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Dr. Ajay Kumar
Professor, Srinivas College of
Physiotherapy, Srinivas
University Mangalore,
Karnataka, India

Arya Dharan B
PG Student, Srinivas College of
Physiotherapy, Srinivas
University Mangalore,
Karnataka, India

Deepak Kumar Pradhan
Assistant Professor, Srinivas
College of Physiotherapy,
Srinivas University Mangalore,
Karnataka, India

Corresponding Author:
Dr. Ajay Kumar
Professor, Srinivas College of
Physiotherapy, Srinivas
University Mangalore,
Karnataka, India

Prevalence of temporomandibular joint disorders in competitive swimmers: A cross sectional study

Dr. Ajay Kumar, Arya Dharan B and Deepak Kumar Pradhan

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Abstract

Swimming is a combination of upper limb and lower extremities strength exercise and also cardiovascular training. In competitive swimmers during swimming functional variations in anatomy or biomechanics and poor techniques leads to overuse injuries and micro trauma. TMD is multifactorial disorder commonly associated with masticatory and articular disabilities. According to previous studies there is a high demand on neck rotation and upper limb activities for the propulsion of the body inside the water and which negative synchronized activities of jaw and mastication structure. There is no studies have been attempted to find out the prevalence of TMD among competitive swimmers through there is a greater demand on TMJ structure due to their swimming mechanics.

Keywords: TMJ, swimmers, cross sectional

Introduction

Swimming is an unique sport. It is the combination of upper limb and lower extremity strength exercise and also cardiovascular training in non-weight bearing environment^[1]. In competitive swimmers, there are four strokes freestyle, butterfly, backstroke, and breaststroke^[2]. Competitive swimmers trains 10,000 to 20,000 meter per day. At an average of 8 to 10 arm cycles per 25 meter. Swimmers push their body to the limits of the functions so normal variations in anatomy or biomechanics and poor technique may lead to overuse injuries and micro trauma. The most common swimming injuries are shoulder, neck and back. The prevalence of musculoskeletal injuries in competitive swimmers is, shoulder 37%, knee 28%, spine 22% and foot and ankle is 19%^[2, 3].

Front crawl, butterfly and backstrokes all relay on the arms for 75% of the arm propulsion forward while in the breaststroke the legs and the arms contribute equally^[1, 4]. The neck can be subjected to sustained and repetitive movements which can leads to overuse injury. Atlanto axial (C1-C2) joint is given the most 55% total cervical movements, which houses the trigeminal spinal tract sub nucleus and C1-C2 dorsal horns^[5].

Maximum body rotation approximately 30⁰ - 40⁰ with minimal head rotation in both side required for breath^[3, 6]. The correct stroke pattern must be accompanied with equal body rotation to avoid injury. So the bilateral breathing is encouraged in swimmers because of neck over rotation leads to cervical spine ligament and muscle asymmetrical development. If the body is rotation is well then there is no need of over rotation of neck. But unilateral breathing during swim (breath only to the favored side) leads to muscle imbalance can be aggravated by towards head carriage, changing axis of rotation that leads to greater extension and side bending of the cervical spine to compensate for the decreased rotation^[5]. And alternatively, breathing to the unfavored side may not rotate the body enough it may cause over rotation of the neck and subsequent discomfort because of the asymmetric body roll may increases the impingement by causing a compensatory crossover entry position during pull through and recovery phase on the side with less roll or on the non-breathing side^[4-6].

The muscle imbalance and upper cervical spine joint dysfunction are significantly contributing factors of neck pain. In swimmers the over activity of neck flexors will causes an inhibitory weakening of deep neck flexors. And it leads to forwarded head posture^[6, 7].

In older swimmers disc dysfunction and spondylosis may cause nerve root compression at the level of C4, C5 & C6 resulting radiating pain to the shoulder joint and beyond. And also can cause weakness of large group of shoulder girdle. These type of injuries make difficulty to swim due to additional load placed on cervico-cranial structures [2].

