



Research article

Impact of lockdown on musculoskeletal health due to COVID-19 outbreak in Bangladesh: A cross sectional survey study

Sohel Ahmed^{a,*}, Rahemun Akter^a, Mohammad Jahirul Islam^b, Amena Abdul Muthalib^a, Asima Akter Sadia^c^a Mount Adora Physiotherapy & Neuro-rehabilitation Center, Mount Adora Hospital, Akhaila 3100, Sylhet, Bangladesh^b Department of Physical Medicine and Rehabilitation, M A G Osmani Medical College Hospital, Sylhet 3100, Bangladesh^c Sher-E-Bangla Medical College, Barisal, Bangladesh

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ABSTRACT

Background: During the nationwide lockdown implemented by the government of Bangladesh due to the coronavirus, has led to the various changes in the overall activities and lifestyle. Most of the people began living a sedentary lifestyle, spending more time on their phone, watching television and excessive sleeping. Reduction of physical activity level had profoundly negative impact on musculoskeletal health.**Aim:** This study aims to investigate the impact of lockdown on musculoskeletal health, association between leisure and musculoskeletal pain during this period.**Methods:** A cross sectional study was conducted among general populations living in a specific area of Bangladesh by simple random sampling methods. A total of 230 participants both male (182) and female (48) age group between 18-60 years have participated. The study was carried out by sending the Google Form link containing demographic questionnaire, numeric pain rating scale and Nordic musculoskeletal Questionnaire. Wilcoxon sign rank t and Chi square test was used to analyze the data.**Results:** The mean height, weight and BMI of the participants were 164.17 ± 8.40 cm, 63.82 ± 10.70 kg and 23.74 ± 3.97 kg/m² respectively. There was significant increase in time spent in watching television ($p = < 0.0001$), using smartphone ($p = < 0.0001$) and sleeping ($p = < 0.0001$) during the lockdown period. 33.9% participants had pain before the lockdown which increased by 57% during the lockdown periods. There was a significant association between pain intensity and sleeping time ($X^2 = 54.84$; $p = < 0.0001$), time spent watching television ($X^2 = 83.70$; < 0.0001), time spent on smartphone ($X^2 = 58.39$; < 0.0001) during the lockdown period.**Conclusion:** The result of this study concluded that the lockdown has negatively impacted the musculoskeletal health of the participants. The musculoskeletal pain might be short term initially, but can develop to be a long-term problem and burden if proper measures are not taken.

1. Introduction

The coronavirus disease was first identified in the city of Wuhan, Hubei State in China on 31st of December 2019, [1] and has affected more than 213 countries around the world [2]. The causative agent was identified on 7th January 2020 and named as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) by the Chinese Centre for Disease Control and Prevention. The World Health Organization named the disease COVID-19 and declared the outbreak as global emergency on 30th January due to the virulence and highly interactivity [3].

The first confirmed case of COVID-19 in Bangladesh was detected on the 8th of March 2020 by the Institute of Epidemiology, Disease Control and Research (IEDCR). Since then, the virus has spread day by day affecting the whole nation and is still increasing on a daily basis [4]. At first the government of Bangladesh declared the implementation of lockdown for 10 days effective from 26th March to 4th April 2020, later the government declared postponements of the countrywide lockdown extended up to 30 May [5].

During the lockdown, regular outdoor activities were limited, affecting the daily routine of the individuals [6]. Staying at home restricted the athletes to perform physical activity leading to

* Corresponding author.

E-mail address: ptsohel@gmail.com (S. Ahmed).

development of sedentary habits. Home based fitness activities remained the only solution for being active and helped to maintain exercise routine and fitness during the pandemic [7]. A recent study reported that during lockdown period there was markedly reduced physical activity and energy expenditure level [8]. Long term detraining leads to marked reduction in maximal oxygen consumption, decreased endurance and loss of muscle mass and strength leads to increased risk of injuries. Physical workout denotes a good strategy to preserve function, decrease pain and fatigue, increase joint flexibility and muscle strength [9].

