Orapuh Journal

OPEN ACCESS

ORIGINAL ARTICLE

Journal of Oral & Public Health

Etiology, Chewing Side Preference, and Associated Oral Health Effects of Unilateral Mastication Among Dental Patients in Enugu State, Nigeria

Ngwu, J. N.[1], Olofin, O. A.[2], Chiakwa, E.[3], Ezema, S.[4], & Ezeaku, A.[1]

[1]*Department of Dental Therapy, Faculty of Dental Health, Federal University of Allied Health Sciences, Enugu State, Nigeria*
[2]*Department of Community Health, Faculty of Healthcare Services, Federal University of Allied Health Sciences, Enugu State, Nigeria*
[3]*Department of Dental Therapy, Faculty of Basic Medical Sciences, University of Ilesa, Ilesa, Osun State, Nigeria*
[4]*Department of Dental Therapy, Enugu State Dental Clinic, Enugu State, Nigeria*

ARTICLE INFO

Received: *30 September 2026*
Accepted: *11 November 2026*
Published: *16 November 2026*

Keywords:
Unilateral mastication, etiology, preferred chewing side, temporomandibular joint disorders, toothache, malocclusion, Enugu State Dental Hospital

Peer-Review: *Externally peer-reviewed*

© 2026 The Authors.

Re-use permitted under CC BY-NC 4.0
No commercial re-use or duplication.

Correspondence to:
Dr. Justina Nnenna Ngwu
tinangwu@gmail.com

To cite:
Ngwu, J. N., Olofin, O. A., Chiakwa, E., Ezema, S., & Ezeaku, A. (2026). Etiology, chewing side preference, and associated oral health effects of unilateral mastication among dental patients in Enugu State, Nigeria. *Orapuh Journal, 7*(10), e1499. https://doi.org/10.4314/orapj.v7i10.99

ISSN: *2644-3740*

Published by ***Orapuh, Inc.***, F. Gaye Res., Sukuta-Jamisa, Greater Banjul, The Gambia.

Editor-in-Chief: *Prof. V. E. Adamu (editor@orapuh.org)*

ABSTRACT

Introduction

Unilateral mastication, the habitual use of one side of the mouth during chewing, is a prevalent oral parafunctional behavior associated with asymmetrical tooth wear, temporomandibular disorders (TMD), and compromised masticatory efficiency. Despite its clinical significance, there remains a paucity of empirical research investigating its primary etiological factors among adult dental patients in Nigeria.

Purpose

This study aimed to determine the etiology, preferred masticatory side, and associated clinical effects of unilateral mastication among patients attending the Enugu State Dental Hospital.

Methods

A descriptive cross-sectional survey was conducted among 168 adult patients. Data were gathered through structured interviews, comprehensive clinical oral examinations, and a validated researcher-developed data sheet. Inferential analyses were executed using Jamovi at an alpha level of $\alpha = 0.05$, incorporating Chi-Square tests, Fisher's exact tests, binary logistic regression models, and Chi-Square goodness-of-fit tests.

Results

The participant cohort was predominantly female (75.6%), with a modal age range of 41 to 50 years. The most prevalent etiological factors identified were pain-related dental pathology from caries and periodontitis (75.0%), malocclusion (50.6%), and learned preference or habit (45.2%). Gender exhibited no statistically significant association with any etiology. Age emerged as a statistically significant predictor exclusively for TMD-related unilateral mastication (OR = 1.024, p = .034). A significant preference for the right side of the mouth for mastication was observed (59.5%, p = .014). The most frequent clinical sequelae were poor oral hygiene (83.9%) and dental attrition (69.0%). Notably, temporomandibular disorders were reported more frequently as an etiological driver (24.4%) than as a clinically observed effect (6.5%).

Conclusion

Unilateral mastication within this clinical population is predominantly propelled by pain-driven dental pathology and structural malocclusion. While gender exerts no influence on etiology, advancing age significantly predicts TMD-associated unilateral mastication. Dental clinicians should prioritize early intervention for localized oral pain and implement targeted oral hygiene instructions for the non-functional chewing side to mitigate long-term adverse oral health consequences.

INTRODUCTION

Mastication is an intricate, rhythmic, and largely automatic motor process. Its foundational neural pattern is generated by a central pattern generator located within the brainstem and is dynamically modulated by continuous sensory feedback originating from the teeth, periodontium, masticatory muscles, and temporomandibular joints (TMJs), alongside descending neural inputs from higher cortical centers (Morquette et al., 2012). The stomatognathic system—comprising the dental arches, supporting bone, skeletal jaws, masticatory musculature, and TMJs—must operate in synchronized harmony to ensure both efficient and symmetrical food processing.

