Medical Science

pISSN 2321–7359; eISSN 2321–7367

# Assessment of the prevalence of temporomandibular joint disorder among vocalists and musicians using a questionnaire study

**Jaishankar HP**[1], **Karthikeya Patil**[2*], **Sanjay CJ**[1], **Shiny A**[3], **Sharath N**[3], **Barsha Bharadwaj**[3]

**To Cite:**
Jaishankar HP, Patil K, Sanjay CJ, Shiny A, Sharath N, Bharadwaj B. Assessment of the prevalence of temporomandibular joint disorder among vocalists and musicians using a questionnaire study. *Medical Science* 2023; 27: e84ms2825.
doi: https://doi.org/10.54905/disssi/v27i132/e84ms2825

**Authors' Affiliation:**
[1]Reader, Department of Oral Medicine and Radiology, JSS Dental College and Hospital, JSS Academy of Higher Education and Research, India
[2]Professor and Head of the Department, Department of Oral Medicine and Radiology, JSS Dental College and Hospital, JSS Academy of Higher Education and Research, India
[3]Postgraduate Student, Department of Oral Medicine and Radiology, JSS Dental College and Hospital, JSS Academy of Higher Education and Research, India

**ORCID List**

| | |
|---|---|
| Jaishankar HP | 0000-0003-3581-3362 |
| Karthikeya Patil | 0000-0002-7941-2467 |
| Sanjay CJ | 0000-0003-2830-1481 |
| Shiny A | 0000-0003-4417-2042 |
| Barsha Bharadwaj | 0000-0003-1783-5891 |

[*]**Corresponding Author**
Professor and Head of the Department, Department of Oral Medicine and Radiology, JSS Dental College and Hospital, JSS Academy of Higher Education and Research,
India
Email: dr.karthikeyapatil@jssuni.edu.in
ORCID: 0000-0002-7941-2467

**Peer-Review History**
Received: 10 January 2023
Reviewed & Revised: 14/January/2023 to 02/February/2023
Accepted: 06 February 2023
Published: 11 February 2023

**Peer-review Method**
External peer-review was done through double-blind method.

**URL**: https://www.discoveryjournals.org/medicalscience



## ABSTRACT

*Objective:* To evaluate the risk for symptoms of temporomandibular joint disorders (TMD) prevalent among the vocalists and musicians in Indian population. *Materials and Methods:* A total of 367 musicians filled an online questionnaire to participate in the study, 9 of whom were excluded. *Results:* The prevalence of TMJ pain was highest among the wind instrument players (50.8%) followed by the violinists (28.6%). The musicians who noticed joint sounds were highest among the wind instrumentalists (68.3%). Incidence of difficulty in mouth opening was more in wind instrumentalists (41.3%) and violinists (23.2%). The participants who reported having jaw, cheek, temple or headache pain was highest (68.3%) among players of wind instruments. The number of participants who reported to be suffering from pain in the shoulder or neck region was predominant in wind instrumentalists (73%). *Conclusion:* The results imply that playing musical instruments increases the possibility of developing TMD, with wind instrumentalists being at a higher risk.

**Keywords:** Musicians, Questionnaire survey, Temporomandibular disorders

## 1. INTRODUCTION

Music provides huge pleasure to those who listen and a great lot of pleasure to those who practice it. It is also thought to decrease stress since it allows a wide spectrum of emotions to be expressed solely through music. Music appears to have become inextricably linked to people's lives in today's globe. There's music for every occasion, whether it is a wedding or a funeral, a movie or an Annual Day programme, joyous or sad.

A professional musician or vocalist develops their skills from an early age, spending hours together perfecting their skills (Amorim and Jorge, 2016). Pain in the joint, difficulty in opening the mouth, jaw deviation while opening and joint sounds, as well as pain in and around the joint, are all signs of temporomandibular dysfunction. Other symptoms include ear pain, tinnitus,

headaches, neck pain and hearing loss (Attallah et al., 2017).