Temporomandibular joint (TMJ) is complex junction. It consists of three articular surface mandibular fossa, articular tubercle and head of the mandible. The main function of the joint is opening and closing of the mouth [8]. The important muscles are involved in TMJ movements are the digastricus, masseter, lateral pterygoid and masticator muscles such as supra hyoid and infra hyoid. In temporomandibular joint disorder (TMD), the TMD, masticatory muscles or both are involved. It can cause non dental pain in orofacial region. Impaired joint mobility clicking or crepitus, pain in the TMJ and ear, Eustachian tube dysfunction and dizzy spells. The predisposing factors are joint laxity, anatomical variations, capsular or muscular inflammation, repetitive motion and static articular stress [8, 9].

According to the previous studies there is a strong relationship exists between neck disability and jaw disability [5, 9, 10]. Temporomandibular joint disorders presented with abnormal pattern of contraction of cervical flexor muscles and an increased fatigability of the flexors and extensors cervical muscles. And also found that cervical mobility and functional exercise and head and neck postural correction decreases the symptoms in patients with TMD [5, 11, 12].

The supra hyoid and infra hyoid affect the balance between the flexors and extensors of the head and neck dysfunction in either these muscles or cervical muscles can easily disturb in this normal balance [8]. Mouth breathing is an important contributing factor. Breathing through the mouth facilitate forward head posture and a low and forward tongue position [8, 13].

During swimming nasal breathing is left and mostly favor of an oro-nasal respiration. That leads to less or more mandibular movements with variation of supra and infra hyoid muscle, and of cervico-brachial muscle and their variation can leads to alternative of position of teeth and bone bases and may develop dental mal occlusion, dysfunction of temporomandibular joint intra or extra capsular type [12, 13].

Other predisposing factors that may cause TMD is variety of neurological and muscular disorder, bone diseases, tumors, infections, psychogenic disorder, disease causing disturbance of the occlusion of the teeth or supporting structures, faulty habits of the jaw, and orofacial imbalance [5, 13].

Previous studies has evaluated the prevalence of TMJ disorder among various population But till date there is no studies have been attempted to find out the prevalence of TMD among competitive swimmers through there is a greater demand on TMJ structure due to their swimming mechanics.

Aims and Objectives

To find out the prevalence of TMD in competitive swimmers.
To assess the TMJ disorder among swimmers by using RDC/TMJ criteria.
To find the prevalence of TMJ disorders among competitive swimmers by using screening questionnaire.

Methodology

Study design: A cross sectional study
Study population: Competitive swimmers
Study sample size: 155
Study setting: Various sports clubs and swimming clubs in Kerala and Mangalore
Study duration: April 2019- May 2020

Criteria for selection [9, 10, 11]

Inclusion criteria

- Competitive swimmers aged between (15-35) years.
- Regularly train at least 5 times per week,
- Distance 6-8 miles per practice.
- Subjects with TMD, 6 month history of pain.

Exclusion criteria

- History of spinal surgery
- Any previous incidence of TMD or dental issues (before coming to swimming)
- Previous history of major trauma (motor vehicle accidents)

Tester

The principal investigator is qualified physiotherapist, currently perusing master's degree in musculoskeletal and sports condition at Srinivas College of Physiotherapy and Research Centre, Mangalore.

Methodology

155 samples, they screened from various sports clubs and swimming clubs around Mangalore and Kerala, followed by the ethical clearance of respective clubs. The swimmers were screened before the eligibility criteria and they have been given the consent form prior to participation. In this study the presence of TMJ disorders was assessed with RDC/TMJ criteria

Statistical analysis

All the data were calculated and tabulated in the form of SPSS statistics V25.0. To examine the baseline characters of the subjects we analyzed the frequency and descriptive statistics. To examine the TMD in swimmers

Sample size estimation

Level of significance $\alpha = 0.05$

Power $\beta = 80\%$

Confidence interval level = 95%

$$\text{Formula} - n = \frac{Z_a * Z_b [p(1-p)]}{d^2}$$

Results

Table 1: Descriptive statistics for age of competitive swimmers

Age	
Mean	19.26
SD	1.951

This table shows the demographic characteristic of age were 19.26 ± 1.95 for the competitive swimmers