Unilateral mastication is defined as the habitual utilization of one specific side of the oral cavity for chewing, typically quantified as a functional pattern in which chewing cycles executed on one side exceed those on the contralateral side by at least 30% (La Touche et al., 2019). A natural chewing-side preference is common among healthy humans, with reported population prevalence figures spanning widely from 45% to 98% across diverse global cohorts (Haralur et al., 2019). Sustained, long-term unilateral chewing induces asymmetrical activation profiles across the elevator muscles of the jaw and introduces pronounced discrepancies in orofacial sensorimotor behavior between the working and non-working sides (La Touche et al., 2019). Furthermore, contemporary biomechanical investigations demonstrate that unilateral chewing imposes differential loading forces on the left and right TMJs, which may act as a primary driver for progressive, asymmetrical joint remodelling and condylar degeneration (Ma et al., 2023; Um et al., 2023). Clinically, this parafunctional habit correlates strongly with uneven occlusal wear patterns and temporomandibular disorders (TMD; Jeon et al., 2017), and has been documented in half of examined adult cohorts presenting with severe tooth surface loss (Al-Zarea, 2012).

Multiple etiological factors have been hypothesized to account for lateralized chewing habits. Odontogenic and periodontal pathologies—including active dental caries, chronic periodontitis, localized dental pain, premature tooth loss, and occlusal discrepancies—represent the most thoroughly documented drivers, with qualitative distributions of occlusal contact points varying significantly between preferred and non-preferred sides (Haralur et al., 2019; Jeon et al., 2017). Habituation and underlying temporomandibular joint dysfunctions constitute additional compounding contributors.

These etiological determinants likely manifest differently in regions where access to comprehensive restorative and preventive dental care is restricted. Within Nigeria, dental caries remains a major public health burden, with a recent systematic review and meta-analysis estimating a pooled national prevalence of 17% across all dentitions, emphasizing an urgent requirement for enhanced preventive frameworks and improved healthcare utilization pathways (Akinsolu et al., 2026). Barriers restricting regular dental care access among Nigerian adults and older populations are also well established (Folorunsho et al., 2025). When dental treatment is delayed or deferred, untreated caries and periodontal disease prolong acute or chronic pain states, eventually prompting tooth loss and establishing environmental conditions where intentional avoidance of the painful side solidifies into a permanent masticatory habit. To the best of our knowledge, no comprehensive empirical investigation has evaluated the full spectrum of etiologies underlying unilateral mastication among dental patients within Nigeria, leaving a significant gap in sub-Saharan African clinical literature.

This study therefore investigated the etiology of unilateral mastication among patients presenting to the Enugu State Dental Hospital, examined the moderating influence of gender and age, determined the preferred masticatory side, and evaluated associated oral health sequelae. We formulated the following hypotheses:

- (H_1) Pain-related dental pathology (specifically toothache resulting from active caries or chronic periodontitis) serves as the most prevalent etiology;
- (H_2) The etiology of unilateral mastication is significantly associated with patient gender;
- (H_3) Advanced age is a significant positive predictor of temporomandibular joint disorders acting as an underlying etiology; and

- (H_4) The preferred chewing side deviates significantly from an expected equal (50:50) distribution, exhibiting a distinct right-side preference.

METHODS

Study Design and Setting

A hospital-based, descriptive cross-sectional survey design was implemented to address the research aims. The investigation was carried out at the Enugu State Dental Hospital, Enugu State, Nigeria, a prominent public institution delivering comprehensive preventive, restorative, and prosthetic dental healthcare services.

Population and Sampling Strategy

The target population comprised adult patients aged 18 years and older attending out-patient dental clinics. Utilizing Slovin's formula based on an estimated patient attendance frame of 290 and a 5% margin of error, a sample size of 168 participants was calculated. Eligible participants were recruited via a purposive non-probability sampling technique from patients presenting to the clinic between January and April 2026.

Operational Definition: Unilateral mastication was defined as a self-reported habitual behavioral preference for chewing food predominantly on one specific side of the oral cavity for a minimum duration of the past six consecutive months.

- **Inclusion Criteria:** Patients aged 18 years or older possessing a natural dentition or stable fixed dental prostheses.
- **Exclusion Criteria:** Edentulous patients, individuals presenting with acute facial trauma, severe neurological disorders, or those who had undergone recent orthognathic surgical interventions.

While purposive sampling is methodologically appropriate for assembling a targeted clinical cohort, it inherently introduces potential selection bias—demonstrated by the 75.6% female predominance in this sample—which constrains the direct generalizability of these findings to broader community populations or male cohorts.

Data Collection Instruments and Validation

Data were compiled utilizing a structured interviewer-administered questionnaire, comprehensive clinical oral examinations, and a standardized researcher-developed data sheet. The data sheet was pre-tested on a pilot group of 10 clinical patients to verify content validity, structural clarity, and ease of administration prior to initiating full data collection.

