dentist within the past 6 months²⁷, showing the difference in dental health seeking behaviour. This could be due to differences in the level of awareness of importance of dental hygiene in the study populations. From a public health perspective, addressing these risk factors is crucial as they provide modifiable pathways to reduce halitosis prevalence. A recommendation is to establish mobile dental clinics in markets like Oluku to provide routine check-ups and education on risk factors, particularly dietary influences and the importance of regular dental visits.

When evaluating oral hygiene practices among the traders, an impressive majority—more than nine in ten (91%)—demonstrated good oral hygiene. This finding contrasts with a study conducted across 5 geopolitical zones in Nigeria in 2014 in similar populations, where oral hygiene adherence was notably lower, where about half (58.3%) had good oral health, and about one-quarter (26.4%) had good oral health practices²⁸. The high prevalence of good practices, such as regular toothbrushing and the use of mouthwash, reflects a strong baseline awareness of oral health among the respondents. However, a small proportion, roughly one in ten (9%), exhibited poor hygiene, highlighting a subgroup that may require targeted educational efforts. This discrepancy suggests that while most traders prioritize oral hygiene, there remains a minority potentially at risk of oral health issues. Public health strategies should include campaigns promoting the use of additional oral hygiene aids like tongue scrapers and antiseptic mouthwashes to enhance overall oral care. Introducing affordable oral hygiene kits tailored to market traders could further encourage better practices. Additionally, partnerships with local suppliers could reduce costs and improve accessibility to hygiene products.

The impact of halitosis on social interactions and business activities appeared limited, with more than four-fifths (81%) of respondents reporting that their breath had no adverse effect on workplace interactions. This result suggests that while halitosis can be a socially sensitive issue, it does not significantly hinder the majority of traders' interpersonal or business engagements. Nonetheless, approximately one-fifth (19%) of respondents acknowledged a negative impact, which aligns with findings from studies done in Romania in 2023 that highlight the psychological and social effects of halitosis both on the individual and on their relationships with others²⁹. This minority reflects the potential stigma and embarrassment associated with the

condition, warranting public health interventions aimed at reducing stigma through education and promoting empathy. The impact observed here might also be mitigated by the nature of interactions in a bustling market environment where close contact may be less emphasized compared to other professions. Encouraging open dialogue about halitosis within community forums and providing discreet treatment options would support those affected. Market associations could facilitate workshops on personal hygiene and communication skills to empower traders in addressing this concern.

Awareness of halitosis was relatively high among the traders, with nearly nine out of ten (87%) respondents indicating they had heard of the condition. Among these, friends and colleagues were the most common sources of information (56%), followed by family members (41%) and media platforms like television and social media (36%). These findings are similar to that seen in a study conducted among clinical students in Edo state, Nigeria in 2021, where almost all respondents (97.5%) had heard of halitosis., but contrasts with the study in that the main source of information among these students was from formal sources, not informal ones like social media or family³⁰. While the strong community-based channels in this study are advantageous, they may perpetuate misinformation or incomplete knowledge. The relatively lower contribution of healthcare professionals to awareness campaigns in this population suggests gaps in formal health education efforts. Public health initiatives should leverage existing interpersonal networks while introducing accurate, evidence-based messaging through professional-led outreach programs. Health talks and educational materials tailored to the market environment could enhance knowledge and correct misconceptions. Additionally, incorporating halitosis awareness into broader oral health campaigns could strengthen community understanding.

Finally, the study found no statistically significant association between halitosis and assessed dental or medical conditions such as diabetes, hypertension, or asthma. Almost all respondents with halitosis (98%) showed no concurrent medical conditions, suggesting a predominantly oral aetiology for the condition in this population. This finding aligns with a study done in Gondar, Ethiopia in 2021, which report oral causes as the dominant factor in halitosis cases, particularly those arising from poor hygiene or bacterial overgrowth, such as poor tooth brushing, smoking, mouth breathing and development of dental caries³¹. The absence of associations here might be attributed to the younger demographic of traders, with fewer systemic health issues compared to older populations. Nonetheless, systemic contributions to halitosis should not be dismissed entirely. Routine health screenings integrated into dental check-ups could facilitate early detection of underlying conditions that might contribute to oral malodour. Public health recommendations include training local health workers to conduct comprehensive assessments and referring cases requiring advanced care to specialized facilities.