Table 2: Descriptive statistics for gender of competitive swimmers

	Frequency	Percentage
Male	76	49.0%
Female	79	51.0%

Table 3: Descriptive statistics for swimming style of competitive swimmers

Sl. No.	Character/Variable	Frequency	Percentage
1	Freestyle	85	54.8%
2	Butterfly	64	41.3%
3	Backstroke	58	37.4%
4	Breaststroke	32	20.6%

This table shows the frequency of different swimming style for competitive swimmers. Data showed that there are total of freestyle 85 (54%), butterfly 64 (41%), backstroke 58 (37.4%) and breaststroke 32 (20.6%) out of 155. The diagrammatic representation of frequency of competitive swimmers, which they are using for the competition or practice, is shown in Fig.

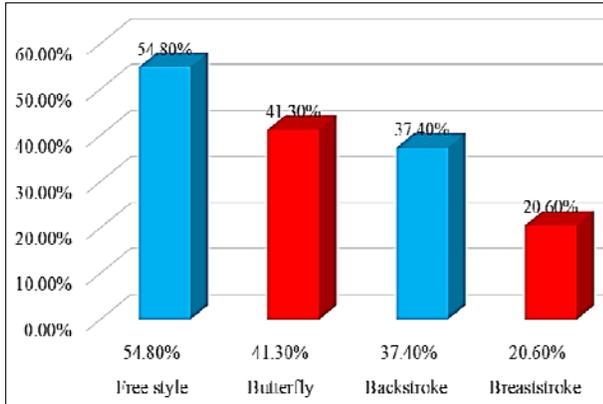


Fig 1: Swimming style

Table 4: Descriptive statistics for practice hours per day, distance per day and practicing days per week

Sl. No.	Character/variable	Frequency	Percentage
1	Hours/Day	>1hr	54
		>1hr	101
2	Distance/Day	<6miles	81
		>6miles	74
3	Days/Week	<5days	64
		>5days	91

In this table shows, how many hours the competitive swimmers are practicing per day. The data showed that, less than 1 hour 54 (34.8%) and more than 1 hour 101 (65.2%). How many distance practice per day according to miles and the data showed that, less than 6 miles (9000 meter) 81 (52.3%) and more than 6 miles 74 (47.7%). And how many days per week they are practicing, less than 5 days 64 (41.3%) and more than 5 days 91 (58.7%). The diagrammatic representation is given in Fig 2.

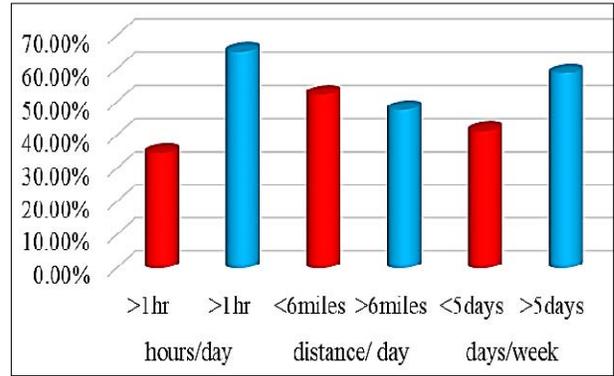


Fig 2: Practice

Table 5: Descriptive statistics for currently suffering any pain in body parts (jaw, forehead, ear, dental pain)

Sl. No.	Character/Variable	Frequency	Percentage
1	Jaw Pain	23	14.8%
2	Pain In Forehead	32	20.6%
3	Pain In The Ear	37	23.9%
4	Dental Pain	17	11.0%

This table shows the statistics for competitive swimmers are currently suffering from any pain in their particular body parts, jaw, forehead, ear, or dental pain. The data showed that competitive swimmers having pain in jaw 23 (14.8%), pain in forehead 32 (20.6), pain in the ear 37 (23.9%) and dental pain 17 (11.0 %) out of total subjects. The diagrammatic representation is given in

