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# ERRATUM

## WEST AFRICAN JOURNAL OF MEDICINE



### ORIGINAL ARTICLE

## Relationship between Playing of Wind Musical Instruments and Symptoms of Temporomandibular Joint Disorders in a Male Nigerian Adult Population

*Relation entre le jeu d'instruments de musique à vent et les symptômes des troubles articulaires temporo-mandibulaires dans une population adulte nigériane masculine*

T. E. Adeyemi\*, O. D. Otuyemi†

#### ABSTRACT

**BACKGROUND:** Concern over the impact of playing wind instruments on the stomatognathic system has increased in the last few decades with many health practitioners attending to an increasing number of musical instrument players.

**OBJECTIVE:** This study assessed the effects of playing wind musical instruments on the temporomandibular joints (TMJ) of male Nigerian adults.

**METHODS:** This was a descriptive cross-sectional study which was conducted in the Dental clinic of Aminu Kano Teaching Hospital, Kano. Fifty male Wind Instrument Players (WIPs) were recruited for the study and compared with fifty non-Wind Instrument Players (non-WIPs) of the same age, gender and environment. The temporomandibular dysfunction was assessed in both groups using Helkimo index. Reliability test demonstrated an excellent intra-rater correlation (Cronbach's Alpha; 0.98). Data was analyzed using SPSS version 17 and statistical significance set at  $p < 0.05$ .

**RESULTS:** The majority of participants in the WIP group (32, 64%) had mild to severe anamnestic dysfunction score compared with (20, 40.0%) in the non-WIP group. The difference between the two groups was statistically significant ( $p < 0.05$ ). The class of instruments played, number of years and frequency of play had a significant negative impact on the anamnestic dysfunction of the TMJ with statistically significant difference ( $p < 0.05$ ). No statistically significant differences in clinical dysfunction scores were observed in the two groups ( $p > 0.05$ ).

**CONCLUSIONS:** Playing wind instruments including the class of instrument, number of years and frequency of playing affected the TMJ function, especially anamnesis. Clinical dysfunction was not affected by playing wind instruments. **WAJM 2019; 36(3): 262–266.**

**Keywords:** TMDs, Wind instrument players, Helkimo index, Male Nigerian adults.

#### RÉSUMÉ

**CONTEXTE:** L'inquiétude suscitée par l'impact des instruments à vent sur le système stomatognathique s'est accrue au cours des dernières décennies, et de nombreux praticiens de la santé ont assisté à un nombre croissant de joueurs d'instruments de musique.

**OBJECTIF:** Cette étude a évalué les effets des instruments de musique à vent sur les articulations temporo-mandibulaires (ATM) des adultes nigériens.

**METHODES:** Il s'agissait d'une étude transversale descriptive menée à la clinique dentaire de l'hôpital universitaire Aminu Kano parmi les participants à l'étude. Cinquante joueurs masculins d'instruments à vent ont été recrutés et comparés à cinquante autres acteurs du même âge, du même sexe et du même environnement. Le dysfonctionnement temporo-mandibulaire a été évalué dans les deux groupes à l'aide de l'indice de Helkimo. Le test de fiabilité a démontré une excellente corrélation intra-juge (Alpha de Cronbach; 0,98). Les données ont été analysées avec SPSS version 17. Signification statistique fixée à  $p < 0,05$ .

**RÉSULTATS:** La majorité des participants du groupe de joueurs d'instruments à vent avaient un score de dysfonctionnement anamnestic léger à grave (64,0%), contre 40,0% dans le groupe de joueurs autres que d'instruments à vent. La différence entre les deux groupes était statistiquement significative ( $p < 0,05$ ). La classe d'instruments joués, le nombre d'années et la fréquence de jeu ont eu un impact négatif significatif sur le dysfonctionnement anamnestic de l'articulation temporo-mandibulaire. Aucune différence significative dans les scores de dysfonctionnement clinique n'a été observée dans les deux groupes ( $p > 0,05$ ).

