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Determination of Familial Inheritance of Temporomandibular Joint Disorders among the Urhobos in Delta State, Nigeria.

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ABSTRACT: This study determined if temporomandibular joint disorders (TMDs) are substantially heritable among the Urhobos in Delta State, Nigeria. Ethical clearance was sought from the Research and Ethics Committee of the Delta State University Teaching Hospital, Oghara, Delta State. Multistage sampling was used in this study to select 384 Urhobo subjects. A total of 96 families (96 fathers, 96 mothers and 192 offsprings) were examined. Data collection was done between the first day of the month of February and the last day of the month of July in the year 2025. The subjects were examined physically and completed questionnaire regarding age, gender, ethnicity, social status, personal and medical history, antidepresant drug usage, dental status, limited mouth opening, temporomandibular joint sound and parafunction (bruxism, clenching). Examination of the temporomandibular joint was guided by the principles based on International RDC/TMD and the amendments thereto (version: 20 Jan 2014). Data obtained was subjected to Statistical Package for the Social Sciences (SPSS), version 24.0. Results were presented in frequency distribution and cross tabulation. All inferential statistical analysis was carried out at 95% confidence level, with $P<0.05$ regarded as significant. Mendelian chi-square analysis was done to determine the closeness of the observed offspring outcome (TMDs) to the expected Mendelian ratio. The results divulged that gender variation in prevalence of TMDs among the Urhobo subjects is not significant. Mendelian chi square test when both parents are affected by TMDs disclosed a chi square value of 0.000. This indicates exteme closeness of the observed offspring outcome (TMDs) to the expected Mendelian ratio. The p-value is greater than the chosen significance level (0.05), thus the null hypothesis should be accepted. Accepting the null hypothesis after the Mendelian chi-square test means that the observed results (TMDs) are statistically close enough to the expected Mendelian ratios. The conclusion is that the TMD data supports the predicted inheritance pattern (3:1 or 9:3:3:1 ratio) and does not show a statistically significant deviation from it. This means the results are consistent with Mendelian inheritance. Thus the present scrutiny affirms that temporomandibular joint disorders are substantially heritable among the Urhobos in Delta State, Nigeria.

KEYWORDS: Temporomandibular, joint, disorders, heritable, Urhobos, Delta.

INTRODUCTION

The right and left temporomandibular joints connect the lower jawbone to the skull. The temporomandibular joint is a bilateral synovial juncture between the temporal bone of the skull at the top and the mandible underneath. Temporomandibular joint disorders represent a group of musculoskeletal conditions characterized by orofacial pain and limitations in function. The etiopathogenesis of temporomandibular joint disorders is complex and multifactorial. Proposed risk factors for temporomandibular joint disorders include joint and muscle trauma, anatomical factors, psychosocial profile, and sensitization of nociceptive pathways, but the relative importance of environmental versus genetic factors in explaining variability is poorly understood (Smith *et al*., 2011).

The etiology of temporomandibular joint disorders are multidimensional: biomechanical, neuromuscular, bio-psychosocial and biological factors may contribute to the disorders. The etiopathogenesis of the condition is poorly understood, therefore temporomandibular joint disorders are difficult to diagnose and manage. Early and correct identification of the possible etiologic factors will enable the appropriate treatment scheme application in order to reduce or eliminate temporomandibular joint disorders' debilitating signs and symptoms (Chisnoiu *et al.*, 2015).

The cause of temporomandibular joint disorders has been attributed to many different factors, a large portion being environmental. These include trauma, bruxism, and other oral habits. A genetic component has been explored, different genes have been

proposed as possible candidates. The genetic component of temporomandibular joint disorders, while not as extensively explored as the environmental aspect, presents with some compelling support (Genello, 2017).

Many cases of temporomandibular joint disorders have a strong environmental component; however, genetic elements to the disease have been studied and (Genello, 2017). Certain candidate genes have been highlighted, which include the serotonin 5---HT transporter gene and the COMT gene, whose activity is inversely correlated to pain sensitivity and the development of temporomandibular joint disorders. It was found that nearly a third of new temporomandibular joint disorder cases reported could be attributed to having a variation in the COMT gene (Oakley and Vieira, 2008).