During long practice sessions, vocalists tend to use their masticatory muscles very frequently, which might put some pressure on the TMJ. TMD symptoms can be caused by increasing the length of practice sessions over time. Frequent pressure on muscles of mastication is directly proportional to the length of practice session. Violins, for example, necessitate the support of the shoulder and mandible, which exerts pressure on the TMJ. Other wind instruments tend to strain the masticatory muscles (Amorim and Jorge, 2016).

Several researches have been undertaken among the musicians in different populations. Very few studies have found the association of TMD among the wind instrumentalists while there is sufficient evidence of TMD associated among the violinists (Van-Selms et al., 2017). In other studies, guitarists were found to be suffering from musculoskeletal disorders (Dhrithi et al., 2013). The assessment of the association of the musician's posture during practice with the musculoskeletal disorders or TMD was conducted in our study.

This research will aid in determining the extent to which musicians and vocalists are affected by TMJ problems. As a result, a path has been paved for raising awareness, counseling and treating the symptoms early. Therefore, the aim of the current study was to assess the risk for symptoms of TMD prevalent among the vocalists and musicians in the Indian population.

## 2. MATERIALS AND METHODS

**Data collection procedure Type & duration of study**

Questionnaire study, duration 1 year from May 2021 to May 2022.

**Study setting & source of data**

An online questionnaire was sent via Microsoft form to the musicians and vocalists in India.

**Validation on the questionnaire**

The questions framed were read by the staff in our department and was sent to the psychometrician for validation.

***Inclusion criteria***

Musicians and vocalists

Patients willing for participation

***Exclusion criteria***

Patients with any systemic bone disease affecting the joint

Congenital or hereditary disorders

***Withdrawal criteria***

Subjects not willing to give their consent for the participation

Incomplete filled form

***Sampling procedure***

Convenience sampling

***Statistical analysis***

The data was analyzed with the Statistical Package for Social Sciences (SPSS 22.0). The study used Descriptive (Frequency and percentage) and inferential statistics (Pearson Chi-Square test) to determine the statistical significance in the responses.

## 3. RESULTS

The results from the questionnaire study revealed a wide range of outcomes for each group of musicians. The musicians were found to have various symptoms of musculoskeletal disorders of head and neck. A total of 367 musicians took part in the study by filling an online questionnaire out of which 9 participants were excluded who was suffering from bone diseases affecting joints. Out of 358 musicians, in the descending order, 78 were vocalists, 63 played wind instruments, 60 played Guitar, 58 played Piano/keys, 56 played violins and 43 played percussion/drums. They had been practicing for a wide range of years. Among the participants, 33.3%

of the wind instrument players had an experience of 15-20 years and 35.7% of the violin players had been practicing for 10-15 years. 30% of the guitarists had been practicing for more than 20 years (Figure 1).