**CONCLUSIONS:** Les instruments à vent, y compris la classe d'instrument, le nombre d'années et la fréquence de jeu, ont une incidence sur la fonction de l'articulation temporo-mandibulaire, en particulier l'anamnèse. La dysfonction clinique n'était pas affectée par le jeu d'instruments à vent. **WAJM 2019; 36(3): 262–266.**

**Mots clés:** Joueurs d'instruments à vent, Indice Helkimo, mâle adultes Nigériens.

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Abbreviations: Non-WIP, Non-wind instrument players; TMD, Temporomandibular joint dysfunction; TMJ, Temporomandibular joints; WIP, Wind instrument players.

## INTRODUCTION

Concern over the impact of playing wind and string musical instruments on the stomatognathic system has generated much interest in the last few decades as many more health practitioners are involved in the management of an increasing number of musicians of all ages with orofacial problems.<sup>1</sup> Wind instruments are classified as Class A if they have cup-shaped mouthpieces and Class B if they have wedge-shaped mouthpieces.<sup>2</sup> Studies suggest that playing musical instruments like wind instruments tend to unduly load the functional masticatory system including the temporomandibular joint (TMJ), which is also responsible for the generation of sound when the instruments are being played.<sup>3</sup> The effects of playing these instruments on the TMJ are varied and complex. Several studies have shown that habitual behaviours burden the TMJ and masticatory muscles and adversely affect the primary functions of the TMJ thereby promoting occupational risks.<sup>2-5</sup> Long-term playing of wind musical instruments has been reported to cause changes in the masticatory musculature and the TMJ resulting in temporo-mandibular joint dysfunction (TMD).<sup>3</sup> Increased activities around the TMJ muscles while playing wind musical instruments may predispose players to higher risk of TMD. In wind musical instrument players, the orofacial muscles are under constant stress and this is also dependent on the duration of play.<sup>1</sup> For many amateur musicians, daily practice of not more than one and half hours may not be sufficient to bring about significant changes in the TMJ; unlike professional players who may practice for more than three hours daily and hence will require greater dental supervision.<sup>1</sup> Pampel *et al.* noted a contradictory phenomenon in which some individuals demonstrated many TMD symptoms with low morbidity while others reported few symptoms but high morbidity.<sup>3</sup> However, Attallah *et al.*<sup>6</sup> found no clear-cut evidence as to whether playing a musical instrument was associated with TMD, either directly or in combination with other factors. These narratives call for further investigations.

There is dearth of information on TMD in our population.<sup>6</sup> This present study assessed and compared the TMJ function in wind instrument players (WIP) and non-wind instrument players (non-WIP) in a male adult Nigerian population.

## SUBJECTS AND METHODS

This was a descriptive comparative cross-sectional study conducted among males aged 18 to 45 years. The study protocol was approved by the Research Ethics Committee of Aminu Kano Teaching Hospital. Written informed consent was obtained from individual participants before their inclusion. The sample population comprised the study WIP and the control non-WIP groups.

The WIP group comprised fifty subjects who had been playing wind musical instruments for a minimum of two years. The non-WIP group included fifty subjects who did not play any musical instrument and were in other vocations in the same local environment matched for age with the study group. All participants in both groups had full complement of dentition. Individuals with history of orthodontic treatment, surgery to the TMJ, trauma or fracture of the jaws, and tooth extraction were excluded from this study. The participants in the WIP group were purposively selected from a list of wind instrument players in the traditional emirate council of our country where they played traditional wind instruments (Figure 1) and the churches and clubs where they played contemporary wind instruments. The control group was recruited from the same environment as the wind instrument players. Selection was done from the list of eligible non-WIPs who were of the same age as the WIP in the study group. This selection was done until the sample size was achieved.

In cases where there was no control group subject in the same environment to match the age of the already selected wind instrument player, the wind instrument player was removed from participating in the study. The sample size was calculated based on the prevalence of severe symptoms of TMD of 2.9% among young adults in Nigeria<sup>6</sup> using Fisher's formula. A sample size of

50 was determined for each group which included addition of 10% for attrition.

