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A web- based survey- Influence of smartphone addiction on Tempero-Mandibular joint function during Covid 19 lockdown among urban young adults

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Abstract:
Background*: Temporomandibular joint is one of the complex joints in the human body. The integrity of the joint is dependent on the unique structure and balance of ligaments and muscles. TM joint dysfunction is described in terms of myofascial pain, internal derangement and cervical spine dysfunction. The association between postural deviations due to smartphone addictions and TMJ dysfunction is overlooked. The overwhelming use of smartphones has become the need of the hour for young adults in COVID-19 lockdown. During this exceptional situation, a smartphone is the most handy device for entertainment, educational purpose and social connect. Therefore, this study was conducted to see the Influence of smartphone addiction on Tempero-mandibular joint function during Covid 19 lockdown among urban young adults.*
Materials and Methods*:*
This was a multidisciplinary web-based study. Outcome measures used were SmartPhone Addiction Scale Short Version (SAS-SV) and Jaw functional limitation Scale 20 (JFLS-20) among young adults.
Results*:*
Out of 314 participants, SAS-SA score was $\geq$ 33 in 88 (61.97%) females and $\geq$31 in 106 (61.63%) males. The Scores of subscales of JFLS-20 in this study are as follows: In females, for mastication (mean $\pm$ SD) was (2.8 $\pm$ 2.2), for mobility was (2.4$\pm$2.3), and for verbal and non-verbal communication was (2.5 $\pm$ 2.4). In males, for mastication (mean $\pm$ SD) was (2.6 $\pm$ 2.3), for mobility was (2.6$\pm$2.3), and for verbal and non-verbal communication was (2.6 $\pm$ 2.2).
Conclusion:
Impact of smartphone addiction can be seen in the upper quarter. This further affects TM joint function including mastication, mobility and verbal and non- verbal communication.
Keyword*: Smartphone addiction, Temporomandibular joint dysfunction, mastication, jaw mobility, altered posture*

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I. Introduction

It would be difficult to imagine life without the cell phone. Over recent years in particular, their use and potential have grown at an incredible rate. Especially during lockdown everyone was using cellphones as it was easy to access everything on a single device. [1] During this lockdown, education sectors were positively adapting the technology. They were engaging students with various online modes of learning. Along with them private Institutes were also organising many virtual sessions to provide information. [2]

The Text neck or turtle neck posture can be described as a repeated stress injury and pain sustained from excessive watching or texting on handheld devices for long periods of time. [3] It was coined by Dr. Dean L. Fishman, a US chiropractor. It can give rise to neck pain, upper back pain, shoulder pain, chronic headaches and increased
curvature of the spine. [3, 4] Users may adopt prolonged forward head posture if using a cell phone for a long period of time. [4-7] It is pointed out by many authors that pain in the upper quarter and masticatory motor system may be caused by cervical spine disorders and vice versa. [8]

The American Academy of Orofacial Pain has defined Temporomandibular disorders (TMD) as a collective term for a number of clinical problems. It involves masticatory musculature, temporomandibular

joints (TMJs) and associated structures. It impairs chewing, swallowing and speaking. The main signs are joint noises, decreased range of motion and deviation of mandible during TMJ function. [9] The prevalence of TMD is between 5% and 12% according to the National Institute of Dental and Craniofacial Research. The prevalence rates of TMJ disorders are higher among younger persons. [10]

Therefore, this study was conducted to find out the intersegmental effect on Tempero-mandibular function in smartphone addicted young individuals during COVID- 19 Lockdown.

II. Material And Methods

Study Design: Cross sectional study
Study Duration: April 2020 to July 2020
Subject selection method: Self Administered Questionnaire

Inclusion criteria:
1. Both females and males with SmartPhone Addiction Scale Short Version (SAS-SV) score more than or equal to 33 and 31 respectively

Exclusion criteria:
1. Not willing to participate
2. Any previous affection of neck and upper extremity