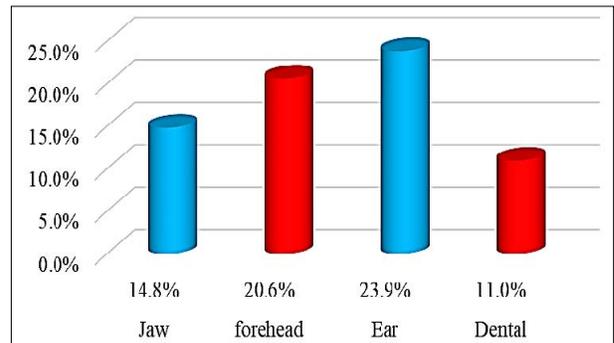


Fig 3: Pain

Table 6: Statistic for any pain in the jaw activities, in the last 30 days

Sl. No.	Character/variable	Frequency	Percentage
1	Chewing hard food or tough food	16	10.3%
2	Opening mouth or moving jaw forward or to side	11	7.1%
3	While jaw habits (clenching, grinding, etc.)	9	5.8%
4	Other jaw activities (talking, kissing, yawning)	5	3.2%

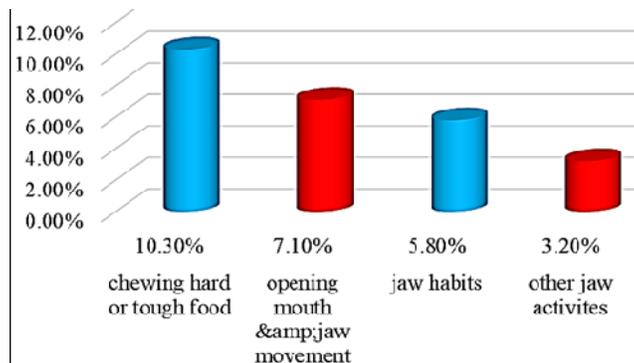


Fig 4: Pain activities

This table shows the statistics for any pain in jaw activities in last 30 days. Data showed that, pain on chewing hard food 16 (10.3 %), pain during opening mouth or moving jaw forward or in to side 11 (7.1%), pain while jaw habits (such as holding

teeth together, grinding, chewing gum) 9 (5.8%) and pain on other activities such as talking, kissing, or yawning 5(3.2%) out of all subjects. Diagrammatic representation is given in Fig 4.

Table 7: Descriptive statistics for pain description (who is having the pain on jaw activities)

Sl. No.	Character/variable	Frequency	Percentage	
1	Pain Duration	<6 months	8	34.8%
		>6 months	15	65.2%
2	In his last 30 days, on set of pain	No Pain	10	43.5%
		Pain intermittent	12	52.2%
		Pain is always present	1	4.3%
3	Pain/stiffness on awakening	No	20	87.0%
		Yes	3	13.0%
4	Jaw pain causing by swimming	No	11	47.8%
		Yes	12	52.2%

This table shows the statistics for pain description that is done only for who is having the pain on jaw activities. The diagrammatic representation is given in Fig 5.