A pilot study was carried out prior to commencement of the investigation to train one of the researchers (T.E.A) on the use of the Helkimo index and to carry out a pre-test of the questionnaire. To confirm intra-examiner reliability, 10 participants (5 in each group) from the total sample were randomly selected for a repeat clinical examination on the same day as the original examinations to reduce the risk of symptom fluctuation as described by Kopp.<sup>7</sup> The results showed an excellent agreement between the two examinations (intra-class reliability of 0.975).

The questionnaire for data collection was used to obtain information regarding socio-demographic characteristics, history of wind instrument play and the TMJ function as described by Helkimo.<sup>8</sup> For the anamnestic dysfunction, the following symptoms were reported as either present or absent: TMJ sound, feeling of facial fatigue, feeling of stiffness of the jaws on awakening, difficulty in opening the mouth wide, locking, luxation, pain on movement of the mandible, facial pain, jaw pain, pain on chewing and tiredness on chewing. For the clinical dysfunction, the following parameters were assessed clinically using a digital calliper: overbite, overjet, maximum mouth opening capacity, maximum mandibular protrusion, maximum lateral movement to the right and maximum lateral movement to the left.

Data was processed and analyzed using Statistical Software Package for Social Sciences (SPSS Inc, Chicago, IL) version 17.

Information obtained from the questionnaire were categorised and summarised using frequencies, percentages and tables; chi-square tests were used to compare categorical variables between the two groups; Fischer's exact test was used where appropriate. Binary logistic regression analysis was used to determine relationships between playing of wind instrument and symptoms of temporomandibular dysfunction in the study population. Statistical significance level was set at  $p < 0.05$ .

**RESULTS**

The overall mean age of the two groups was 28.05±7.56 years, with a range of 18 to 44 years. The mean age of participants in the study group (28.00±7.64 years) was not statistically significantly different from that of the control group (28.10±7.55 years) (p=0.95). The number of years of playing wind musical instrument ranged from 2 to 25 years with a mean of 9.26 ± 6.21 years.

Table 1 shows the socio-demographic characteristics of the study population.

Majority of the subjects in the WIP group (52.0%) were full time musicians while most of the non-WIP group (52.0%) were students. Most of the subjects in the WIP group had secondary/Islamic education (64.0%) while majority in the non-WIP group had tertiary education (62.0%). Trumpet was the most played by the participants in the WIP group (72.0%).

Table 2 shows the assessment of the temporomandibular joint dysfunction score in WIP and non-WIP groups. The majority of participants in the WIP group had mild to severe (64.0%) anamnestic dysfunction compared to 40.0% in non-WIP group. The difference between the two groups was statistically significant (p=0.019).

Similarly, more of the subjects in the WIP group had mild to moderate (26.0%) clinical dysfunction scores compared to 14.0% in the non-WIP group with no statistically significant difference (p=0.116). Generally, severe clinical dysfunction scores were not observed in any of the subjects in both groups.

Table 3 shows the distribution of temporomandibular joint dysfunction score according to the class of wind instrument played.

The proportion of the non-WIP (40.0%) with mild to severe anamnestic dysfunction scores was lower than class A (60%) instrument players. However, a higher proportion of class B instrument players (80.0%) had mild to severe anamnestic dysfunction scores compared to class A instrument players (60.0%). The difference in the anamnestic dysfunction scores among the three groups was statistically significant (p=0.022).

**Table 1: Socio-demographic Characteristics of the Study Population**

Socio-demographic Characteristics	Wind Instrument Players		Non-wind Instrument Players	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
<b>Occupation</b>				
Student	12	24.0	26	52.0
Civil servant	12	24.0	24	48.0
Full time Musician	26	52.0	0	0.0
<b>Total</b>	<b>50</b>	<b>100.0</b>	<b>50</b>	<b>100.0</b>
<b>Educational status</b>				
Primary school	2	4.0	0	0.0
Secondary/Islamic school	32	64.0	19	38.0
Tertiary	16	32.0	31	62.0
<b>Total</b>	<b>50</b>	<b>100.0</b>	<b>50</b>	<b>100.0</b>
<b>Type of wind instrument played</b>				
Clarinet	4	8.0	–	–
Trombone	4	8.0	–	–
Saxophone	6	12.0	–	–
Trumpet	36	72.0	–	–
<b>Total</b>	<b>50</b>	<b>100.0</b>		
<b>Class of wind instruments played</b>				
Class A (Trumpet and Trombone)	40	80.0	–	–
Class B (Clarinet and Saxophone)	10	20.0	–	–
<b>Total</b>	<b>50</b>	<b>100.0</b>		