Clinical examinations were performed by two thoroughly calibrated dental therapists. To guarantee optimal diagnostic reliability, a formal inter-examiner calibration exercise was conducted prior to study commencement, yielding a high Cohen's Kappa coefficient of $\kappa = 0.85$ for the identification of occlusal attrition severity and clinical signs of temporomandibular disorders.

Institutional permissions were secured by obtaining an introductory clearance letter from the Head of Department (HOD), which was formally submitted to the management of the Enugu State Dental Hospital. Verbal informed consent was acquired from each participating individual subsequent to a detailed verbal explanation outlining the study's scope and objectives.

Variables and Theoretical Framework

The independent variables evaluated in this study were patient gender and chronological age. Dependent variables encompassed the specific etiologies of unilateral mastication, the preferred masticatory side, and observed clinical oral health sequelae. The conceptual architecture of the study was guided by the **Biomechanical and Functional Adaptations Framework**, an analytical model designed to explain how human biological systems adapt to internal structural stressors and external environmental constraints through alterations in movement trajectories, morphology, and physiological function. This framework integrates four foundational components:

1. *Biomechanical factors*, analyzing the mechanical forces of unilateral chewing, mandibular kinematics, and muscle coordination;
2. *Functional factors*, assessing the downstream impact of unilateral chewing efficiency on bolus reduction and nutrient processing;

3. *Adaptation mechanisms*, examining compensatory behavioral habits adopted in response to pain, discomfort, or structural asymmetry; and
4. *External influences*, accounting for cultural or dietary habits influencing masticatory patterns.

Identification and Control of Potential Biases

To mitigate recall bias during patient interviews regarding the precise onset duration and historical causes of their chewing patterns, structured, item-specific questioning was utilized, prompting patients to cross-reference recent dental events. To minimize examiner and diagnostic bias, standardized diagnostic criteria were strictly enforced during oral inspections, and the two evaluating examiners remained blinded to each other's specific clinical scoring sheets during the assessment phase.

Statistical Data Analysis

Quantitative data analyses were conducted utilizing Jamovi software (version 2.7.41) with the alpha significance threshold set at $\alpha = .05$. Descriptive statistics, including absolute frequencies and relative percentages, were calculated to summarize participant characteristics. Associations between patient gender and each categorical etiology were evaluated using Pearson's chi-square test of independence, or Fisher's exact test where expected cell frequencies fell below 5. The preferred masticatory side was evaluated against an expected theoretical equal (50:50) distribution using the Chi-Square goodness-of-fit test, with Cohen's w calculated to quantify effect size (Cohen, 1988). Bivariate associations between the preferred chewing side and observed clinical effects were similarly tested using chi-square or Fisher's exact tests.

Chronological age was evaluated as an independent predictor of each etiology category utilizing five separate, univariable binary logistic regression models (predicting tooth loss, toothache, malocclusion, TMJ disorder, and learned preference or habit). In each model, the binary dependent variable represented the presence (1) or absence (0) of the specific etiology, while age in completed years was entered as a continuous independent predictor. No additional covariates were forced into the models, and gender effects were analyzed independently. No mathematical adjustments were implemented for multiple hypothesis testing. Model assumptions were rigorously tested: linearity of the logit was evaluated via Box-Tidwell interaction terms, multicollinearity was assessed using variance inflation factors (VIF), and influential data points were diagnosed via Cook's distance (threshold > 4/N = 0.024) and standardized residuals (threshold > ±2.5). For regression models demonstrating diagnostic assumption violations, sensitivity analyses were executed by re-estimating parameters after temporarily excluding flagged influential cases.

Ethical Considerations

Formal institutional ethical clearance was granted by the Health Research Ethics Committee (HREC) of the Enugu State Dental Hospital (Approval Reference Number: ESDH/HRC/2026/0405, dated May 21, 2026). Administrative authorization was similarly secured from the Head of the Dental Department.

Due to the minimal-risk, observational nature of the clinical protocol, a formal waiver for written documentation of consent was reviewed and approved by the HREC. Verbal informed consent was successfully secured from all study participants following a comprehensive explanation of research goals, assuring complete privacy and data confidentiality.

RESULTS

Sociodemographic and Clinical Characteristics

A total of 168 adult participants met all inclusion criteria and completed the study protocol. As detailed in **Table 1**, the participant cohort exhibited a marked female predominance (n = 127, 75.6%), with the modal age group falling between 41 and 50 years (n = 41, 24.4%). Unemployed individuals constituted the largest occupational category (33.3%), while tertiary-level education was the most frequently reported educational attainment level (41.1%).