Due to COVID-19, both healthy individuals and patients all around the world have suddenly become inactive which lead to development of several kinds of disease [10, 11, 12]. Di Stefano V et al. reported there was a significant decrease in physical activity and quality of life in patients with neuromuscular disease [13]. The onset of any pain is associated with several factors, including poor posture, performing repetitive movements, heavy lifting and sedentary lifestyle [14]. In addition, few factors can also aggravate pain intensity including reduction of physical activity level which may have a negative impact on psychological well-being [15] and proportional to the increasing level of stress and anxiety [16, 17]. Quarantine measures have a negative impact on human beings which increases anger and aggression, increases sedentary behaviors and leads to development of musculoskeletal pain [18]. Few recent studies investigate the impact of lockdown on physical and/or intellectual disability [19], low back pain [18], hip and knee osteoarthritis [20], and physical activity and psychological well-being in people with chronic pain [21]. But there is scarcity of literature regarding the various effects of the nationwide lockdown on the overall musculoskeletal health in Bangladesh.

So, in this current situation, due to lockdown most of the people are living a sedentary lifestyle [22], spending more time on their phone, watching television and excessive sleeping [23] leading to decreased physical activity which is associated with high risk of musculoskeletal pain [21]. Physical activity and well-being outcome were associated with each other, as significant difference were observed between physical activity level and well-being status [24]. This present study aims to investigate the impact of lockdown on musculoskeletal health and association between leisure activities (time spent on smartphone, watching television and sleeping) and musculoskeletal pain. We hypothesized that there was significant difference in musculoskeletal pain before and during the lockdown period.

2. Methodology

2.1. Ethical statement

Ethical clearance has been obtained from the ethical review board of Mount Adora Hospital, Akhaila, Sylhet with the reference number of MAH/ERB-20/03. The study was performed according to the guideline laid by, declaration of Helsinki (Revised 2013) and Bangladesh medical research council guideline 2014. The nature and purpose of the study was informed; followed by informed consent obtained was obtained from the participants through a digital form. The study design, data collection, presentation and citation of this study comply with the standard Committee on publication Ethics (COPE) guideline.

2.2. Subject and procedure

This cross-sectional study was conducted among general population staying in specific area of Bangladesh between the 24th of April and the 25th of May 2020. The required sample was recruited by simple random sampling method. Sampling population was made by listing 1000 individuals, which was selected from the Facebook friend list of the listed four authors based on their current location who were residing in Sylhet division in Bangladesh. From the selected 1000 individuals A sampling frame of 350 population was made by using a

random number generator (an application tool; SPSS 20) which is a computer-based software.

2.3. Subject recruitment criteria

Participants, both male and female were recruited for this cross-sectional survey study. The criteria for selecting participants in this study were age group between 18-60 years, residing in Sylhet division, having smartphone or device by which questionnaire can be filled, and willing to participate in this study. The exclusion criteria were: participants who were not willing to spend time to fill-up the questionnaire and who did not have an account on social media such as Facebook and WhatsApp, were excluded from this study.

2.4. Sample size estimation

The required sample size was estimated by using the formula for estimating proportion: $n = Z\alpha^2 P(1 - P)/d^2$, where $Z\alpha = 1.96$; $P = 82\%$; as the response rate of the online survey is $>80\%$ [25], and $d = 5\%$. The minimum number of participants required for this study was estimated to be 230. Google forms prevented incomplete or partial submission thus we did not require anticipation of 10% incomplete forms. When the survey response hit 230 and above, the survey link was closed for accepting further responses.

2.5. Survey development

A series of structured questionnaire (Supplementary file 1) were carried out in this survey containing 1. Demographic data (age group, gender, weight, height, and profession) 2. Coping strategies taken for COVID-19 outbreak, 3. Physical activity before and during the outbreak, 4. Leisure activity before and during the outbreak including; sleeping time, time spent watching television, time spent using mobile phone, 5. History of pain before and during the outbreak and last section containing Nordic musculoskeletal questionnaire to find out the area of pain in the body.

2.5.1. Nordic musculoskeletal disorder questionnaire

Nordic musculoskeletal disorder questionnaire is a valid and reliable tool for assessment of various musculoskeletal disorder present in our body. The questionnaire contains nine symptoms site including neck, shoulder, upper back, elbow, low back, wrist/hands, hips/thighs knees and ankles/feet. Participants were asked whether they had any musculoskeletal issues in their body within the last one week which has affected them to perform their daily activities [26].