In addition to these findings, providing education on halitosis management emerged as a pivotal aspect of the study. While most traders demonstrated good hygiene practices, knowledge gaps remain, particularly concerning the multifactorial nature of halitosis. Structured educational programs focusing on the causes, prevention, and management of halitosis could empower traders to adopt more effective strategies. Topics such as the role of diet, the importance of hydration, and recognizing systemic health indicators should be emphasized. Furthermore, traders should be encouraged to seek professional dental care regularly to address any potential underlying issues. Collaboration with local health authorities to organize workshops, distribute

informational leaflets, and offer subsidized dental care would significantly enhance the effectiveness of these efforts.

CONCLUSION

Among respondents, 22% reported experiencing halitosis, while 78% believed they did not. Additionally, 19% noted halitosis had affected workplace interactions, whereas 81% disagreed. Dietary habits, including raw onion consumption (43%) and limited dental care (65% had never visited a dentist), emerged as potential risk factors, though no statistically significant associations were found. Smoking, reported by 9%, was noted as a known risk factor.

Most respondents (91%) practiced good oral hygiene, such as regular toothbrushing and mouthwash use, while 9% exhibited poor habits. Tongue coating, a contributor to halitosis, was noted in 12%. Social and professional interactions were negatively impacted for 19% of respondents, indicating a minority faces stigma or challenges.

Awareness of halitosis was high (87%), with informal sources like friends (56%) and family (41%) serving as primary information channels. No significant associations were observed between halitosis and conditions like diabetes, hypertension, or asthma.

RECOMMENDATIONS

To the Government:

1. Implement community dental health campaigns focused on halitosis prevention and management.
2. Subsidize oral hygiene products and services to improve accessibility.
3. Develop policies encouraging routine dental check-ups in underserved populations.

To Healthcare Facilities:

1. Establish mobile dental clinics in markets like Oluku for periodic check-ups.
2. Train healthcare providers to recognize and manage halitosis comprehensively.
3. Organize public workshops on the importance of oral hygiene and its impact on social and professional life.

To Individuals:

1. Maintain consistent oral hygiene practices, including brushing twice daily and using mouthwash.
2. Seek regular dental check-ups to address potential oral health issues early.
3. Avoid habits and foods that may exacerbate halitosis, such as smoking or consuming raw onions and garlic.

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APPENDIX I

ASSESSMENT OF THE PREVALENCE OF HALITOSIS AMONG TRADERS AT OLUKU MARKET, OVIA NORTH EAST LGA, BENIN CITY.

We are Final Year Dental students of the University of Benin, Benin City. This questionnaire is designed to assess the prevalence of halitosis among traders in your market. All information given will be treated as confidential. Please mark and fill in any areas as appropriate. Thank you.

Section A: Social Demographic Characteristics

- 1) Age (in years): _____
- 2) Sex: Male () Female ()
- 3) Level of Education: No Formal Education () Primary () Secondary () Tertiary ()
- 4) Group of Trade(what you sell): Provision sellers () Food stuff/Ingredient () Wears ()
Food sellers () Others () Specify _____
- 5) Duration of Business (Years): <5 () 5-10 () 11-15 () 16- 20 () >20 ()

Section B: Assessment of Knowledge on Halitosis

- 6) Have you heard of the word halitosis/bad breathe? Yes () No ()
- 7) If yes, where did you hear about it? (**multiple responses allowed**) Radio/Television ()
Friends/Colleagues () Internet/Social Media () Books () Family Members ()
- 8) Do you think you have bad breathe? Yes () No ()
- 9) Have you ever had an examination for bad breath by your : Dentist () Physician ()
None ()
- 10) Have you ever received any treatment from your practitioner for bad breath? Dentist ()
Physician () None ()
- 11) Have you ever treated yourself for bad breath by: Self medication () Traditional
Medicine () None ()