Table 1:
Sociodemographic Characteristics of Study Participants (N = 168)

Characteristic	n	%
Gender		
Female	127	75.6
Male	41	24.4
Age Group (Years)		
≤20	10	6.0
21–30	25	14.9
31–40	28	16.7
41–50	41	24.4
51–60	35	20.8

≥61	29	17.3
Occupation		
Unemployed	56	33.3
Self-employed	48	28.6
Employed	43	25.6
Student	21	12.5
Educational Attainment		
Tertiary	69	41.1
Secondary	53	31.5
Primary	33	19.6
No formal education	13	7.7

Note: Percentages are calculated relative to the total sample size (N = 168).

Etiology of Unilateral Mastication

The empirical distribution of reported etiological factors is summarized in **Table 2**. Toothache resulting from active dental caries and chronic periodontitis emerged as overwhelmingly the most prevalent reason cited for adopting unilateral mastication, affecting three-quarters of the patient cohort (75.0%). This was followed sequentially by structural malocclusion (50.6%), learned preference or habitual pattern (45.2%), and tooth loss (43.5%). Temporomandibular joint disorder was identified as the least frequently reported primary etiology (24.4%). Because participants were permitted to report multiple contributing etiologies, cumulative percentages across categories exceed 100%.

Observed clinical sequelae are detailed in **Table 3**. Poor oral hygiene status was the most prevalent clinical finding (83.9%), followed closely by generalized dental attrition (69.0%). Conversely, clinical signs of TMD were infrequent as an observed objective effect (6.5%), and localized muscular asymmetry was entirely undetected during clinical examination.

Table 2:
Etiology of Unilateral Mastication Among Study Participants

Etiology Category	n	%
Toothache (Caries / Periodontitis)	126	75.0
Malocclusion	85	50.6
Preference / Habit	76	45.2
Tooth Loss	73	43.5
TMD Disorder	41	24.4

Table 3:
Preferred Masticatory Side and Observed Clinical Sequelae

Clinical Variable	n	%
Preferred Chewing Side		
Right Side	100	59.5
Left Side	68	40.5
Observed Clinical Effects		
Poor Oral Hygiene	141	83.9
Dental Attrition	116	69.0
TMD Signs	11	6.5

Gender and Etiology Associations

Pearson's chi-square tests of independence demonstrated no statistically significant associations between patient gender and any of the five evaluated etiology categories. Statistical outcomes were non-significant for tooth loss (χ^2 (1, N = 168) = 0.433, p = .511), toothache (χ^2 = 0.527, p = .468), malocclusion (χ^2 = 0.008, p = .927), TMJ disorder (χ^2 = 0.173, p = .678), and learned preference or habit (χ^2 = 0.027, p = .870). All expected cell frequencies exceeded 5 across all cross-tabulations, confirming the statistical validity of the chi-square tests. Proportions for individual etiologies were strikingly comparable across genders; for instance, toothache was reported by 76.4% of females and 70.7% of males, while malocclusion was reported by 50.4% and 51.2% respectively. These minor variations imply that the underlying etiological pathways driving unilateral mastication operate similarly across genders within this clinical population. Nonetheless, the prominent female skew (75.6% of the cohort) restricts broader generalizability toward male demographics and limits analytical power for detecting subtle gender-based divergences.

Age as a Predictor of Etiology

Univariable binary logistic regression models were executed to ascertain whether chronological age significantly predicted individual etiology categories. Regression assumptions were verified prior to model interpretation: linearity of the logit was successfully satisfied across all five models via non-significant Box-Tidwell interaction terms (all p > .05), and collinearity was absent (VIF = 1.00 for all models).

Primary regression findings are detailed in **Table 4**. Chronological age emerged as a statistically significant positive predictor for exactly one etiology category: temporomandibular joint disorder (B = 0.024, Z = 2.12, p = .034, OR = 1.024, 95% CI [1.002, 1.046]). For every one-year increment in patient age, the odds of reporting TMJ disorder as an etiological driver for unilateral mastication increased by 2.4%. The overall model was statistically significant (χ^2 (1) = 4.65, p = .031), explaining 2.5% of the total variance (Nagelkerke/McFadden McF = .025). Conversely, age failed to reach statistical significance as a predictor of tooth loss (B = 0.005, p = .572), toothache (B = 0.007, p = .491), malocclusion (B = 0.007, p = .458), or preference/habit (B = 0.018, p = .059). Notably, the

predictive relationship for preference or habit approached, but did not formally cross, the significance threshold (p = .059).