**Table 2: Distribution and Comparison of Wind and Non-wind Instrument Players According to the Temporomandibular Disorders using Helkimo Index**

Helkimo index	WIP n(%)	Non-WIP n(%)	Fisher’s Exact Test		
			χ <sup>2</sup>	df	p-value
<b>Anamnestic dysfunction</b>					
Absence (Ai0)	18(36.0)	30(60.0)	7.88	2	0.019*
Mild (AiI)	14(28.0)	13(26.0)			
Severe (AiII)	18(36.0)	7(14.0)			
<b>Total</b>	<b>50(100.0)</b>	<b>50(100.0)</b>			
<b>Clinical dysfunction</b>					
Clinically free	37(74.0)	43(86.0)	4.70	2	0.116
Mild dysfunction	9(18.0)	7(14.0)			
Moderate dysfunction	4(8.0)	0(0.0)			
Severe dysfunction	–	–			
<b>Total</b>	<b>50(100.0)</b>	<b>50(100.0)</b>			

p< 0.05 - \* statistically significant; p>0.05-not statistically significant.

In terms of clinical dysfunction, a higher proportion of class B instrument players (30.0%) had mild to moderate dysfunction scores compared to non-WIP (14.0%) and players of class A wind instruments (25.0%). The difference in the clinical dysfunction scores among non-WIP and players of classes A and B instruments was not statistically significant (p=0.066).

Table 4 shows the distribution of temporomandibular joint dysfunction scores according to the number of years of playing wind instruments.

The proportion of mild to severe anamnestic dysfunction score reported in non-WIP and those that played for short, medium and long terms were 40.0%, 50.0%, 61.4% and 76.2% respectively suggesting an increase in proportion of

**Table 3: Distribution of Temporomandibular Joint Dysfunction Scores according to the Class of Wind Instrument Played**

Helkimo Index	Type of Wind Instrument Played			Fisher's Exact Test		
	None(Nil) n(%)	Class A (Trumpet + Trombone) n(%)	Class B (Clarinet + Saxophone) n(%)	$\chi^2$	df	p-value
Anamnestic dysfunction						
Absence (Ai0)	30(60.0)	16(40.0)	2(20.0)	10.88	4	0.022*
Mild (AiI)	13(26.0)	9(22.5)	5(50.0)			
Severe (AiII)	7(14.0)	15(37.5)	3(30.0)			
<b>Total</b>	<b>50(100.0)</b>	<b>40(100.0)</b>	<b>10(100.0)</b>			
Clinical dysfunction						
Clinically free	43(86.0)	30(75.0)	7(70.0)	7.69	4	0.066
Mild dysfunction	7(14.0)	8(20.0)	1(10.0)			
Moderate dysfunction	0(0.0)	2(5.0)	2(20.0)			
Severe dysfunction	–	–	–			
<b>Total</b>	<b>50(100.0)</b>	<b>40(100.0)</b>	<b>10(100.0)</b>			

*p* < 0.05 – \* Statistically significant; *p* > 0.05 – not statistically significant.