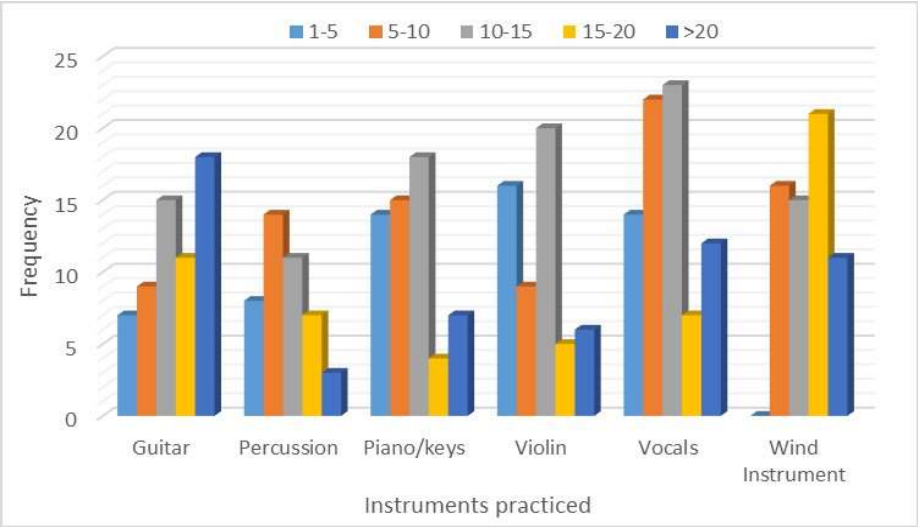


**Figure 1** Years of experience among various musicians

The 358 musicians were segregated into two groups, Group 1 playing instruments that does not involve the muscles of mastication or the mouth (guitar, percussion, piano/keys, violin) and Group 2 that do (wind instruments and vocalists). 217 participants were in Group 1 category and 141 in Group 2. In Group 1, 39.1% (42) of the musicians had joint sounds out of which 19.35% (85) were known to have pain in TMJ. Out of 141 musicians in Group 2, 51% (72) had joint sounds out of which 30.45% (43) suffered from TMJ pain. In Group 1, 39.6% (86) of the musicians suffered from pain around jaw, cheeks, temple or had headaches and 55.3% (78) of the musicians suffered from pain in the neck or shoulders. In Group 2, 44.6% (63) of the musicians suffered from pain around jaw, cheeks, temple or had headaches and 52.4% (74) of the musicians suffered from pain in the shoulder or neck region (Table 1).

**Table 1** Symptoms of musculoskeletal disorders in Group 1 (musicians playing instruments that do not require the use of the mouth or the masticatory muscles) and Group 2 (musicians playing instruments that require the use of the mouth or the masticatory muscles) (n=358)

| Symptoms | Group 1 | Group 2 |
|---|---|---|
| TMJ pain | 42 (19.35%) | 43 (30.49%) |
| TMJ sounds | 85 (39.1%) | 72 (51%) |
| Pain around your jaw, cheeks, temple or had headaches | 86 (39.6%) | 63 (44.6%) |
| Pain in your neck or shoulder? | 78 (55.3%) | 74 (52.4%) |

Pain in TMJ was predominant among the wind instrument players (50.8%) followed by the violin players (28.6%) while it was least among the piano/keys players. The musicians who noticed joint sounds on opening and closing the jaws were highest among the wind instrument players (68.3%) followed by violin (44.6%) and percussion/drums players (44.2%) and least among the guitarists (28.3%). Incidence of difficulty in mouth opening was more in wind instrument (41.3%) and violin players 23.2%) (Table 2).

Questions to access the influence of posture on the TMJ was included in the questionnaire. 92.1% of the wind instrument players, 83.7% of the percussion/drums players, 78.6% of the guitarists, 58.6% of the pianists, 55% of the violinists and 47.4% of the vocalists practiced in the sitting posture (Table 3). The number of subjects who reported to suffer from pain around the jaw, cheeks, temple or headaches was highest among the wind instrument players (68.3%).

The number of musicians, who reported to be suffering from pain in the shoulder or neck region, in the decreasing order, were 73% of the wind instrumentalists, 60.7% of the violinists, 56.7% of the guitarists, 55.8% percussion/drummers, 55.2% of the

pianist/keyboard players and 35.9% of the vocalists (Table 4). The percentage of musicians who practiced with their hands at the shoulder level was highest among the violinists, vocalists followed by the wind instrumentalists (Figure 2).