Table 4:
Primary Univariable Binary Logistic Regression of Age Predicting Etiology Categories

Etiology Category	B	SE	Z	p	OR	95% CI	Model p
Tooth Loss	0.005	0.009	0.57	.572	1.005	0.987–1.024	.571
Toothache	0.007	0.011	0.69	.491	1.007	0.987–1.029	.489
Malocclusion	0.007	0.009	0.74	.458	1.007	0.989–1.025	.457
TMJ Disorder	**0.024**	**0.011**	**2.12**	**.034**	**1.024**	**1.002–1.046**	**.031**
Preference / Habit	0.018	0.010	1.89	.059	1.018	0.999–1.038	.055

Note: Bold font designates statistical significance at α= .05. B represents unstandardized regression coefficient; SE represents standard error; OR represents odds ratio; CI represents confidence interval.

Preferred Side of Mastication

A Chi-Square Goodness-of-Fit test evaluated whether the observed distribution of preferred chewing sides deviated from an expected theoretical equal (50:50) split. All analytical assumptions were fully satisfied, with expected cell counts fixed at 84.0 per category (well exceeding the minimum threshold of 5). The right side of the oral cavity was preferred by 59.5% (n = 100) of patients, whereas the left side was favored by 40.5% (n = 68), establishing a proportional ratio of approximately 1.5:1 favoring right-sided mastication. The Chi-Square goodness-of-fit test confirmed that this distribution was statistically significant (χ^2 (1, N = 168) = 6.10, p = .014). The observed effect size, quantified via Cohen's w, was w = 0.190, representing a small-to-medium effect size according to established behavioral science conventions.

Association Between Preferred Side and Clinical Effects

Bivariate cross-tabulations examining potential relationships between the preferred masticatory side and observed clinical sequelae revealed no statistically significant associations. Dental attrition was diagnosed in 66.0% of right-side chewers compared to 73.5% of left-side chewers (χ^2 (1) = 1.07, p = .300). Poor oral hygiene was similarly prevalent across both cohorts, affecting 81.0% of right-side chewers and 88.2% of left-side chewers (χ^2 (1) = 1.57, p = .210). Clinical TMD signs were infrequent in both subgroups, documented in 7.0% of right-side chewers and 5.9% of left-side chewers (Fisher's exact p = 1.000). These empirical patterns indicate that the adverse oral health consequences of unilateral mastication manifest irrespective of which side serves as the primary functional chewing pathway.

Sensitivity Analysis for Regression Models

Diagnostic evaluations revealed that several individual observations exceeded recommended statistical thresholds for Cook's distance (> 0.024) and standardized residuals (> ±2.5) within the toothache, TMJ disorder, and preference/habit regression models. The tooth loss and malocclusion models demonstrated no severe diagnostic violations and thus required no re-estimation. Comprehensive comparative outcomes between primary and sensitivity models are presented in **Table 5**.

For the toothache model, the non-significant predictive outcome remained unchanged after excluding seven influential cases (p = .369 vs. .491). For the TMJ disorder model, chronological age remained a statistically significant predictor following the exclusion of ten extreme cases, with enhanced statistical precision (p decreased from .034 to .004, odds ratio increased from 1.024 to 1.037, and model fit improved to R^2_γ = .052; model χ^2 (1) = 8.76, p = .003), confirming that the primary finding was not an artifact of influential outliers. For the preference or habit model, after discarding seven influential cases, age achieved statistical significance (B = 0.023, p = .024, OR = 1.023), driving the overall model to significance (χ^2 (1) = 5.32, p = .021). This indicates that the original borderline result (p = .059) was susceptible to masking and likely represented a Type II statistical error. This sensitivity outcome supplies suggestive evidence that a true relationship exists between age and habitual side preference, warranting future investigation within larger epidemiological samples.

Table 5:
Primary and Sensitivity Binary Logistic Regression Analyses for Models Exhibiting Diagnostic Violations

Etiology Model	Excluded Cases	Final N	Primary p	Sensitivity p	Primary OR	Sensitivity OR
Toothache	7	161	.491	.369	1.007	1.010
TMJ Disorder	10	158	.034	.004	1.024	1.037
Preference / Habit	7	161	.059	.024	1.018	1.023

Note: Final N represents sample size following the exclusion of flagged cases. Exclusion criteria comprised Cook's distance > 0.024 or standardized residuals > ±2.5.

DISCUSSION

Interpretation of Principal Findings

Toothache originating from dental caries and periodontal disease was identified as the predominant etiological driver of unilateral mastication, providing strong empirical

support for hypothesis H_1. This finding aligns with established neurophysiological mechanisms governing masticatory control. While the rhythmic oscillation of the mandible is centrally orchestrated by brainstem central pattern generators, motor output is continuously modulated by peripheral sensory feedback streams originating from periodontal mechanoreceptors and pulpal nociceptors (Morquette et al., 2012). Nociceptive signals arising from a diseased, carious, or inflamed tooth actively modify this feedback loop, prompting the patient to subconscious or conscious avoidance of mechanical loading on the painful side, thereby shifting mastication toward the contralateral, pain-free arch. Because direct electromyographic or kinematic recordings of neuromuscular activity were beyond the scope of this study, this pathophysiological mechanism remains an informed clinical inference. Analogous neuro-reflexive adaptations apply to periodontal disease, which has previously been associated with lateralized chewing and secondary temporomandibular joint dysfunctions (Jeon et al., 2017).