Procedure methodology

The approval was taken from Institutional Ethics Committee approval number N- EC/2020/09/97. Links of the outcome measures and consent were sent via google form during COVID-19 lockdown from April 2020 to July 2020. 314 responses were received which were analysed. Confidentiality was ensured for all participants enrolled in the study. Outcome measures used were SmartPhone Addiction Scale Short Version (SAS-SV) and Jaw functional limitation Scale 20 (JFLS-20). The SAS-SV is a self-reporting scale of smartphone addiction that consists of 6 factors and 10 items with a six-point Likert-type scale (ranging from 1: 'strongly disagree' to 6: 'strongly agree'). The six factors include daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance. For males, the cut off value is 31. The sensitivity is 0.867 and specificity 0.893. For females, cut off is 33 and the sensitivity and specificity value are 0.875 and 0.886 respectively. [12] JFLS -20 is an instrument that measures limitations across 3 domains: mastication, vertical jaw mobility, and verbal and emotional expression. It has a high level of internal consistency (0.87), reliability and construct validity. [13,14] It is an excellent functional measure for TM Joint dysfunction. A response scale used 0 to 10 signifying level of limitation (0 = "no limitation" and 10 = "severe limitation"); an option for "not applicable" is also available, and was scored as "missing." The subscales are computed as the mean response for all items in the subscale. Mastication is based on 6 items, vertical jaw mobility is based on 4 items, and verbal and emotional expression is based on 8 items; 2 items are not scored as part of these 3 subscales. A total score is also computed from the 3 subscales when all 3 component scores are available. It was designed based on item response theory, and consequently identical non-zero responses to all items within a subscale are highly improbable; non-zero responses that were the same within a subscale were regarded as invalid and recoded to "missing." [13,14]

Statistical analysis
Data was analyzed using Microsoft Excel version 2010.

III. Result

Table:1 Demographic Data

Age Group	No of students	%
19-23	81	25.80
24-28	59	18.79
29-33	93	29.62
34-39	81	25.80
	No of students	**%**
Females	142	45.22
Males	172	54.78
Total Number	314	81.77

Table 1 shows that 81 (25.80%) students between the age group 19-23 years, 59 (18.79%) between the age group of 24-28 years, 93 (29.62%) from 29-33 years and 81 (25.80%) students from 34-39 years participated in this study. Out of 314 (81.77%), 142 (45.22%) were females and 172 (54.78%) were males.

Table 2: Frequency of for smartphone addicts

Score	Number of Females	%	Mean	Standard Deviation
≥33	88	61.97	41.7	5.85
<33	54	38.03	25.14	4.63
Score	**Number of Males**	**%**	**Mean**	**Standard Deviation**
≥31	106	61.63	38.36	6.48
<31	66	38.37	26.09	2.59

Table 2 shows that 88 (61.97%) females had SAS-SA score ≥ 33 and 54 (38.03%) had scores less than 33. 106 (61.63%) males had SAS-SA score ≥31 and 66 (38.37%) had less than 31.

Table 3: Global score of Jaw functional limitation Scale 20

	Mean	Standard Deviation
Global Score	2.6	2.2

The (mean ± standard deviation) for global score of Jaw functional limitation Scale 20 was (2.6 ± 2.2)

Table 4: Scores of subscales of Jaw functional limitation Scale 20

	Females		Males	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Mastication	2.8	2.2	2.6	2.3
Mobility	2.4	2.3	2.6	2.3
Verbal and non-verbal communication	2.5	2.4	2.6	2.2