2.5.2. Numeric pain rating scale

The numeric pain rating scale is a subjective measure to assess individual's pain. The scale is composed of 11-point numerical scale ranging from 0 (no pain at all) to 10 (worst imaginable pain). The scale was shown high test-retest reliability ($r = 0.96$) and validity ($r = 0.86-0.95$) [27].

2.6. Survey validation

The initial draft of the survey questionnaire was submitted to a panel of expertise (two professor of physiotherapy, an epidemiologist and an assistant professor of neurology) for content validity. The revised questionnaire was tested on a small target population to check whether the question was confusing or unclear. The response time was monitored while testing the questionnaire. It took not more than 20 min to complete the questionnaire. Thus, the final draft contains 6 sections and 26 questions.

2.7. Survey administration

The survey was distributed by sending the link (=https://docs.google.com/forms/d/e/1FAIpQLSfZK21lCoqFgWuo9sjVPZx7uAf2RLUo768_Uk a7DZLq3GA/viewform?usp=link) to the participants through social networking sites such as Facebook, Messenger and WhatsApp. 350 potential participants were selected from a population of 1000 by using a simple random sampling method (A tool of SPSS software). The survey was conducted by using online survey portal, Google Forms®. As potential participants were mostly active on Facebook, Messenger, and WhatsApp as compared to checking frequent email or text messages, the above-mentioned social media sites were used to distribute the questionnaire. A reminder message was sent to the participants who did not respond within two weeks. After receiving 230 responses, the survey response link was closed from accepting further responses making a response rate of 65.72%.

2.8. Statistical analysis

Statistical analysis was carried out by using the software SPSS version 20.0. Descriptive statistics were expressed as mean and standard deviation for continuous variables. In this study leisure time (sleeping time, time spent watching television, and time spent on smartphone) were measured as categorical variables. For categorical data descriptive statistics (frequencies and percentage) were used. Wilcoxon sign rank t test was used to measure the difference between before lockdown and during lockdown variable differences. Chi square test was used to find out the association between leisure activity and pain history. The p value was set as 0.05 as level of significant and 95% confidence interval was taken for this study.

3. Results

3.1. Socio demographic variable of the participants

In this study, a total number of 230 volunteers both male and female participated (the number of male participants were greater than female 79.1% vs 20.9%). Most of the participants were from the age group of 18–29 (73.5%). The mean height, weight and BMI of the participants were 164.17 ± 8.40 cm, 63.82 ± 10.70 kg and 23.74 ± 3.97 kg/m² respectively. The percentage of participants who went out for emergency needs was 63.5% and most of these participants maintained social distancing. About half of the participants performed breathing exercises (40.9%) and one third of the participants performed yoga (31.7%) at home during lockdown periods. The socio demographic data are presented in Table 1.

3.2. Leisure activity and pain before and during lockdown

The mean pre lockdown working hours of the participants were 7.20 ± 3.39 h which decreased significantly 3.23 ± 2.72 (p = < 0.0001) during the lockdown periods. On the other hand, time spent on smartphone, watching television and sleeping, significantly increased during the lockdown periods. 33.9% participants had pain before lockdown which later increased to 57% during the lockdown periods due to physical inactivity. The mean numeric pain rating scale score of the participants (who had pain in their body) before lockdown was 3.10 ± 1.73 which intensified during the lockdown to 3.51 ± 2.06. There was significant difference observed (p = < 0.0001) in pain intensity between before and during lockdown periods among the participants. Table 2 represents the Leisure activity performed by the participants before and during lockdown periods.

3.3. Association between pain and leisure activities during lockdown

There was significant association between pain intensity and time spent on sleeping (X² = 54.84; p = < 0.0001), time spent on watching television (X² = 83.70; < 0.0001), smartphone usage (X² = 58.39; < 0.0001) and physical activity time (X² = 71.04; < 0.0001) during the lockdown period.

Table 1. Socio demographic data of the participants.