The incidence of TMD in different study populations reported in different cross-sectional studies varies widely across different populations because of variations of examining practitioners and racial differences, different criteria for diagnosis, and different examination methods (Sena *et al*., 2018). Several studies had successfully investigated the prevalence of temporomandibular joint disorders in different populations globally (Castelo *et al*., 2005; Soukaina *et al*., 2012; Ahmed and Abaffan, 2016; Sena *et al*., 2018).

Scrutiny of published literature divulged want of information on the heritability of temporomandibular joint disorders among the Urhobos in Delta State, Nigeria, thus there is need for this research. Novelty concerns the fact that this research throws light on the complex interactions of genetic influences that make it possible to calculate a patient's individual risk for temporomandibular joint disorder.

The findings from this scrutiny will definitely be utilized by the Maxillofacial Surgeons as guide to dictate treatment goals for patients in Nigeria. This research offers ample data for use in Maxillofacial Surgery, Genetics and Anthropology in understanding familial inheritance of temporomandibular joint disorders. The objective of the study is to determine the familial inheritance of temporomandibular joint disorders using family subsets of the Urhobos in Delta State, Nigeria.

MATERIALS AND METHODS

Urhobo is a major Nigerian ethnic nationality in tropical Niger Delta. Urhobo speaking people are located in the present Delta State of Nigeria (Agbegbedia, 2015).

A descriptive cross-sectional study was done and this involved the use of questionnaire, direct observation and in-depth interview. The research involved a total of 384 subjects from the Urhobo ethnic group. The formula for sample size determination is:

$$\mathbf{n} = \frac{\mathbf{z}^2 \times \mathbf{p(1-p)}}{\mathbf{e}^2}$$

n = required sample size, **z** = confidence level at 95% (standard value of 1.96), **p** = estimated prevalence in the project area (assumed to be .5), q =1-p, e = margin of error at 0.05.

$$\mathbf{n} = \frac{1.96^2 \times .5(1-.5)}{0.05^2}$$

n = 384.

Multistage sampling was employed in this study. A list of the 9 Urhobo speaking Local Government Areas (Ethiope East, Ethiope West, Okpe, Sapele, Udu, Ughelli North, Ughelli South, Uvwie and Warri South) in Delta State was made. A town was randomly selected in each of the 9 Local Government Areas. Entirety of 10 or 11 families were randomly selected from each of the 9 towns (Warri, Sapele, Abraka, Ughelli, Effurun, Oghara, Agbarho, Ekpan, Okparabe). There was stratified sampling such that almost equal number of male and female subjects were selected. A total of 96 families (96 fathers, 96 mothers and 192 offspring) were examined.

The research subjects met the following criteria:

Age 18 to 65 years.

Parents and grandparents are Urhobos.

The subjects were examined physically and completed a questionnaire regarding age, gender, marital status, ethnicity, social status, personal and medical history, antidepresant drug usage, dental status, limited mouth opening, temporomandibular joint sound and parafunction (bruxism, clenching). The following details were also be considered; earache, joint locking, pains associated with chewing, head and neck injury, and stressful conditions.

Examination of the temporomandibular joint was done guided by the principles based on International RDC/TMD and the amendments thereto (version: 20 Jan 2014). These principles concern the assessment of pain intensity, pain-related disability, psychological distress, jaw functional limitations, and parafunctional behaviors, and locations of pain. Furthermore the screening

assessed detail jaw functional limitations and psychological distress as well as additional constructs of anxiety and presence of comorbid pain conditions.

Ethical clearance was sought from the Research and Ethics Committee of the Delta State University Teaching Hospital, Oghara, Delta State prior to the commencement of this research. Data collection was done between the first day of the month of February and the last day of the month of July in the year 2025.

Data obtained was subjected to Statistical Package for the Social Sciences (SPSS), version 24.0. Results were presented in frequency distribution and cross tabulation. All inferential statistical analysis were carried out at 95% confidence level, with $P<0.05$ regarded as significant. Chi-Square test determined the influence or relationship of the variables. Mendelian chi-square analysis determined the closeness of the observed offspring outcome (TMDs) to the expected Mendelian ratio. The expected outcome calculated from the Mendelian assumption of segregation of allele was used to compare the conformance of the observed outcome (family ratio) to that of the Mendelian outcome and inference subsequently drawn from the result.