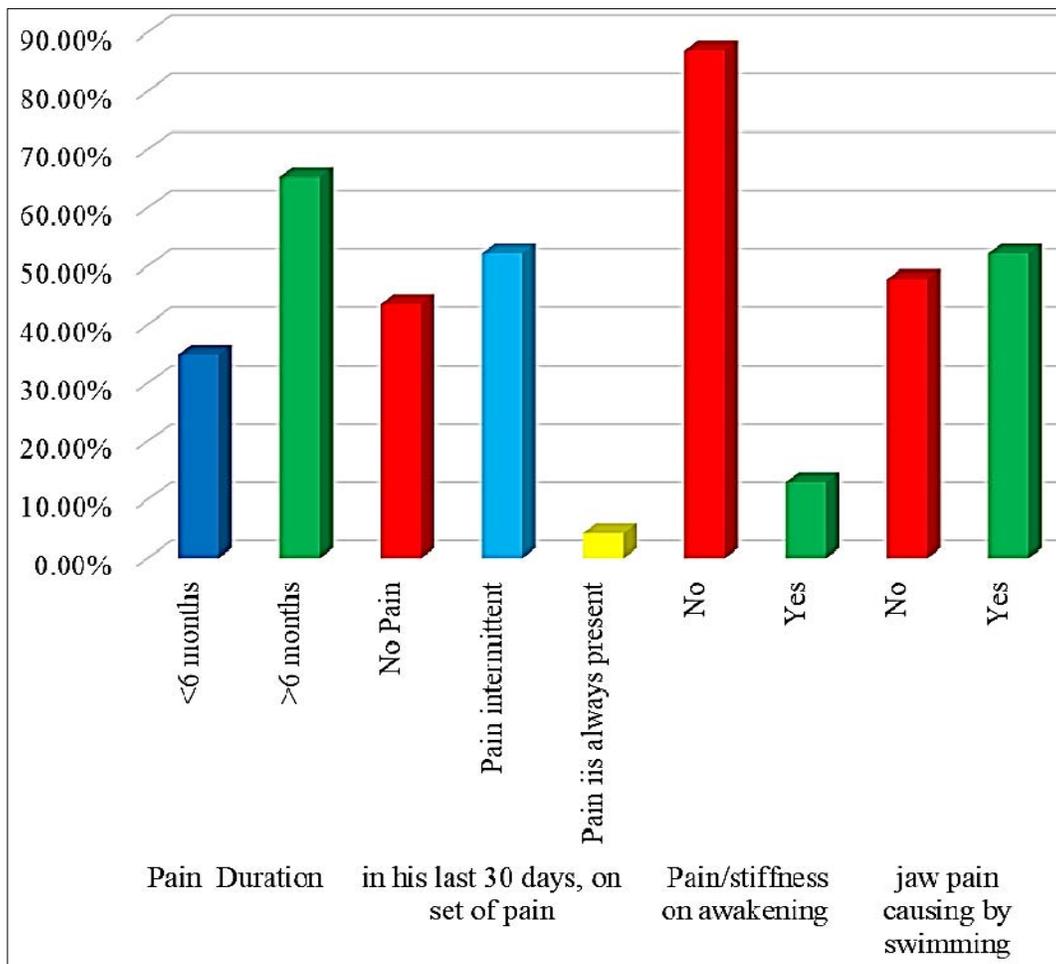


Fig 5: This table shows the statistics for pain description that is done only for who is having the pain on jaw activities.

Table 8: Statistic for pain on other regions

Sl. No.	Character/variable	Frequency	Percentage
1	Neck	14	23.7%
2	Shoulder	27	45.8%
3	Back	11	18.6%
4	Knee	7	11.9%

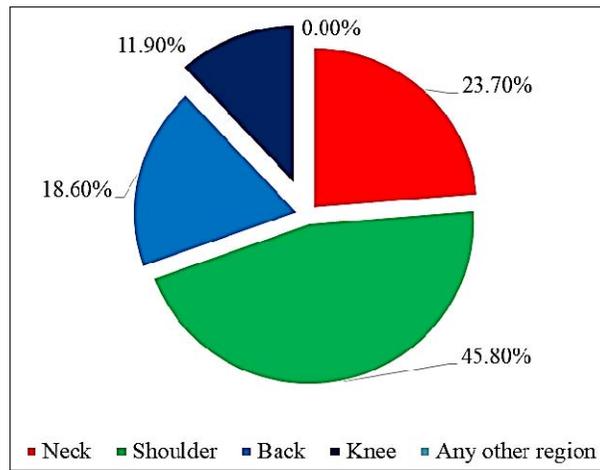


Fig 6: Statistics for pain on other regions

Table 9: Statistics for TMD according to RDC/TMD criteria

Sl. No.	TMD according to RDC/TMD criteria	Frequency	Percentage
1	Yes	18	13.54%
2	No	137	86.50%

This table shows that the frequency and percentage of the TMD in competitive swimmers according to RDC/TMD criteria. 13.54% shows TMD in competitive swimmers. Diagrammatic representation shown in Fig 7.