**Table 4: Distribution of Temporomandibular Joint Dysfunction Scores according to the Number of Years of Playing Wind Instruments**

Helkimo Index	Number of Years of Playing Wind Instruments				Fisher's Exact Test		
	None(Nil) n(%)	Short (2–4 years) n(%)	Medium (5–10 years) n(%)	Long (>10 years) n(%)	$\chi^2$	df	p-value
Anamnestic dysfunction							
Absence (Ai 0)	30(60.0)	8(50.0)	5(38.6)	5(23.8)	12.23	6	0.049*
Mild (Ai I)	13(26.0)	2(12.5)	4(30.7)	8(38.1)			
Severe (Ai II)	7(14.0)	6(37.5)	4(30.7)	8(38.1)			
<b>Total</b>	<b>50(100.0)</b>	<b>16(100.0)</b>	<b>13(100.0)</b>	<b>21(100.0)</b>			
Clinical dysfunction							
Clinically free (Di 0)	43(86.0)	13(81.2)	10(76.9)	14(66.7)	8.41	6	0.137
Mild dysfunction (Di I)	7(14.0)	2(12.5)	3(23.1)	4(19.0)			
Moderate dysfunction (Di II)	0(0.0)	1(6.3)	0(0.0)	3(14.3)			
Severe dysfunction	–	–	–	–			
<b>Total</b>	<b>50(100.0)</b>	<b>16(100.0)</b>	<b>13(100.0)</b>	<b>21(100.0)</b>			

*p* < 0.05 – \* Statistically significant; *p* > 0.05 – not statistically significant.

**Table 5: Distribution of Temporomandibular Joint Dysfunction Scores according to the Frequency of Playing Wind Instruments**

Helkimo Index	Frequency of Playing Wind Instruments			Fisher's Exact Test		
	None (Nil) n(%)	Regular (Daily or weekly) n(%)	Occasional (1 to 3 times monthly) n(%)	$\chi^2$	df	p-value
Anamnestic dysfunction						
Absence	30(60.0)	17(40.5)	1(12.5)	12.95	4	0.008**
Mild	13(26.0)	9(21.4)	5(62.5)			
Severe	7(14.0)	16(38.1)	2(25.0)			
<b>Total</b>	<b>50(100.0)</b>	<b>42(100.0)</b>	<b>8(100.0)</b>			
Clinical dysfunction						
Clinically free	43(86.0)	31(73.8)	6(75.0)	5.93	4	0.167
Mild dysfunction	7(14.0)	7(16.7)	2(25.0)			
Moderate dysfunction	0(0.0)	4(9.5)	0(0.0)			
Severe dysfunction	0(0.0)	0(0.0)	0(0.0)			
<b>Total</b>	<b>50(100.0)</b>	<b>42(100.0)</b>	<b>8(100.0)</b>			

*p* < 0.05 – \* statistically significant; *p* < 0.01 – \*\*highly statistically significant; *p* > 0.05 – not statistically significant.

anamnestic dysfunction as the number of years of playing wind instruments increased. The difference in the anamnestic dysfunction scores during these different periods of playing wind instruments was statistically significant (*p*=0.049).

The proportion of subjects that had mild to moderate clinical dysfunction scores in non-WIP and WIP that played for short, medium and long terms were 14.0%, 18.8%, 23.1% and 33.3% respectively. The difference in the clinical dysfunction scores among the different categories of years of playing wind musical instruments was however not statistically significant (*p*=0.137).

Table 5 shows the distribution of temporomandibular joint dysfunction scores according to the frequency of playing wind instruments. A higher proportion of subjects who played wind instruments occasionally (87.5%) had mild to severe anamnestic dysfunction scores when compared to subjects that played wind instruments regularly (59.5%) and those that did not play (40.0%). The difference in anamnestic dysfunction scores in the study population according to their frequency of play was highly statistically significant (*p*=0.008).

A contrasting trend was seen in the pattern of clinical dysfunction scores, as more of those that played regularly (26.2%) had mild to moderate clinical dysfunction score than those that played occasionally (25.0%) and non-WIPs (14.0%). The difference in the clinical dysfunction scores among the different frequencies of playing wind instruments was however not statistically significant (*p*=0.167). No severe clinical dysfunction score was recorded in the study population.



**Fig. 1: Traditional Wind Instrument.**

## DISCUSSION

The primary objective of this study was to assess the effects of long-term playing of wind musical instruments on the temporomandibular joint in our population. Females were not included in this study for cultural and religious reasons as females do not usually engage in professional wind instrument play in the northern part of Nigeria where this study was done.

