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PREVALENCE OF MUSCULOSKELETAL PAIN DUE TO ONLINE CLASSES DURING COVID-19 LOCKDOWN PERIOD AMONG UNDERGRADUATE STUDENTS: AN ONLINE SURVEY

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ABSTRACT:

Purpose: During covid-19 lockdown period, students spent their maximum time in using smart phones/ laptops for online classes and recreation. So, the purpose of this study was to find out the percentage of musculoskeletal pain in undergraduate students during covid-19 period. Secondly, this study aimed to find out the relationship between duration of smart phone/laptop usage and musculoskeletal pain and relationship between physical activity and musculoskeletal pain.

Methods: In this prospective online survey, a Google form including student's consent, their demographic data and a self prepared questionnaire including 11 questions related to use of devices, their physical activity and musculoskeletal pain was created. Its link was sent to all the known faculties all over India and they were requested to send this link to their students. Then these responses were collected in an excel sheet and the data was analysed.

Results: The percentage of students who were having pain during covid-19 period was 50.9%. Maximum number of students felt pain at eyes, neck and back. This study found a positive relationship between duration of smart phone/laptop usage and musculoskeletal pain however, it was mild relationship (r = 0.312) and a negative relationship between hours of vigorous activity or moderate activity and musculoskeletal pain which was also mild (r = -0.2).

Conclusion: Excessive use of smart phones/ laptops for online classes or recreation and decreased physical activity during this covid-19 lockdown period leads to musculoskeletal pain.

KEYWORDS:

MUSCULOSKELETAL PAIN, COVID-19 LOCKDOWN PERIOD, ONLINE CLASSES, SMART PHONES, PHYSICAL ACTIVITY, UNDERGRADUATE STUDENTS.

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INTRODUCTION:

The corona virus disease had started in Wuhan city of China in December, 2019. From China it had spread rapidly all over the world.(1) According to a report by WHO, the number of confirmed cases in the world was 15,581,009 and in India, it reached upto 1,336,861 cases by 26th July, 2020.(2) Its reproductive number (R_0) is 2 to 2.5, that means one person can transmit disease to approximately 2-3 more persons.(3) Seeing its high transmission rates many countries including India, started taking measures such as making the population aware about corona virus , its precautions, social distancing, home quarantine, travel restrictions from country to country and city to city, movie theatres, gyms, temples, places with large gatherings such as marriage halls, parks, historical monuments were closed. The biggest restriction was the closure of school, colleges and educational institutions.(1) The universities had changed its mode of teaching from in-class face to face teaching to online teaching.(4) Although the mobile devices such as laptops, smart phones had been in the use for the purpose of teaching in classrooms as well as outdoor learning, but in this covid period students were totally dependent on these gadgets.(5)

Advancement of technologies, especially computers, smart phones etc. have change radically or fundamentally our way of working. Regardless its benefits & use, it is not free from health issues. Recent studies have proved that excessive use of smart phones will cause pain in neck, shoulders, and these symptoms increases as the use of smart phones increases. Due to this faulty posture, such as forward neck posture, slouched posture or rounded shoulders, musculoskeletal changes occur commonly in smart phone users and this can further leads to respiratory dysfunction.(6) Smart phones are the source of fundamental information now days. It was also found that the size of the LCD screen is directly related to the pain in the body. Musculoskeletal changes also depends upon the amount of time spend in using smart phone or laptops or computers(7).

Work related musculoskeletal disorder are very common, can also leads to temporary or permanent disability. Extreme degree of concentration & tiresome work for a

long period, excessive workload are some of the factors that cause musculoskeletal changes among teachers as well as students.(8) Excessive use of smart phones for learning around the world has some serious health hazards on human health & wellbeing. Online learning on smart phones has enormous effect on the human body in that some musculoskeletal disorders & health problems might evolve. These days the use of earphones whether for training, calling, online classes affects every level of the society. This will also affect the human health & behavior. Musculoskeletal changes are the most common issues related with the use of smart phones or computers for online training.(9)

So, the need of this study is to find out the prevalence of musculoskeletal pain which occur due to long hours of online classes in undergraduate students during covid-19 lockdown period. This study also wants to find out the relation between hours of use of smart phones and musculoskeletal pain and the relationship between physical activity and musculoskeletal pain.

METHODS: This prospective online survey was conducted on the undergraduate students of India from 1st June,2020 to 15th June, 2020 to find the prevalence of musculoskeletal pain among undergraduate students in covid-19 lockdown period. This study used the purposive sample design. The students (both males and females) between the age of 18 to 25, who had attended online classes in covid -19 lockdown period, filled the questionnaire through google link form were included in this study. The students who sent incomplete responses, postgraduate and diploma students and students who did not gave their consent were excluded from the study.