Age group	18–29 years	169 (73.5%)
	30–39 years	41 (17.8%)
	40–49 years	18 (7.8%)
	50–60 years	2 (0.9%)
Profession	Government Service	21 (9.1%)
	Private Service	72 (31.3%)
	Business	7 (3%)
	Student	115 (50%)
	Housewife	7 (3%)
	Unemployed	8 (3.5%)
Going out of house	I am not going out of the house	59 (25.7%)
	Going out for an emergency	146 (63.5%)
	Going out once a day	22 (9.6%)
	I am always going out	3 (1.3%)
Maintaining social distance	Yes	169 (73.5%)
	No	7 (3%)
	Maybe	54 (23.5%)
Performing Breathing exercise at home during lockdown	Yes	94 (40.9%)
	No	136 (59.1%)
Performing Yoga at home during lockdown	Yes	73 (31.7%)
	No	157 (68.3%)

3.4. Causes and area of pain in the body

More than half of the participants (56.1%) complaint about pain in their body during past 7 days. The most common reasons of pain displayed by the participants were spending more time on mobile phone, sitting all day, excessive sleeping and inactivity. Most of the participants complaint mainly of lower back pain, followed by neck pain and upper back pain. The causative factor and area of pain during lockdown period are presented in Table 3.

4. Discussion

This online cross-sectional study was conducted among general populations who were residing in a specific area of Bangladesh. We conducted the web-based survey as it was easy to implement and required less time for gathering information. A total of 230 potential participants both male and female participated in this survey study. The study accepted alternative hypothesis as there is significant difference (p < 0.0001) in pain before and during lockdown period.

The study findings revealed that 40.9% of participants performed breathing exercise and 31.7% of the participants performed Yoga at home during the lockdown periods as advised by The World Health Organization (WHO). 73.5% participants who went out for their emergency needs maintained social distancing. During the lockdown period, working hours of the participants were significantly reduced (p = < .0001). At the same time leisure activity such as watching television (p = < .0001), smartphone usage (p = < .0001) and sleeping time (p = < .0001) were significantly increased during the lockdown period. There was no significant change in physical exercise level (p = .774) before and during lockdown period. The presence of pain in the body has significantly increased (p = < .0001) among the study participants during lockdown period as compared to before the time of lockdown. Statistically significant association were noted in pain intensity with sleep time (p = < .0001), watching television (p = < .0001), and mobile phone usage (p = < .0001).

The most common causes of pain during the lockdown period represented by the participants were, spending more time on mobile phone (17.5), sitting all the day (16.6%), disruption of daily activity (13.4%), inactivity (11.8%) and excessive sleep (11.1%). The most common pain site in the body were lower back (24.8%), followed by neck (19.1%) and upper back (14.1%) as shown in Table 3.

Table 2. Leisure activity performed before and during lockdown.

Variables (n)		Before lockdown (n%)	During lockdown (n%)	Z value	P value
Sleep time (n = 230)	5–6 h	79 (34.3)	38 (16.5)	-8.96	<0.0001
	7–8 h	132 (57.4)	85 (37)		
	8–9 h	18 (7.8)	85 (37)		
	>9 h	1 (.4)	22 (9.6)		
Time spent for watching television (n = 230)	Not at all	127 (55.2)	90 (39.1)	-7.34	<0.0001
	<1 h	58 (25.2)	54 (23.5)		
	1–2 h	38 (16.5)	53 (23)		
	3–5 h	6 (2.6)	22 (9.6)		
	>5 h	1 (.4)	0 (0)		
Time spent for smartphone use (n = 230)	1–2 h	71 (30.9)	21 (9.1)	-10.53	<0.0001
	3–4 h	108 (47)	73 (31.7)		
	5–6 h	40 (17.04)	74 (32.2)		
	7–8 h	9 (3.9)	38 (16.5)		
	>8 h	2 (.9)	24 (10.4)		
Time spent for performing physical activity (n = 230)	No activity	83 (36.1)	83 (36.1)	-0.29	.774
	<20 min	66 (28.7)	66 (28.7)		
	20–30 min	44 (19.1)	43 (18.7)		
	30–40 min	16 (7)	23 (10)		
	>40 min	21 (9.1)	15 (6.5)		

Table 3. Causes of pain and prevalence of pain complaint by the participants during lockdown.