Malocclusion and localized tooth loss represent structural etiological pathways. Occlusal discrepancies compromise overall masticatory efficiency, while aberrant occlusal contact geometries can render chewing on one side mechanically superior or more comfortable, fostering the adoption of a preferred working side (Haralur et al., 2019). Similarly, partial edentulism creates functional asymmetry by diminishing the surface area available for bilateral occlusal contact. Once established, compensatory masticatory patterns can become hardwired via motor learning pathways, persisting long after the initial pathological trigger has resolved. This phenomenon likely accounts for why habitual preference was reported by nearly half of the cohort, and why numerous patients engaged in unilateral chewing without presenting active pathology. Such entrenched habits represent learned motor engrams that persist over time.

Temporomandibular disorder was reported least frequently as a primary etiology (24.4%), yet remains clinically vital. Interestingly, TMD was cited more frequently as a perceived etiological cause than as an objectively observed clinical sequela (6.5%), reflecting a clinical pathway wherein arthrogenic or myogenous TMJ pain discourages joint loading during jaw closure. Conversely, chronic unilateral chewing imposes uneven mechanical stresses across the left and right TMJs, accelerating asymmetric condylar remodelling (Ma et al., 2023; Um et al., 2023), and TMD has frequently been documented as a direct pathological consequence of prolonged lateralized chewing (Jeon et al., 2017). This complex relationship is inherently bidirectional, and a cross-sectional design precludes definitive causal determinations. Chronological age emerged as a statistically significant, albeit modest, positive predictor of TMJ disorder as an etiology, with odds increasing by 2.4% per year of life (roughly 27% per decade), while the overall model accounted for 2.5% of variance. This supports hypothesis H_3, though interpretations must remain conservative given the univariable modeling structure and absence of multiplicity corrections. The borderline finding for preference or habit is noted as exploratory.

Poor oral hygiene and dental attrition constituted the most prevalent clinical sequelae. These outcomes align logically with reduced self-cleansing mechanisms on the non-functional chewing side alongside repetitive mechanical stress focused on the working side, although functional washing dynamics were not directly measured. The low frequency of objective TMD signs and the absence of detectable facial muscle asymmetry must be interpreted within the methodological boundaries of routine clinical examinations.

The absence of statistically significant associations between patient gender and etiology led to the rejection of hypothesis H_2. The pronounced female predominance (75.6%) reflects established healthcare-seeking behaviors, where women utilize outpatient dental services at higher rates than men (Reda et al., 2018), alongside population data indicating higher self-reported chewing-side preferences among females (Diernberger et al., 2008). However, with only 41 male participants, statistical power to detect subtle gender-based divergences was restricted.

Comparison With Existing Literature and Regional Context

The observed preference for right-sided mastication (59.5% of participants) supports hypothesis H_4 and falls comfortably within the broader 45% to 98% prevalence range documented internationally for preferred chewing sides (Haralur et al., 2019). This proportion closely mirrors

the roughly 64% right-side preference reported in a large population-based German cohort (Diernberger et al., 2008), suggesting that fundamental laterality traits contribute to masticatory behavior even within hospital populations heavily burdened by active dental disease. To our knowledge, this represents the initial documented quantification of masticatory side preference within a Nigerian clinical sample.

The high frequency of toothache, poor oral hygiene, and dental attrition must be contextualized within regional healthcare realities in Nigeria. Dental caries remains highly prevalent nationally (Akinsolu et al., 2026), and documented barriers restrict timely access to professional dental care (Folorunsho et al., 2025). Delayed professional intervention prolongs symptomatic periods during which pain compels compensatory chewing maneuvers, while untreated decay and premature extractions create structural occlusal imbalances that solidify the habit. Because variables such as treatment delay intervals, dietary consistency, and household income were unmeasured, these explanations remain hypothetical, and direct comparisons with high-income cohorts are constrained by methodological differences between population-based surveys and hospital-based clinical samples. The observed coexistence of unilateral chewing and attrition aligns with findings from Saudi Arabia linking lateralized chewing to tooth surface loss (Al-Zarea, 2012). Finally, the clinical absence of overt muscular asymmetry should not be interpreted as definitive proof of neuromuscular symmetry, as manual palpation and visual inspection lack the sensitivity to detect subtle asymmetric tonus.