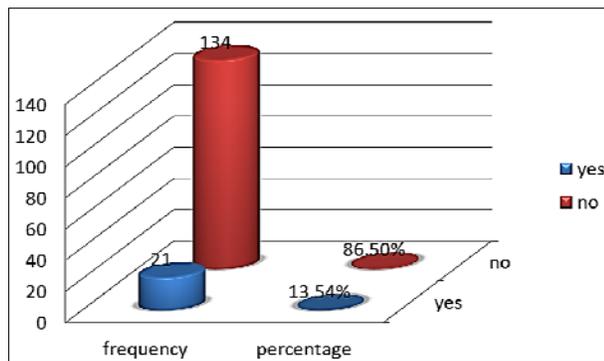


Fig 7: TMD according to RDC/TMD criteria

Table 10: descriptive statistics for different genders, different injuries and different swimming style.

	Variable (Count)	Prevalence
Gender	Male (10)	13.2%
	Female (11)	13.92%
Swimming Style	Freestyle (10)	11.8%
	Butterfly (8)	12.5%
	Backstroke (8)	13.8%
	Breaststroke (1)	3.13%
Different Regions	Neck (14)	50%
	Shoulder (27)	33.33%
	Back (11)	27.23%
	Knee (7)	14.3%

Discussion

This study is focused on the prevalence of Temporomandibular joint disorders in competitive swimmers. Swimming is a unique sport. It is the combination of upper limb and lower extremity strength exercise and also cardiovascular training in non-weight bearing environment [1]. In the present sample of 155 subjects, we assessed the

prevalence of temporomandibular disorders.

The result shows that there is lower prevalence (13%) of temporomandibular joint disorders in competitive swimmers. In our view of findings, most of swimmers having Myofascial pain (muscle disorders) according to RDC/TMD criteria. Most swimmers with TMJ pain are those who practicing more than 1 hour in a day and more than 5 days they are practicing in a week. Most of the swimmers are not aware about their TMJ pain. In the affected swimmers only 46% of swimmers believe that the jaw pain is causing by swimming.

In previous studies found that, swimmers can cause neck pain, shoulder pain, knee pain and ankle pain. 20% of swimmers reported musculoskeletal pain. Competitive swimmers having 50% prevalence of shoulder pain [14] and neck/cervical (6.2%) knee (16%), ankle and foot (4.6%) [14] also found. According to previous studies, TMJ dysfunctions are associated with masticatory and articular disabilities and the physiological structural and postural factors leads to functional balance between structures of TMJ. In the current study we found that most of the competitive swimmers those who are having TMD also having difficulty in chewing activities.

According to previous studies we found that, in competitive swimmers there is a high demand on neck rotation and upper limb activities for the propulsion of the body inside the water and which negative synchronized activities of jaw and mastication structure. The supra hyoid and infra hyoid affect the balance between the flexors and extensors of the head and neck dysfunction in either these muscles or cervical muscles can easily disturb in this normal balance [8]. Increases muscular activity in the anterior cervical (longus coli) and hyoid muscle will turn in cause tightness in the through and difficulty in swallowing. Mouth breathing is an important contributing factor. Breathing through the mouth facilitates forward head posture and a low and forward tongue position [8, 13]. In the current study we can found 50% of neck is present with TMD. 13.2% of male and 13.92% female have present with TMD. Backstroke swimmers were more prevalent (13.8) to TMD. And in current study not identified risk factors causing TMD in competitive swimmers.

A similar study was conducted in this region by Dr Ajay *et al.* [15] and this study is in agreement with the other study.

Acknowledgement

A similar study was conducted by Dr Ajay (First Author) and his team and this study is more complete.

Conclusion

We have concluded that competitive swimmers are prone to

temporomandibular disorders. Though, this study is not intended to make cause and effect relationship. It creates awareness among coaches, physiotherapist. That they are vulnerable to injuries. Future studies should be done to identify risk factors causing TMD in competitive swimmers.