Variables	Factors	Responses (n & %)	Percent of cases
Causes of pain	Not because with my routine work	28 (8.9)	22.2%
	Because of my too much routine work	10 (3.2)	7.9%
	Because of my inactivity	37 (11.8)	29.4%
	I am spending more time on watching television then before	13 (4.1)	10.3%
	I am spending more time on mobile phone then before	55 (17.5)	43.7%
	Because of my daily life is totally disrupted	42 (13.4)	3.3%
	Because I am doing household work	14 (4.5)	11.1%
	Due to excessive sleep	35 (11.1)	27.8%
	Because of sitting all the days	52 (16.6)	41.3%
	For an uncertain future	15 (6.1)	15.1%
	Others	9 (2.9)	7.1%
Total		314 (100%)	249.2%
Painful area during lockdown	Neck	61 (19.1)	48.0%
	Upper back	45 (14.1)	35.4%
	Shoulder	28 (8.8)	22.0%
	Elbow	16 (5.0)	12.6%
	Wrist and hand	30 (9.4)	23.6%
	Lower back	79 (24.8)	62.2%
	Hips and thigh	21 (6.6)	15.5%
	Knee	25 (7.8)	19.7%
	Ankle and foot	14 (4.4)	11.0%
Total		319 (100%)	251.2%

Previous studies were conducted to examine the impact of lockdown on pain, physical activity and psychological well-being in individuals with chronic pain. In this study they investigated how lockdown impacted individuals with chronic pain in United Kingdom. The study results indicated that the perception of pain was increased during the lockdown periods [21]. In another study, the negative impact of lockdown on pain and physical function in patients with hip and knee osteoarthritis (OA) was observed. This study recruited 63 patients with hip and knee OA who had been scheduled for surgery that was postponed. The result of the study showed significant impact on pain, physical function, joint function and physical activity in patient with hip and knee OA [20]. The findings of those studies were similar to the findings of this present study as the pain intensity of the general populations were

significantly increased ($p = < 0.0001$) during the lockdown periods which is a growing concern for the health care providers.

During the lockdown periods, people of Bangladesh were physically inactive and reported >8 h per day of sedentary behaviors [28]. In another study, during the lockdown period participants declined to participate in physical activity and observed an increased in sedentary behavior and sleep time [29]. Physical inactivity and sedentary behavior were also observed among children living in United states. The study concluded that physical inactivity during COVID-19 may become permanently rooted leading to increased risk of obesity, cardiovascular disease, and diabetes in children [30]. Staying at home for a prolonged period of time lead to sedentary behaviors such as spending more time on phone, watching television, playing games and excessive sleeping [31].

Our present study observed that time spent watching television ($p = < .0001$), duration of smartphone usage ($p = < .0001$) and sleeping time ($p = < .0001$) were significantly increased during lockdown period. According to our observation, there was no significant change in physical activity level ($p = .774$) before and during lockdown period that was in line with the objective of the studies reported previously that might be the reason of increased musculoskeletal pain among the study participants.

In this present study the most common causes of pain reported by the participants were, spending more time on smartphone than before (17.5%), disruption of daily activity (13.4%), and physical inactivity (11.8%). Neck pain was associated with spending more time on mobile phone reported by S. Ahmed et al. [32]. Statistical significant relationship was observed between leisure activity and low back pain outcome [33]. Prolonged sitting in awkward posture is associated with low back pain and sciatica [34] due to which there has been an increase in musculoskeletal pain during the lockdown as compared to before the lockdown started.

More than 1 million people have died due to COVID-19, which is a matter of concern to the scientist now a days. COVID-19 is not a pandemic, It is a syndemic reported by Horton R in a recent literature [35]. Due to the syndemic nature of the threat we face today means that a more strict and hands-on approach is required if we are to safeguard the health of our communities. A syndemic is not merely a comorbidity. Syndemics are characterized by biological and social interactions between conditions and states, interactions that increase a person's susceptibility to harm or worsen their health outcomes. In the case of COVID-19, tackling non communicable diseases will be a prerequisite for successful containment [35]. The scientific world is now focusing more on the pandemic not on syndemic which may become a health concern for those having musculoskeletal conditions.