Clinical and Public Health Implications

Because pain-driven dental disease serves as the primary catalyst for unilateral mastication, early clinical screening, prompt caries control, and timely periodontal therapy can prevent the establishment of lateralized chewing habits. Routine dental evaluations at the primary care level should incorporate inquiries regarding habitual chewing side and visual screening for asymmetrical occlusal wear, facilitating early identification of patients vulnerable to accelerated attrition and temporomandibular disorders. Patients identified with unilateral mastication should receive tailored oral hygiene instructions emphasizing meticulous plaque removal on the non-functional (unused) side, where food stagnation is accelerated, alongside regular monitoring of working-side attrition. At the public health policy level, community oral health outreach and national health strategies must emphasize early management of dental pain, prosthetic replacement of missing teeth, and affordable access to restorative services, particularly for socio-demographic groups who currently seek care solely during acute pain episodes.

Methodological Strengths and Limitations

Primary strengths of this study encompass the collection of original empirical data from an under-researched West African clinical population, the utilization of combined interviews and calibrated clinical examinations, and the rigorous execution of assumption diagnostics and sensitivity analyses for logistic regression models.

Several methodological limitations merit explicit acknowledgment. First, the cross-sectional design precludes causal inferences, preventing definitive establishment of the temporal directionality between temporomandibular disorders and unilateral mastication. Second, purposive sampling executed at a single hospital setting introduces potential selection bias. Patients presenting to a public dental hospital are predominantly symptomatic, which may inflate the proportion of cases attributed to acute toothache and limit generalizability to asymptomatic community populations or other geographic regions in Nigeria. Third, the heavy female skew (75.6%) restricts external validity regarding male cohorts and reduces internal statistical power for gender sub-analyses based on only 41 male subjects. Fourth, etiological data relied partly on retrospective self-reports, rendering them susceptible to recall bias. Fifth, the absence of a healthy, bilateral-chewing control group limits the ability to attribute clinical sequelae exclusively to unilateral chewing. Sixth, muscular asymmetry was evaluated exclusively via clinical inspection rather than electromyography. Seventh, multiple univariable regression models were executed without formal alpha-inflation adjustments, and sensitivity findings were derived post-hoc.

Recommendations for Future Research

Future investigations should employ multi-center or community-based probability sampling designs ensuring

balanced gender representations. Longitudinal cohort studies or controlled clinical trials are required to determine whether treating carious lesions, replacing missing teeth, and resolving periodontal disease successfully reverses unilateral mastication and halts its pathological sequelae. Objective physiological instruments—such as surface electromyography of the masseter and temporalis muscles or kinematic tracking of mandibular chewing cycles—should be deployed to quantify muscle activation asymmetries and validate the 30% behavioral threshold. Finally, multivariable analytical models incorporating gender, age, socioeconomic variables, and clinical dental status concurrently, alongside a matched bilateral-chewing control group, will clarify the independent predictors of unilateral mastication.

CONCLUSION

In summary, unilateral mastication among patients presenting to the Enugu State Dental Hospital is predominantly propelled by untreated pain-related dental pathology and structural occlusal anomalies such as malocclusion. While patient gender does not significantly influence etiology, advancing chronological age serves as a significant positive predictor for TMD-related unilateral mastication. Patients exhibit a statistically significant functional preference for right-sided mastication, which correlates clinically with high prevalences of poor oral hygiene and dental attrition. Clinically, these findings mandate routine screening for lateralized chewing habits during standard dental examinations. Immediate restorative interventions to eliminate odontogenic pain, paired with targeted patient education regarding oral hygiene maintenance on the non-functional side, are vital to arresting long-term stomatognathic deterioration.

Use of Artificial Intelligence (AI) Declaration: The authors declare that no generative artificial intelligence (AI) tools were used to generate, modify, or manipulate any primary research data. The authors take full responsibility for the accuracy, integrity, and scientific content of this manuscript.

Acknowledgments: The authors extend their sincere gratitude to the administrative and medical leadership of the Enugu State Dental Clinic, as well as to all participating patients for their time and collaboration.

Authors' Contributions

i. **Justina Nnenna Ngwu:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration, Supervision.
ii. **Oluchi Ann Olofin:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – review & editing.
iii. **Everistus Chiakwa:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – review & editing.
iv. **Ezema Scholastica:** Conceptualization, Methodology, Validation, Investigation, Resources, Writing – review & editing, Supervision.
v. **Ada Ezeaku:** Conceptualization, Methodology, Validation, Investigation, Resources, Writing – review & editing.
vi. **All authors**: Review and final approval of the manuscript for publication.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author, Justina Nnenna Ngwu, upon reasonable request. The data are not publicly available due to privacy and ethical restrictions.

Ethical Approval: The study received approval from the Health Research Ethics Committee (HREC) of the Enugu State Dental Hospital (Approval No. ESDH/HRC/2026/0405).

Informed Consent: Verbal informed consent was obtained from all individual participants included in the study.