**Table 2** Symptoms of temporomandibular joint disorder among different musicians

| Instrument type | Have you ever had pain in the joint around your ear? | | Have you ever noticed sounds while opening or closing your jaw? | | Have you ever experienced any difficulty while opening your mouth? | | Have you ever stopped performing due to pain in the joint? | |
|---|---|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No | Yes | No |
| Guitar | 12<br>20.0% | 48<br>80.0% | 17<br>28.3% | 43<br>71.7% | 10<br>16.7% | 50<br>83.3% | 7<br>8.9% | 53<br>91.1% |
| Percussion/drums | 8<br>18.6% | 35<br>81.4% | 19<br>44.2% | 24<br>55.8% | 9<br>20.9% | 34<br>79.1% | 0<br>0.0% | 43<br>100.0% |
| Piano/keys | 6<br>10.3% | 52<br>89.7% | 24<br>41.4% | 34<br>58.6% | 6<br>10.3% | 52<br>89.7% | 6<br>10.3% | 52<br>89.7% |
| Violin | 16<br>28.6% | 40<br>71.4% | 25<br>44.6% | 31<br>55.4% | 13<br>23.2% | 43<br>76.8% | 12<br>23.3% | 44<br>76.7% |
| Vocals | 12<br>20.0% | 48<br>80.0% | 29<br>37.2% | 49<br>62.8% | 6<br>7.7% | 72<br>92.3% | 5<br>6.4% | 73<br>93.6% |
| Wind Instrument | 32<br>50.8% | 31<br>49.2% | 43<br>68.3% | 20<br>31.7% | 26<br>41.3% | 37<br>58.7% | 12<br>19.0% | 51<br>81.0% |
| Chi-Square test | | | | | | | | |
| Value | 37.028 | | 22.675 | | 29.838 | | 19.435 | |
| Df | 5 | | 5 | | 5 | | 5 | |
| Asymp. Sig. (2-sided) | .000 | | .000 | | .000 | | .002 | |

**Table 3** Body posture in various musicians

| Instrument type | What is your usual body posture during practice? | |
|---|---|---|
| | Sitting | Standing |
| Guitar | 46<br>78.6% | 14<br>21.4% |
| Percussion/drums | 36<br>83.7% | 7<br>16.3% |
| Piano/keys | 34<br>58.6% | 24<br>41.4% |
| Violin | 31<br>55.0% | 25<br>45.0% |
| Vocals | 37<br>47.4% | 41<br>52.6% |
| Wind Instrument | 58<br>92.1% | 5<br>7.9% |
| Chi-Square test | | |
| Value | 46.356 | |
| Df | 5 | |
| Asymp. Sig. (2-sided) | .000 | |

**Table 4** Muscle pain in the head, neck and shoulder region among musicians

| Instrument type | Have you ever experienced pain in your neck or shoulder? | | Have you had pain around your jaw, cheeks and temple or had headaches? | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| Guitar | 34<br>56.7% | 26<br>43.3% | 17<br>28.3% | 43<br>71.7% |
| Percussion/drums | 24<br>55.8% | 19<br>44.2% | 20<br>46.5% | 23<br>53.5% |
| Piano/keys | 32<br>55.2% | 26<br>44.8% | 29<br>50.0% | 29<br>50.0% |
| Violin | 34<br>60.7% | 22<br>39.3% | 20<br>35.7% | 36<br>64.3% |
| Vocals | 28<br>35.9% | 50<br>64.1% | 35<br>44.9% | 43<br>55.1% |
| Wind Instrument | 46<br>73.0% | 17<br>27.0% | 43<br>68.3% | 20<br>31.7% |
| Pearson Chi-Square test | | | | |
| Value | 20.593 | | 22.912 | |
| Df | 5 | | 5 | |
| Asymp. Sig. (2-sided) | .001 | | .000 | |