We conducted a web-based online survey because the people of today are consistently on their phones or other electronic devices and are habitually using social networking sites such as Facebook, WhatsApp, and Messenger. The strength of this study was minimally time consuming, cost-effective, easily acceptable to all participants and eco-friendly (data collection through online methods helps to maintain social distancing during lockdown and does not require pen and paper). Thanks to the help of telematic communication software i.e., Google Forms, the collection and distribution of the data required for this study was made convenient and easy to understand during the lockdown period. Limitations of this cross-sectional study includes data collection from a specific area of Bangladesh, data regarding participants previous medical conditions, and mental health status were not assessed and self-reported instrument used that per se the risk of self-reporting bias. Despite these limitations, by using pre-fixed exclusion and inclusion criteria, the ascertainment bias eliminated. Selection bias was eliminated by using simple random sampling method. Future studies can be done to examine the long-term effects of lockdown on musculoskeletal health.

5. Conclusion

The result of this study concludes that the lockdown has negatively impacted the musculoskeletal health of the participants. A significant increase in pain among general population during lockdown period as compared to before the lockdown period was also observed. The musculoskeletal pain might be short term initially, but may possibly develop into a long-term problem and may be burden if proper measures are not taken.

Declarations

Author contribution statement

Sohel Ahmed: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Rahemun Akter: Conceived and designed the experiments; Wrote the paper.

Mohammad Jahirul Islam and Asima Akter Sadia: Conceived and designed the experiments; Performed the experiments.

Amienna Abdul Muthalib: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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References

- [1] H. Lu, C.W. Stratton, Y.W. Tang, Outbreak of pneumonia of unknown etiology in Wuhan, China: the mystery and the miracle, *J. Med. Virol.* 92 (4) (2020) 401–402.
- [2] J. Lai, S. Ma, Y. Wang, Z. Cai, J. Hu, N. Wei, et al., Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019, *JAMA Netw. open* 3 (3) (2020), e203976.
- [3] C. Sohrabi, Z. Alsafi, N. O'Neill, M. Khan, A. Kerwan, A. Al-Jabir, et al., World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19), *Int. J. Surg.* 76 (February) (2020) 71–76.
- [4] M.T. Islam, A.K. Talukder, M.N. Siddiqui, T. Islam, Tackling the COVID-19 pandemic: the Bangladesh perspective, *J. Publ. Health Res.* 9 (4) (2020 Oct 14) 1794.
- [5] S. Anwar, M. Nasrullah, M.J. Hosen, COVID-19 and Bangladesh: challenges and how to address them, *Front. Publ. Health* [Internet] 8 (2020) 154. Available from: <https://www.frontiersin.org/article/10.3389/fpubh.2020.00154>.
- [6] P. Pulla, Covid-19: India imposes lockdown for 21 days and cases rise, *BMJ* 368 (2020).
- [7] S. Ravalli, G. Musumeci, Coronavirus outbreak in Italy: physiological benefits of home-based exercise during pandemic, *J. Funct. Morphol. Kinesiol.* [Internet] 5 (2) (2020 May 7) 31. Available from: <https://pubmed.ncbi.nlm.nih.gov/33467247>.
- [8] A.K. Srivastav, N. Sharma, A.J. Samuel, Impact of Coronavirus disease-19 (COVID-19) lockdown on physical activity and energy expenditure among physiotherapy professionals and students using web-based open E-survey sent through WhatsApp, Facebook and Instagram messengers, *Clin. Epidemiol. Glob. Health* 9 (2021) 78–84.
- [9] A. Paoli, G. Musumeci, Elite athletes and COVID-19 lockdown: future health concerns for an entire sector, *J. Funct. Morphol. Kinesiol.* [Internet] 5 (2) (2020 May 7) 30. Available from: <https://pubmed.ncbi.nlm.nih.gov/33467246>.
- [10] P. Chen, L. Mao, G.P. Nassis, P. Harmer, B.E. Ainsworth, F. Li, Coronavirus disease (COVID-19): the need to maintain regular physical activity while taking precautions, *J. Sport Health Sci.* [Internet] 9 (2) (2020 Mar) 103–104, 2020/02/04; Available from: <https://pubmed.ncbi.nlm.nih.gov/32099716>.
- [11] J. de Seze, C. Lebrun-Frenay, Covid-19, the pandemic war: implication for neurologists, *Rev. Neurol. (Paris)* [Internet] 176 (4) (2020 May) 223–224. Available from: <https://pubmed.ncbi.nlm.nih.gov/32303331>.
- [12] T.P. Velavan, C.G. Meyer, The COVID-19 epidemic, in: *Tropical Medicine & International Health*, 25, TM & IH, 2020, pp. 278–280.
- [13] V. Di Stefano, G. Battaglia, V. Giustino, A. Gagliardo, M. D'Aleo, O. Giannini, et al., Significant reduction of physical activity in patients with neuromuscular disease during COVID-19 pandemic: the long-term consequences of quarantine, *J. Neurol.* [Internet] 268 (1) (2021) 20–26.
- [14] M.A. Cimmino, C. Ferrone, M. Cutolo, Epidemiology of chronic musculoskeletal pain, *Best Pract. Res. Clin. Rheumatol.* [Internet] 25 (2) (2011) 173–183. Available from: <https://www.sciencedirect.com/science/article/pii/S1521694211000052>.
- [15] G. Maugeri, P. Castrogiovanni, G. Battaglia, R. Pippi, V. D'Agata, A. Palma, et al., The impact of physical activity on psychological health during Covid-19 pandemic in Italy, *Heliyon* [Internet] 6 (6) (2020), e04315.
- [16] G. Maugeri, G. Musumeci, Adapted physical activity to ensure the physical and psychological well-being of COVID-19 patients, *J. Funct. Morphol. Kinesiol.* 6 (1) (2021) 13.
- [17] G.E. Duncan, A.R. Avery, E. Seto, S. Tsang, Perceived change in physical activity levels and mental health during COVID-19: findings among adult twin pairs, *PLoS One* [Internet] 15 (8) (2020 Aug 13), e0237695.