RESULTS

Table 1: Gender Frequency Distribution in Study Sample.

Gender	Frequency	Percent
Male	192	50.0
Female	192	50.0
Total	**384**	**100.0**

Table 1 divulges the gender distribution of the study sample. Equal number of males and females participated in the study.

Table 2: The Socioeconomic Status of the Respondents.

Social Status	Frequency	Percent
Low Income	158	41.2
Middle Income	203	52.8
High Income	23	6.0
Total	**384**	**100.0**

Table 2 illustrates the socioeconomic status of the study sample. Most of the participators belong to the middle socioeconomic class.

Table 3: Educational Status of the Respondents.

Level of Education	Frequency	Percent
Primary	45	11.6
Secondary	119	31.0
Tertiary	220	57.4
Total	**384**	**100.0**

Table 3 discloses the educational status of the respondents. Most of the study subjects are graduates.

Table 4: Prevalence of TMD

TMD Status	Frequency	Percent
Present	59	15.3
Absent	325	84.7
Total	**384**	**100.0**

Table 4 depicts the occurrence of TMD in the study subjects. Only few of the subjects were affected by TM

Table 5: Gender Differences in Prevalence of TMD in The Study Sample

TMD Status	N Gender Male	Female	χ^2	*P* Value
Present	27	32		
Absent	164	161	0.260	0.610

Table 5 shows gender differences in prevalence of TMD in the study sample. There was no significant gender variation in the occurrence of TMD.

Table 6: Mendelian Chi square test when one parent is affected

Child TMD	Observed	Expected	Residual	χ^2	*P* Value
Absent	14	11	3.0		
Present	4	7.0	-3.0	3.60	0.058
Total	18				

*P significant at <0.05.

Table 6 depicts the outcome of Mendelian Chi square test when one parent is affected by TMD. In over half of such cases, the offspring are affected.

Table 7: Mendelian Chi Square Test when both Parents Are Affected

Child TMD	Observed	Expected	Residual	χ^2	*P* Value
Absent	5	5.0	0.0		
Present	16	16	0.0	0.000	1.000
Total	21				

*P significant at <0.05.

Table 7 divulges the outcome of Mendelian chi square test when both parents are affected by TMDs. A chi square value of 0.000 indicates exteme closeness of the observed offspring outcome (TMDs) to the expected Mendelian ratio. The p-value is greater than the chosen significance level (0.05), thus the null hypothesis must be accepted.

DISCUSSION

Findings from the present research divulged that Mendelian chi square test when both parents are affected by TMDs disclosed a chi square value of 0.000. This indicates exteme closeness of the observed offspring outcome (TMDs) to the expected Mendelian ratio. The p-value is greater than the chosen significance level (0.05), thus the null hypothesis should be accepted. Accepting the null hypothesis after the Mendelian chi-square test means that the observed results (TMDs) are statistically close enough to the expected Mendelian ratios.

The results of the current study are in harmony with the findings of previous researches. Visscher and Lobbezoo (2015) confirmed the role of heritability in the development of TMD as one that is cumulating. Genello (2017) reported a case of TMD occurring within three consecutive generations of a family and explored the possibility of this disorder exhibiting familial inheritance. Moorthy *et al*., (2024). noted inherited genetic markers for temporomandibular disorders. Niibo *et al*., (2024) concluded that genetic factors play a role in determining which individuals are more prone to develop temporomandibular disorders or in predicting the severity of the disease process. Ojima *et al*., (2007) stated that temporomandibular disorder is associated with a serotonin transporter gene polymorphism.

The outcome of the present research did not concur with that of previous researches. Michalowicz *et al*., (2000) affirmed that there is no heritability of temporomandibular joint signs and symptoms. Liljestro *et al*., (2007) affirmed that familial occurrence of TMD cannot be found in children and their mothers.

CONCLUSION

The conclusion is that this TMD data supports the predicted inheritance pattern (3:1 or 9:3:3:1 ratio) and does not show a statistically significant deviation from it. This means the results are consistent with Mendelian inheritance. Thus the present scrutiny affirms that temporomandibular joint disorders are substantially heritable among the Urhobos in Delta State, Nigeria.

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