- 12) In the last month, did your breath interfere with your social life at place of work? Yes ()
No ()
- 13) What time during the day do you find your breath the worst (**bad breath**)? After waking
up. () When hungry () When thirsty () While talking with other people () When
tired ()
Morning () Afternoon () All day ()
- 14) Put your right palm in front of your mouth and exhale (breath out). Do you have bad
breath? Yes () No ()

Section C: Assessment on Oral Hygiene and Dietary habit

- 15) a). Do you brush your teeth every day? Yes () No ()
b). Do you use chewing stick every day? Yes () No ()
c). Do you use toothbrush and chewing stick regularly? Yes () No ()
d). Do you use mouthwash regularly? Yes () No ()
e). Do you use toothpick regularly? Yes () No ()
- 16) a). Do you have tooth decay (dental caries)? Yes () No ()
b). Do you have bleeding gums? Yes () No ()
- 17) a). Do you have dryness of mouth, (dry mouth)? Yes () No ()
b). Do you smoke? Yes () No ()
- 18) a). Do you use local concoction regularly? Yes () No ()
b). Do you take raw onions? Yes () No ()
c). Do you take raw garlic? Yes () No ()
- 19) Is our tongue coated with white or yellowish deposits? Yes () No ()

Section D: Assessment on General health history

- 20) Do you have any existing health challenge? Yes () No (). if yes, please specify

- 21) Are you currently taking any medication(s)? Yes () No (). if yes, please specify

- 22) Do you smoke cigarettes or use other tobacco products? Yes () No ()

23) Do you consume alcohol regularly? Yes () No ()

24) Do you visit the dentist for regular check-ups? Yes () No ()

APPENDIX II

HEALTH RESEARCH ETHICS COMMITTEE (HREC)

UNIVERSITY OF BENIN TEACHING HOSPITAL
P.M.B. 111 BENIN CITY NIGERIA Telephone: 052 800418 Website: ubth.org

CHIEF MEDICAL DIRECTOR: Prof. Darlington E. Obovaki
DIRECTOR OF ADMINISTRATION: Jim Uwadiae, Esq.
CHAIRMAN: Prof. (Mrs.) Antoinette N. Ofili

HREC OFFICE:
Committee email: ubthresearchethics@gmail.com
Registration Number: NHREC-UBTH-HREC/24/12/2022B

PROTOCOL NUMBER: ADM/E 22/A/VOL. VII/1486549134

PROPOSAL TITLE: "PREVALENCE OF HALITOSIS AMONG TRADERS AT OLUKU MARKET, OVIA NORTH EAST LGA, BENIN CITY"

PRINCIPAL INVESTIGATOR(S): OLUKA DAMILOLA ISAAC, OLOTU OSAYUWAMEN KELVIN, OMONODE JOY UFUOMA, OSAKUE STEPHANIE EJEHL, OSAYANDE CHRISTABELAIWANSOSA

DEPARTMENT/INSTITUTION: DEPARTMENT OF COMMUNITY DENTISTRY, SCHOOL OF DENTISTRY, UNIVERSITY OF BENIN, BENIN CITY

DATE CONSIDERED: SEPTEMBER 3RD, 2024

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 03/9/2024 TO 02/9/2025. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI SIGNATURE & DATE: *A.N. Ofili 3/9/2024*

SUPERVISOR (S): PROF. ALICE A. UMWENI

DECLARATION BY INVESTIGATOR(S):
PROTOCOL NUMBER (please quote in all enquiries)
Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date: *Alice A. Umweni 23/09/2024*

 **ubthresearchethics@gmail.com** Registration Number: NHREC/24/01/2020