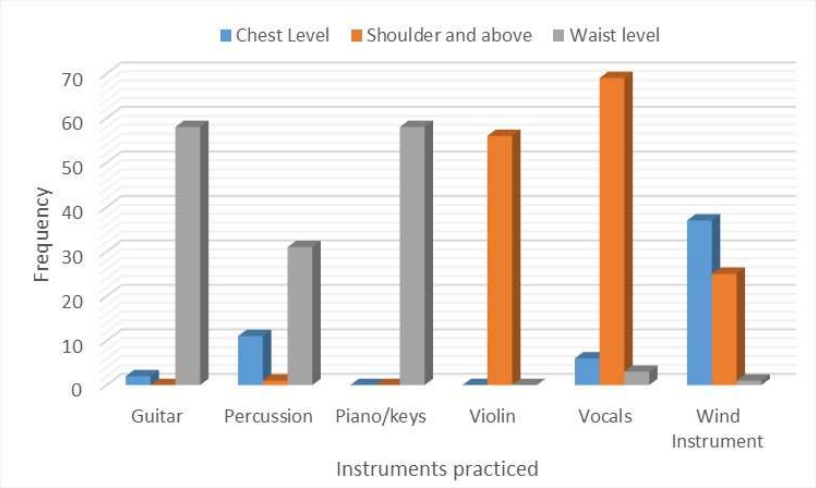


**Figure 2** Arm position while practicing various instruments

## 4. DISCUSSION

Musculoskeletal disorders and TMD are frequently associated with musicians when compared with other medical ailments (Cavalcanti et al., 2017). The study added to the evidence of the same. The Wind instrumentalists and violinists were more affected with TMD than the others. Playing wind instrument in India can be more of an occupation than a hobby. It is an important instrument in most of the Indian weddings and festivals. The practice of playing also gets passed on from generations. The long-term practice of violin and wind instrument can result in craniomandibular dysfunction (Głowacka et al., 2014). Our present study was in line with this. Since most of the affected wind instrument players had been practicing for a period of 10 to 20 years and even more.

In our study, 70 (19.6%) of the musicians complained of difficulty in mouth opening out of which 43 of them had TMJ pain. Twenty-seven of them had difficulty in mouth opening without TMJ pain. Pampel et al., (2014) in his study, found that, on palpation the tenderness of the masseter muscle was predominant among the wind instrument players which were comparatively higher when compared with other TMD-patients.

Santos Silva et al., (2021) in their study stated the risk factors for developing TMD in the wind instrument players could be previously existing TMJ pain, pressure exerted by the mouthpiece and increased mandibular protrusion. The attempt to bring the lips in contact with the mouthpiece brings the mandible forward leading to a non-physiological position of the mandible causing TMD. Nishiyama and Tsuchida, (2016) in their study stated that the pressure from the mouthpiece to be one of the risk factors in the development of TMD.

In the present study done in India, the incidence of TMJ pain was highest among the wind instrument players (50.8%) followed by the violinists (28.6%). A systemic review and meta-analysis done in different countries on 13 related articles showed almost similar prevalence of TMD in string instrument players (53.9%) and wind instrument players (52.8%) (Campos et al., 2021). The reason for the difference could be the culture and population of the study group.

The current study showed lower incidence of TMJ pain in the vocalists (20%) compared to violin and wind instrument players. Van-Selms et al., (2019) in their study 21.9% of the vocalists reported to have TMJ pain. They concluded that there was no association between TMJ sounds and TMD. This was in line with the current study.

In the current study, practicing in the sitting posture was predominantly noticed among the guitarists and wind instrument players and many of the vocalists were found to practice in the standing posture. Among those who practice in the sitting posture, 60 (16.34%) participants had TMJ pain and 142 (38.69%) had shoulder or neck pain. Among those who practice in the standing posture, 25 (6.8%) participants had TMJ pain and 56 (15.25%) had pain in neck and shoulders. Pain in shoulder and neck was predominantly noticed among the wind instrumentalists (73%), violinists (60.7%) and guitarists (56.7%). Therefore, pain in shoulder and neck was more prevalent in the musicians who practice in the sitting posture.

On practicing in the sitting posture, there is a tendency to lean forward with extended shoulders, which puts strain on the neck and back. If this posture is persisted, more strain is added, which frequently causes neck pain (Dhrithi et al., 2013). Practicing instruments by placing them between the lower jaw and the shoulder may strain the orofacial musculoskeletal system, potentially leading to TMD or aggravating a pre-existing TMD (Attallah et al., 2017). By using the chin to stabilize the instrument, violin players apply pressure to the chinrest and mandible, causing mechanical stress to the TMJ (Kovero et al, 1997).

In the current study, arm position varied while playing different instruments. Neck and shoulder pain was predominant in the musicians who practiced with a raised arm position than in those who played with the arm in a relaxed position except for the vocalists. This was most likely due to the posture used while playing. Most of the vocalists in our study practiced standing with elevated arm which is probably due to the holding of the microphone. When musicians who play instruments that require a raised arm position (violin and some of the wind instruments) and maintain poor posture can cause neck and shoulder pain.