References

1. Middleton P, Pollard H. Chiropractic & Osteopathy 2005;13(1):8.
<https://doi.org/10.1186/1746-1340-13-8>
2. Wanivenhaus F, Fox AJ, Chaudhury S, Rodeo SA. Epidemiology of injuries and prevention strategies in competitive swimmers. Sports Health: A Multidisciplinary Approach 2012;4(3):246-251.
<https://doi.org/10.1177/1941738112442132>
3. Johnson JN, Gauvin J, Fredericson M. Swimming biomechanics and injury prevention. The Physician and Sports medicine 2003;31(1):41-46.
<https://doi.org/10.3810/psm.2003.01.165>
4. Troup JP. The physiology and biomechanics of competitive swimming. Clinics in Sports Medicine 1999;18(2):267-285.
[https://doi.org/10.1016/s0278-5919\(05\)70143-5](https://doi.org/10.1016/s0278-5919(05)70143-5)
5. Mandibular pain-dysfunction syndrome [temporomandibular joint (TMJ) dysfunction syndrome]. Oral and Maxillofacial Diseases 2010, P354-356.
<https://doi.org/10.3109/9781841847511-28>
6. Guth EH. A comparison of cervical rotation in age-matched adolescent competitive swimmers and healthy males. Journal of Orthopaedic & Sports Physical Therapy 1995;21(1):21-27.
<https://doi.org/10.2519/jospt.1995.21.1.21>
7. Silveira A, Gadotti IC, Armijo-Olivo S, Biasotto-Gonzalez DA, Magee D. Jaw dysfunction is associated with neck disability and muscle tenderness in subjects with and without chronic Temporomandibular disorders. Bio Med Research International 2015, P1-7.
<https://doi.org/10.1155/2015/512792>
8. Abidov A. Comprehensive textbook of echocardiography (First edition; Volume 1 and volume 2), edited by Navin C. Nanda, Jaypee brothers medical publishers Ltd., Delhi, London and Philadelphia 2014, 2070 pages. Echocardiography 2014;31(2):262-263.
<https://doi.org/10.1111/echo.125469>
9. Olivo SA, Fuentes J, Major PW, Warren S, Thie NM, Magee DJ. The association between neck disability and jaw disability. Journal of Oral Rehabilitation 2010;37(9):670-679.
<https://doi.org/10.1111/j.1365-2842.2010.02098.x>
10. Rocha CP, Croci CS, Caria PH. Is there relationship between temporomandibular disorders and head and cervical posture? A systematic review. Journal of Oral Rehabilitation 2013;40(11):875-881.
<https://doi.org/10.1111/joor.12104>
11. Walczyńska-Dragon K, Baron S, Nitecka-Buchta A, Tkacz E. Correlation between TMD and cervical spine pain and mobility: Is the whole body balance TMJ related? BioMed Research International 2014, P1-7.
<https://doi.org/10.1155/2014/582414>
12. D'ercole S, Tieri M, Martinelli D, Tripodi D. The effect of swimming on oral health status: Competitive versus non-competitive athletes. Journal of Applied Oral Science 2016;24(2):107-113.
<https://doi.org/10.1590/1678-775720150324>
13. Hertling D, Kessler R, Shimandle SA. Management of common musculoskeletal disorders, physical therapy principles and methods. Dimensions of Critical Care Nursing 1990;9(5):279.
<https://doi.org/10.1097/00003465-199009000-00008>
14. Tessaro M, Granzotto G, Poser A, Plebani G, Rossi A. Shoulder pain in competitive teenage swimmers and it's prevention: A retrospective epidemiological cross sectional study of prevalence. International Journal of Sports Physical Therapy 2017;12(5):798-811.
<https://doi.org/10.26603/ijsp20170798>
15. Kumar A, BAD, Pradhan DK. Prevalence of TMJ disorders in competitive swimmers: A cross sectional study. Journal of Advances in Sports and Physical Education 02(07) P139-141.
<https://doi.org/10.36348/jaspe.2019.v02i07.003>