Figure 1: Percentage of smartphone addicts having mastication limitation

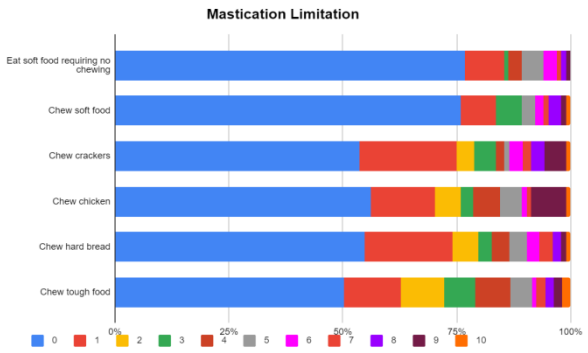


Figure 2: Percentage of smartphone addicts having mobility limitation

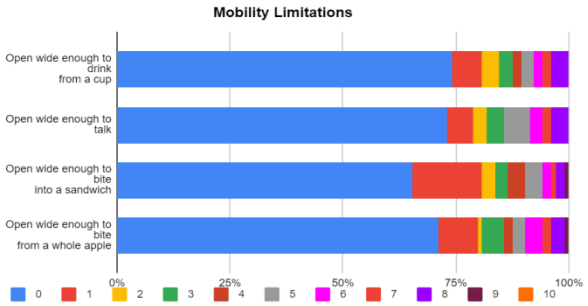
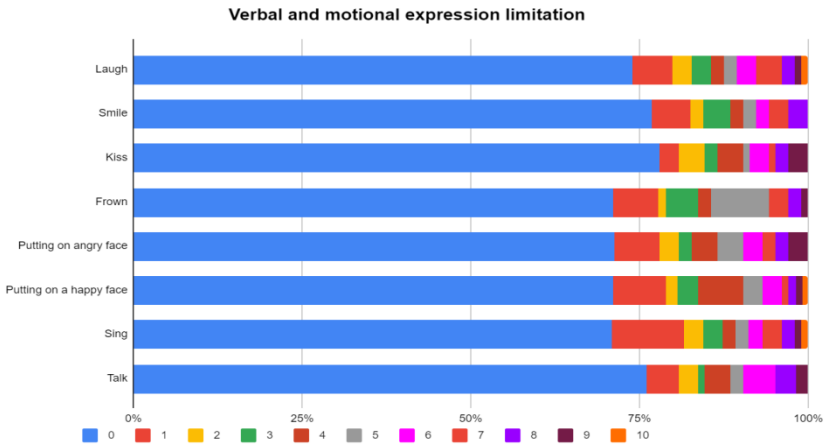


Figure 3: Percentage of smartphone addicts having Verbal and Emotional Expression Limitation



IV. Discussion

This study was conducted to assess the effects of smartphone addiction on TM joint dysfunction. 314 participants responded to the online survey.

Current mobile phones give additional features. They provide text messaging, email, gaming, camera, Whatsapp, Facebook, etc. Smartphones are the most handy gadget used by the young adult. During COVID-19 lockdown they were mainly used for working, learning and entertainment purposes. Excessive increase in smartphone usage leads to addiction. According to this study 106 males (61.63%) and 88 females (61.97%) were found to have smartphone addiction. Accessing the internet, project work, lectures and social sites could be attributed as the probable causes of smartphone addiction. WHO has defined addiction as continuous use of something for sake of relief, comfort or stimulation, which leads to cravings when it is absent.The addiction of Smartphones is classified as a behavioural addiction. [15, 16] The overuse of smartphones could load various areas of the human body especially the musculoskeletal system. Mobile phones are used in the same posture for a long period of time and could give rise to repetitive trauma disorders. [17]

Figure 1 and 2 give the percentage of smartphone addicts having mastication limitations and having mobility limitations respectively. Halbert et al. [18] stated that there is a close relationship between the masticatory system, cervical area and scapular region. The postural alteration is considered to be closely related to the compact size of smartphones. A recent study reported that populations that used a relatively small screen adopted a head and neck posture with greater neck flexion. [19] Excessive use of mobile phones was observed in the symptomatic TMD group. Browsing and texting on the mobile phone involves intentional craniocervical hyperextension. It alteres head posture [20] and alters the muscular biomechanics.[18] It changes cervical curvature angle and causes an exaggerated posterior rotation of the head. The craniovertebral angle (CVA) and neck extensor muscle strength is mainly dependent on a length-tension relationship of the muscles. Hence, tension in the cervical musculature was attributed as a cause of forward head posture. [21]

According to literature, the cervical spine is a predisposing factor to masticatory muscle pain. [22] Afferent inputs coming from neck pain converge onto trigeminal motor neurons in the trigemino cervical nucleus. It results in an increase in masticatory muscle hyperactivity and pain. [23] Other theories suggest that the masticatory muscles contract in response to the contraction of cervical spine muscles. It is observed that jaw and neck muscles work in synchronised fashion during normal activities involving chew, talk, and yawn. [24] Compensatory changes can be seen in the spinal region with increased upper quarter muscle tension. These have been noticed to correct the posture. [25, 26] This happens as the body works on the principle of compensation. If there are disturbances in the upper quarter, such as increased muscle tension then compensatory changes can be seen in the spine to force the correct position. These adaptive changes occur depending on the body's tolerance level. [27, 26] When the body's capacity to compensate for the pathological changes is exceeded, imbalance sets in. It may give rise to pathological symptoms. Each individual has a unique compensation limit beyond which such symptoms are triggered off.

The third subset of JFLS assessed verbal and emotional Expression Limitation. (figure 3) As per the study by LeResche et al, [28] the changes of facial expressions are due to pain in TM joint complex and even the frequency, duration and intensity of facial expressions were correlated with the pain. Al-Khotani et al. [29] in their study reported that limitations in yawning, smiling/laughing were found in myofascial pain. They concluded that facial appearance was affected in children and adolescents having TMD. They also reported an association between jaw disability and chewing, yawning, smiling/ laughing as well as cleaning the teeth/face.

V. Conclusion

The function of the temporomandibular joint is closely related to the cervical curvature and body posture. Smartphone addiction in many said ways could be a potential source in affecting posture and modifying the functioning of temporomandibular joints.

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