Our results were in accordance with the results from the study by Jang et al., (2016) where when playing, the muscle pain showed significant difference with arm position. Muscle pain was more common in the musicians who played with a raised arm position compared to those who played with a relaxed arm position. It has been revealed that playing and practicing in nonergonomic working conditions, activate and exacerbate TMD symptoms (Addey, 1992).

On observing the symptoms for TMD in the two groups (Table 1), both the groups presented with the symptoms of TMD. TMJ sounds and pain were more prevalent in Group 2 and shoulder or neck pain was predominant in group 1. In group 2, the wind instrumentalists were the most affected. Overloading the muscles of mastication during the extensive practice sessions for long period of time can lead to the symptoms of TMD (Zimmers and Gobetti, 1994; Steinmetz et al., 2014). In group 1, the most affected group was found to be violinists.

Furthermore, anxiety while performing and high stress level can be the cause or aggravate a wide range of serious health issues in musicians, including musculoskeletal disorders (Jacukowicz, 2016). Several studies have shown an association between headache and pain in the neck, shoulder and TMDs (Goncalves et al., 2011; Ashina et al., 2015).

According to the findings by Van-Selms et al., (2020), TMJ pain was experienced in 18.3% of the instrumentalists, 52.5% experienced pain in shoulder and neck and 42.5% experienced headache. Among the symptomatic complaints, TMJ sounds were noticed in 18.3% of the musicians, 7.1% reported jaw lock on mouth opening and only 2.4% had a catch or jaw lock on closing. They concluded that TMJ pain was related to practicing a woodwind instrument, while neck and shoulder pain appeared to be related to playing the violin or viola.

**Limitations**

Musicians who play multiple instruments were not considered in order to assess and categorize the instruments that elicit TMD symptoms and those that do not.

## 5. CONCLUSION

The results imply that playing musical instruments with long hours increases the possibility of developing one or other symptoms of TMD of which wind instrumentalists were the most affected followed by violinists. Practicing in sitting posture can cause musculoskeletal disorders of head and neck. Further studies with clinical and radiographic examination are needed to access the further changes in TMJ.

**Institutional ethical approval number**

JSSDCH IEC Research Protocol no. 30/2021.

**Author's Contribution Details**

Dr Jaishankar HP: Concept and design, manuscript preparation, definition of intellectual content, literature search, manuscript editing, manuscript review, guarantor.

Dr Karthikeya Patil: Concept and design, manuscript preparation, definition of intellectual content, manuscript editing, manuscript review, guarantor.

Dr Sanjay CJ: Clinical studies, experimental studies, statistical analysis, manuscript editing, manuscript review, guarantor.

Dr Shiny A: Literature search, clinical studies, experimental studies, data acquisition, statistical analysis, manuscript preparation, manuscript editing, manuscript review.

Dr Sharath N: Literature search, clinical studies, experimental studies, statistical analysis, manuscript preparation.

Dr Barsha Bharadwaj: Literature search, clinical studies, statistical analysis, manuscript preparation.

**Funding**

This study has not received any external funding.

**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

## REFERENCES AND NOTES

1. Addey JJ. Musicians and temporomandibular disorders: Prevalence and occupational etiologic considerations. Cranio 1992; 10:241-4. doi: 10.1080/08869634.1992.11677916
2. Amorim MI, Jorge AI. Association between temporomandibular disorders and music performance anxiety in violinists. Occup Med (Lond) 2016; 66(7):558-563. doi: 10.1093/occmed/kqw080
3. Ashina S, Bendtsen L, Lyngberg AC, Lipton RB, Hajiyeva N, Jensen R. Prevalence of neck pain in migraine and tension-type headache: A population study. Cephalalgia 2015; 35:211-219. doi: 10.1177/0333102414535110
4. Attallah MM, Visscher CM, Selms MKV, Lobbezoo F. Is there an association between temporomandibular disorders and playing a musical instrument? A review of literature. J Oral Rehabil 2014; 41(7):532-541. doi: 10.1111/joor.12166
5. Campos LGN, Pedrosa BH, Cavalcanti RVA, Stechman-Neto J, Gadotti IC, Araujo CMD, Taveira KVM. Prevalence of temporomandibular disorders in musicians: A systematic review and meta-analysis. J Oral Rehabil 2021; 48(5):632-642. doi: 10.1111/joor.13150
6. Cavalcanti AL, Souto JMV, Brand LMT, Fernandes LFH, De-Alencar CRB, Cavalcanti AFC. Is playing string or wind musical instruments a risk factor for temporomandibular dysfunction? A systematic review. J Oral Res 2017; 6. doi: 10 .17126/joralres.2017.083
7. Dhrithi M, Parul A, Kurian A. Prevalence of playing-related musculoskeletal disorder (PRMSD) among amateur young guitar players. J Musculoskelet Res 2013; 16(2):1330002. doi: 10.1142/S0218957713300020
8. Głowacka A, Matthews-Kozanecka M, Kawala M, Kawala B. The impact of the long-term playing of musical instruments