Funding: The authors declare that no financial support was received from any funding agency in the public, commercial, or non-profit sectors for the research, authorship, or publication of this article.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

ORCID iDs:
Ngwu, J. N.[1]: https://orcid.org/0000-0002-8236-7863
Olofin, O. A.[2]: Nil identified.
Chiakwa, E.[3]: https://orcid.org/0009-0002-9766-4198
Ezema, S.[4]: https://orcid.org/0009-0000-8271-2737
Ezeaku, A.[1]: Nil identified.

Open Access: This original article is distributed under the Creative Commons Attribution Non-Commercial (CC BY-NC 4.0) license. This license permits people to distribute, remix, adapt, and build upon this work non-commercially and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made are indicated, and the use is non-commercial. See: https://creativecommons.org/licenses/by-nc/4.0/.

REFERENCES

Akinsolu, F. T., Abodunrin, O. R., Chukwuemeka, A., Olagunju, M. T., Adewole, I. E., Salako, A. O., Eleje, G. U., Ehizele, A. O., Lusher, J., Owotade, F., Ezechi, O. C., & Foláyan, M. O. (2026). Prevalence of dental caries in the primary, mixed and permanent dentitions in Nigeria: A systematic review and meta-analysis. *PLOS ONE*, *21*(6), Article e0349112. https://doi.org/10.1371/journal.pone.0349112

Al-Zarea, B. K. (2012). Tooth surface loss and associated risk factors in Northern Saudi Arabia. *ISRN*

Dentistry, *2012*, Article 161565. https://doi.org/10.5402/2012/161565

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Diernberger, S., Bernhardt, O., Schwahn, C., & Kordass, B. (2008). Self-reported chewing side preference and its associations with occlusal, temporomandibular and prosthodontic factors: Results from the population-based Study of Health in Pomerania (SHIP-0). *Journal of Oral Rehabilitation*, *35*(8), 613–620. https://doi.org/10.1111/j.1365-2842.2007.01790.x

Folorunsho, S., Ajayi, V., Sanmori, M., Suleiman, M., Abdullateef, R., & Abdulganiyu, A. (2025). Access to and utilization of dental care services by older adults in Nigeria: Barriers and facilitators. *Special Care in Dentistry*, *45*(3), Article e70040. https://doi.org/10.1111/scd.70040

Haralur, S. B., Majeed, M. I., Chaturvedi, S., Alqahtani, N. M., & Alfarsi, M. (2019). Association between preferred chewing side and dynamic occlusal parameters. *Journal of International Medical Research*, *47*(5), 1908–1915. https://doi.org/10.1177/0300060519827165

Jeon, H.-M., Ahn, Y.-W., Jeong, S.-H., Ok, S.-M., Choi, J., Lee, J.-Y., Joo, J.-Y., & Kwon, E.-Y. (2017). Pattern analysis of patients with temporomandibular disorders resulting from unilateral mastication due to chronic periodontitis. *Journal of Periodontal & Implant Science*, *47*(4), 211–218. https://doi.org/10.5051/jpis.2017.47.4.211

La Touche, R., Losana-Ferrer, A., Pascual-Vaquerizo, E., Suso-Martí, L., Paris-Alemany, A., Chamorro-Sánchez, J., & Cuenca-Martínez, F. (2019). Orofacial sensorimotor behaviour in unilateral chewing: A comparative analysis in asymptomatic population. *Physiology & Behavior*, *212*, Article 112718. https://doi.org/10.1016/j.physbeh.2019.112718

Ma, H., Zheng, T., Shao, B., & Liu, Z. (2023). Evaluation of the effect of unilateral mastication on the morphology of temporomandibular joint from the perspective of dynamic joint space. *Journal of Oral Rehabilitation*, *51*(5), 795–804. https://doi.org/10.1111/joor.13646

Morquette, P., Lavoie, R., Fhima, M.-D., Lamoureux, X., Verdier, D., & Kolta, A. (2012). Generation of the masticatory central pattern and its modulation by sensory feedback. *Progress in Neurobiology*, *96*(3), 340–355. https://doi.org/10.1016/j.pneurobio.2012.01.011

Reda, S. M., Krois, J., Reda, S. F., Thomson, W. M., & Schwendicke, F. (2018). The impact of demographic, health-related and social factors on dental services utilization: Systematic review and meta-analysis. *Journal of Dentistry*, *75*, 1–6. https://doi.org/10.1016/j.jdent.2018.04.010

Um, T.-J., Choi, H.-S., Lee, D. Y., Yu, J. H., Kim, J. S., Kim, S. G., & Hong, J. (2023). Immediate effects of asymmetric chewing on temporomandibular joint kinematics. *Journal of Korean Physical Therapy*, *35*(6), 185–189. https://doi.org/10.18857/jkpt.2023.35.6.185