The mean age of participants in this study was similar to that of another study in the United Kingdom which also compared players of different classes of wind instruments with a control group.<sup>9</sup>

Most of the participants in the WIP group were full time musicians with secondary/Islamic education whereas majority in the non-WIP group had tertiary education. The lower level of education in the WIP group population may be the reason for the choice of music as a full time vocation. The traditional trumpet (Fig. 1) was the most commonly played by the participants since they were mainly recruited from the Emir's palace. The result of this study showed a higher prevalence of anamnestic dysfunction when compared with the study of Otuyemi *et al*<sup>6</sup> who reported a lower prevalence in a study in young Nigerian adults. The reported prevalence in this study population was also higher than that from other previous studies,<sup>10,11</sup> which may probably be due to the seemingly higher level of socio-economic stress or parafunctional habits in this population suggested by their low educational statuses. There was a significantly higher prevalence of anamnestic dysfunction of TMJ in the WIP group when compared with the non-WIP group, which is also in agreement with previous studies.<sup>2,13-15</sup>

Generally, severe clinical dysfunction was not reported in any of the participants in both WIP and non-WIP groups. However, there was a higher prevalence of mild to moderate clinical dysfunction in the WIP group compared to the non-WIP group in this study. Though this was not statistically significant, it was comparable to reports from other studies.<sup>3,12-14</sup> The higher anamnestic and clinical dysfunctions reported among the WIP group was likely

due to increased stress accompanying this social and professional behavior of playing wind musical instruments. Playing a musical instrument could overload the masticatory muscles and orofacial skeletal system, thereby causing TMD or worsening existing TMD if present as reported in other studies.<sup>5,5,16</sup>

In the study group, we found a slight but significantly higher anamnestic scores in clarinet/saxophone players when compared with the trumpet/trombone players, which suggests a higher tendency to develop anamnestic dysfunction when playing class B instruments than class A instruments. This is probably due to habitual posturing of the mandible during play of class B wind instruments, which increases the stress on the TMJ.<sup>17</sup> Similar pattern though insignificant was also observed in the clinical dysfunction scores of players of classes A and B wind instruments.

This study also demonstrated that those who had been playing wind instruments for longer years had higher anamnestic dysfunction scores than those who engaged in playing for a shorter time. This is in agreement with the finding of Pampel, *et al*<sup>3</sup> on the temporomandibular system of male instrumentalists. De Queiroz<sup>14</sup> reported positive correlation for reported symptoms and the frequency of practice as a higher prevalence of orofacial pain was reported in his experimental group compared to the control subjects.

A similar pattern was observed in their clinical dysfunction scores, though not clinically significant. Reports have also been shown that signs and symptoms of TMD increase with age which may also explain why those that had played for longer years had higher dysfunction scores.<sup>6,18</sup>

Individuals who played wind instruments occasionally for a duration of one to three months had significantly more anamnestic dysfunction scores than non-WIP and those who played it more regularly on a daily or weekly basis. This may likely be due to the non-adaptation to the stress of playing wind instruments in the TMJ of occasional players compared to regular players whose TMJ gradually become adapted to the stress of playing wind instruments as corroborated by Pampel *et al*.<sup>3</sup>

Professional musicians should therefore be offered prophylactic orthodontic relaxation plates to prevent/reduce the symptoms of TMJ dysfunctions.<sup>20</sup>

One limitation of this study is that the findings cannot be generalised to both genders since it was conducted only in adult males. Future studies to include adult female subjects with follow-ups of larger sample size as well as radiological investigations may be necessary to better understand the effects of playing wind instruments on the TMJ especially in our population. Furthermore, longitudinal studies would be recommended to provide more information on the direct effects of playing specific wind instruments on the temporomandibular joints.

## CONCLUSIONS

Playing a wind instrument significantly negatively affected the anamnestic dysfunction of the temporomandibular joint. The number of years and regularity of playing wind instruments significantly predisposed players to anamnestic TMJ dysfunction. Clarinet/saxophone wind instruments significantly predisposed wind instrument players to anamnestic TMJ dysfunction than trumpet/trombone.

## Conflict of Interest

None.

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