on the stomatognathic system: Review. Adv Clin Exp Med 2014; 23(1):143-146. doi: 10.17219/acem/37038
9. Goncalves DA, Camparis CM, Speciali JG, Franco AL, Castanharo SM, Bigal ME. Temporomandibular disorders are differentially associated with headache diagnoses: A controlled study. Clin J Pain 2011; 27:611-615. doi: 10.1097/AJP.0b013e31820e12f5
10. Jacukowicz A. Psychosocial work aspects, stress and musculoskeletal pain among musicians. A systematic review in search of correlates and predictors of playing-related pain. Work 2016; 54:657-668. doi: 10.3233/WOR-162323
11. Jang JY, Kwon JS, Lee DH, Bae JH, Kim ST. Clinical signs and subjective symptoms of temporomandibular disorders in instrumentalists. Yonsei Med J 2016; 57(6):1500-1507. doi: 10.3349/ymj.2016.57.6.1500
12. Kovero O, Könönen M, Pirinen S. The effect of professional violin and viola playing on the bony facial structures. Eur J Orthod 1997; 19:39-45. doi: 10.1093/ejo/19.1.39
13. Nishiyama A, Tsuchida E. Relationship between wind instrument playing habits and symptoms of temporomandibular disorders in non-professional musicians. Open Dent J 2016; 10:411-416. doi: 10.2174/1874210601610010411
14. Pampel M, Jakstat HA, Ahlers OM. Impact of sound production by wind instruments on the temporomandibular system of male instrumentalists. Work 2014; 48(1):27-35. doi: 10.3233/WOR-131621
15. Silva SD, José C, Valério P, Nascimento IJBD, Simoura JADS. Temporomandibular disorders among wind musical instrument players: An integrative review. Jaw Functional Orthopedics and Craniofacial Growth 2021; 1(1):4–11. https://www.extrica.com/article/22041
16. Steinmetz A, Zeh A, Delank KS, Peroz I. Symptoms of craniomandibular dysfunction in professional orchestra musicians. Occup Med (Lond) 2014; 64:17-22. doi: 10.1179/crn.2009.033
17. Van-Selms MKA, Ahlberg J, Lobbezoo F, Visscher CM. Evidence-based review on temporomandibular disorders among musicians. Occup Med (Lond) 2017; 67(5):336-343. doi: 10.1093/occmed/kqx042
18. Van-Selms MKA, Wiegers JW, Lobbezoo F, Visscher CM. Are vocalists prone to temporomandibular disorders? J Oral Rehabil 2019; 46(12):1127-1132. doi: 10.1111/joor.12849
19. Van-Selms MKA, Wiegers JW, Meer HAV, Ahlberg J, Lobbezoo F, Visscher CM. Temporomandibular disorders, pain in the neck and shoulder area and headache among musicians. J Oral Rehabil 2020; 47(2):132-142. doi: 10.1111/joor.12886
20. Zimmers PL, Gobetti JP. Head and neck lesions commonly found in musicians. J Am Dent Assoc 1994; 125(11):1487-90, 1492-4, 1496. doi: 10.14219/jada.archive.1994.0216