PROCEDURE: The researchers had prepared a Google form including demographic details and self prepared questionnaire. First section of this Google form explained the students about the aim and objectives of this study and took their consent. Second section collected their demographic data. The third section had questionnaire which included 11 questions related to musculoskeletal pain, hours of use of smart phone and physical activity. Then this Google form was sent for pilot testing to some of the researcher's colleagues and final year students to know about its comprehensiveness and feasibility of administration. After that the data was collected by sending this Google form link (https:/ /docs.google.com /forms/d/e/ 1FAIpQLSdbtWJ_QZ_UhO0jWghzARFLZ92mQHzni6uYCjl8 1MAl3LeNQ/viewform?usp=sf_link) to faculties of various colleges from different states of India. The faculty of these colleges was requested telephonically to send this Google form to students of their colleges through all the media such as whatsapp, facebook, and messenger and to motivate their students to fill this Google form. The data was collected in an excel sheet, coded and analyzed through descriptive and inferential statistics.

STATISTICAL ANALYSIS: Data was analyzed using SPSS version 20. Descriptive statistics was used to find the percentage and frequency. Karl Pearson Correlation Co-efficient test was used to find relation between duration of smart phone usage and musculoskeletal pain and to correlate physical activity and musculoskeletal pain.

RESULTS: The students were divided in to three groups according to their age. The frequency and percentage of each age group and both gender are shown in Table 1.

TABLE – 1: FREQUENCY AND PERCENTAGE DISTRIBUTION OF SAMPLES ACCORDING TO SOCIO-DEMOGRAPHIC VARIABLES

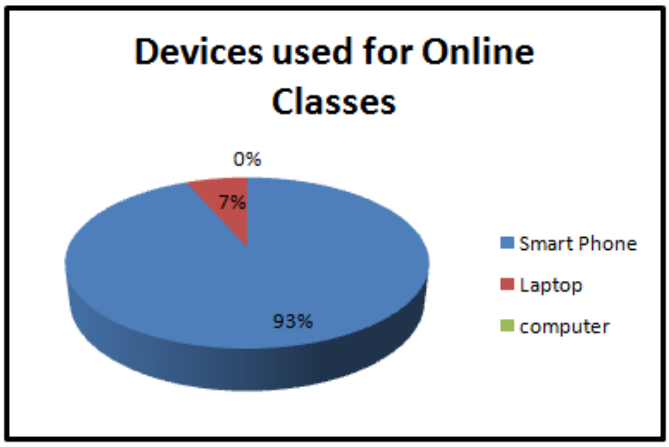
S.N.	Socio - Demographic Variables	Frequency	Percentage
1	Age (Years)		
	• 18 - 20	136	30.6
	• 21 - 23	201	45.3
	• Above 23	107	24.1
2	Gender		
	• Male	172	38.7
	• Female	272	61.3

The frequency and percentage of the device students used for online classes, time they used these devices for work or recreation purpose and the time after which they took break from these devices are shown in Table 2

TABLE - 2: FREQUENCY TABLE FOR USE OF SMART PHONE/ LAPTOP/ COMPUTER

S.N.	Smart phone/ Laptop/ Computer	Frequency	Percentage
1	Device used for online classes		
	• Smart Phone	415	93.5
	• Laptop	29	6.5
	• Computers	0	0
2	Time the students used these devices for work or recreation		
	• 0 - 2 Hour	63	14.2
	• 2-4 Hour	148	33.3
	• 4-6 Hour	130	29.3
	• 6-8 Hour	68	15.3
	• More than 10 Hour	35	7.9
3	Time after which they took break from these devices		
	• Never	35	7.9
	• Only after > 2 hours	78	17.6
	• Once every 1 - 2 hours	170	38.3
	• More than once an hour	161	36.3

The above table shows that 93.5 percent students used smart phone for their online classes. This is very well shown through the graph 1 i.e. Pie chart. Maximum students used the Smart phone or laptop for their work or recreation from 2-6 hr i.e. 62.6 % students. 38.3% students took break these devices once in every 1-2 hr and 36.3 took break more than once in an hour.

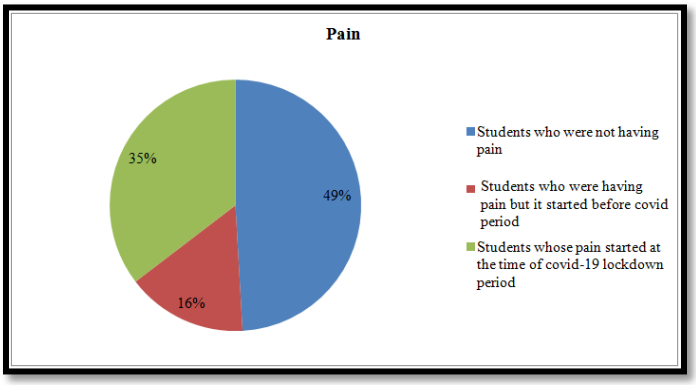


Graph 1 showing the devices that students used for online classes or for recreation

TABLE3: FREQUENCY AND PERCENTAGE TABLE FOR MUSCULOSKELETAL PAIN THAT STUDENTS EXPERIENCED BEFORE OR DURING COVID-19 LOCKDOWN PERIOD

S.N.	Pain	Frequency	Percentage
1	Students who were not having pain	218	49.1
2	students who were having pain but it started before covid period	69	15.5
3	Students whose pain started at the time of covid-19 lockdown period	157	35.4

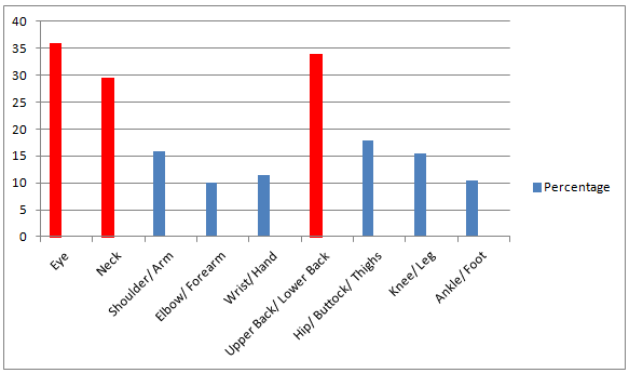
The above table shows that total 50.9% students were having pain during covid-19 lockdown period. In these 15.5 was having pain before the starting of this lockdown period while 35.4% students started experiencing pain during covid-19 lockdown period. 49.1% students were free from any kind of pain. This is similarly shown in graph 2.



Graph 2 showing the percentage of students having pain during covid-19 lockdown period

TABLE 4: FREQUENCY TABLE SHOWING REGION OF BODY IN WHICH STUDENTS FELT PAIN

	Left		Right		Both		None	
	Frequency	%age	Frequency	%age	Frequency	%age	Frequency	%age
Eye	13	2.9	13	2.9	160	**36.0**	258	58.1
Neck	19	4.3	30	6.8	131	**29.5**	264	59.5
Shoulder/ Arm	25	5.6	54	12.2	70	15.8	295	66.4
Elbow/ Forearm	13	2.9	34	7.7	45	10.1	352	79.3
Wrist/ Hand	18	4.1	63	14.2	51	11.5	312	70.3
Upper Back/ Lower Back	16	3.6	23	5.2	151	**34.0**	254	57.2
Hip/ Buttock/ Thighs	8	1.8	12	2.7	79	17.8	345	77.7
Knee/ Leg	7	1.6	24	5.4	69	15.5	344	77.5
Ankle/ Foot	12	2.7	14	3.2	46	10.4	372	83.8



Graph 3 Regionwise percentage of pain (Students who had pain on both sides)

The above table and graph shows that eyes, neck, upper and lower back region were maximally painful in undergraduate students during covid-19 lockdown period.

TABLE 5: CORRELATION BETWEEN HOURS OF PHYSICAL ACTIVITY AND MUSCULOSKELETAL PAIN AND BETWEEN DURATION OF SMART PHONE/ LAPTOP USAGE AND MUSCULOSKELETAL PAIN

	Pain during Covid-19 lockdown period (Students having musculoskeletal pain)	
	r-value	p-value
Hours of vigorous activity	-.205	<.001**
Hours of moderate activity	-.214	<.001**
Hours of walk	-.062	.192***
Duration of Smart phone/ laptop usage	.312	<.001**

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

*** Not significant

In the above table a statistically significant mild negative correlation was found between hours of physical activity and musculoskeletal pain. There was no correlation found between hours of walk and musculoskeletal pain, but this finding was not statistically significant. The relationship between duration of smart phone/ laptop usage and musculoskeletal pain was mildly positive and statistically significant.

DISCUSSION: The objectives of this study were to find the percentage of musculoskeletal pain among undergraduate students during covid-19 lockdown period, to find the relationship between duration of smart phone/ laptop usage and musculoskeletal pain and to find relationship between physical activity and musculoskeletal pain. This study found that total 50.9% students were having pain during covid-19 lockdown period, out of which 15.5% were having pain before start of covid-19 lockdown period while 35.4% students started experiencing pain during covid-19 lockdown period. The region which was most painful includes eyes (36%), thoracolumber region (34%) followed by cervical region (29%). When the smart phone is placed 40 cm from the eyes for 1 hour visual fatigue occurs, which is also known as digital eye strain or computer vision syndrome.(10,11) This may lead to tired, red, dry, irritated and burning eyes(10). A study conducted by Rajgopal V. et al (2012) in Malaysia showed that 88% students were having pain before two weeks of data collection.(12) An another study conducted by Silva GR et al (2015) in Brazil also stated 65.1% presence of musculoskeletal pain in adolescents with highest percentage (46.9%) in thoracolumber region.(13) In one another study conducted in Brazil by Morais BX et al(2017) also shows the highest percentage (74.9%) of musculoskeletal pain in vertebral column.(14) Woo EHC et al (2016) conducted a study in Hong Kong showed that 49.9% university students reported musculoskeletal pain.(15) All these studies were conducted in foreign countries and before covid-19 lockdown period. This could be the region of variation in results. In Indian literature there are studies which show the prevalence of musculoskeletal pain in school students, postgraduate students or in some particular profession(16,17). No study could be found according to researcher's knowledge which shows the prevalence of musculoskeletal pain among under graduate students. In covid-19 lockdown period, all the universities were closed, students have to do online classes, prepare assignments and give online test. No outdoor activity was allowed. Even they have to spend their leisure time in indoor activities.(1) This may lead to mental and behavioral disorders which further leads to prolonged static posture, stress and tension in the muscles. This could be explained by the process of "somatization" in which psychological problems leads to physical problems.(14) Another reason for the presence of musculoskeletal pain in undergraduate students could be bad ergonomic. Students remain in sitting or lying positions over the inadequate furniture for prolonged period. According to Anghel M et al, prolonged static posture leads to isometric contraction which further leads to compression over blood vessels and lactic acid accumulation. All these things ultimately results in different musculoskeletal disorders.(18)

This study found a mild positive relationship between duration of smart phones/laptops usage and musculoskeletal pain. Excessive use of smart phones puts stress & strain on muscles, joints due to without

interruption or tiresome nature of movements.(6) The use of smart phones because of online classes, viewing or watching videos had excessively increased in covid-19 lockdown period and most of the other daily tasks happen through these devices. In this study 93.5% students used smart phones for their online activities and for their leisure time activities.. In this study 85.8% students used smart phone/ laptops for more than 2 hour daily, 7.9% students didn't take break and 17.6% students took break only after 2 hours of smart phone usage. According to Eitivipart AC (2017), the smart phone users adopt a very awkward posture by holding the device with one or two hand, keeping it below eye level, looking down into the screen and touching screen repetitively with thumb. He also added that symptoms of musculoskeletal pain were not only restricted to neck pain but also found in shoulder, elbow, wrist, hand, thumb and fingers.(19) In this study also 15.8% students were having shoulder pain, 10.1% students were having elbow pain and 11.5% students were having wrist or elbow pain. Lee S et al (2015) stated in their study that head flexion angle increases with increased usage of smart phones which further contributes in increasing neck pain.(20) One another study explained that increased neck flexion angle leads to increased muscle activity in cervical erector spinae and decreased muscle activity in upper trapezius.(21) Gustafsson E. et al (2017) also stated that when these smart phone users sit with forward head posture and without supporting their arm, a static load is created on their neck and shoulder muscles which lead to upper back pain and further leads to musculoskeletal disorders.(22) These findings are related to the results of this study that increased duration of smart phone usages leads to increased musculoskeletal pain.

This study showed very mild negative relationship between physical activity and musculoskeletal pain. The studies by Rajagopal V. et al (2012) and Kamada M. et al (2014) found no statistically significant relationship between physical activity and musculoskeletal pain while Nawrocka A. et al (2019) measured physical activity objectively in women of different ages and found decreased prevalence and intensity of pain in women who were physically more active.(12,23,24) It was notified that during covid -19 lockdown period no one was allowed to go outside their homes.(1) But one can do enough physical activity even at home. Moreover, data collected in this study was self reported by students which could lead to over or underestimation of their physical activity or musculoskeletal pain. Further studies with objective data collection methods should be done to reach on final conclusion.

LIMITATIONS OF THE STUDY: As it was an online survey, the researcher couldn't take the objective values for pain, physical activity and posture of students while using smart phones. The data in this study was self reported by the students. There are chances of misinterpretation of questions or information we want to gather from students.

CONCLUSION: In conclusion, this study states that 50.9% undergraduate students were having pain during covid-19 lockdown period. Excessive usages of smart phones/laptops lead to increase in musculoskeletal pain in this time period. A mild negative relationship is found between physical activity and musculoskeletal pain which means that as the physical activity decreases pain increases and as the students become more physically active their pain decreases.

DECLERATION OF INTEREST: Authors report no conflicts of interest for this study. The authors alone are responsible for the content and writing of this article.

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