- [18] P. Šagát, P. Bartfk, P. Prieto González, D.I. Tohánean, D. Knjaz, Impact of COVID-19 Quarantine on low back pain intensity, prevalence, and associated risk factors among adult citizens residing in Riyadh (Saudi Arabia): a cross-sectional study, *Int. J. Environ. Res. Publ. Health* 17 (19) (2020 Oct).
- [19] N. Theis, N. Campbell, J. De Leeuw, M. Owen, K.C. Schenke, The effects of COVID-19 restrictions on physical activity and mental health of children and young adults with physical and/or intellectual disabilities, *Disabil. Health J.* [Internet] (2021) 101064. Available from: <https://www.sciencedirect.com/science/article/pii/S1936657421000054>.
- [20] F. Endstrasser, M. Braitto, M. Linser, A. Spicher, M. Wagner, A. Brunner, The negative impact of the COVID-19 lockdown on pain and physical function in patients with end-stage hip or knee osteoarthritis, *Knee Surgery, Sport Traumatol Arthrosc.* 28 (8) (2020) 2435–2443.
- [21] N. Fallon, C. Brown, H. Twiddy, E. Brian, B. Frank, T. Nurmikko, et al., Adverse effects of COVID-19-related lockdown on pain, physical activity and psychological well-being in people with chronic pain, *Br. J. Pain* (2020).
- [22] S. Stockwell, M. Trott, M. Tully, J. Shin, Y. Barnett, L. Butler, et al., Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review, *BMJ Open Sport Exerc. Med.* [Internet] 7 (1) (2021 Jan 1), e000960. Available from: <http://bmjopensem.bmj.com/content/7/1/e000960.abstract>.
- [23] M.J. Koohsari, T. Nakaya, G.R. McCormack, A. Shibata, K. Ishii, K. Oka, Changes in workers' sedentary and physical activity behaviors in response to the COVID-19 pandemic and their relationships with fatigue: longitudinal online study, *JMIR Pub. Health Surveill.* [Internet] 7 (3) (2021 Mar), e26293. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/33727211>.
- [24] I.A. Lesser, C.P. Nienhuis, The impact of COVID-19 on physical activity behavior and well-being of Canadians, *Int. J. Environ. Res. Publ. Health* [Internet] 17 (11) (2020 May 31) 3899. Available from: <https://pubmed.ncbi.nlm.nih.gov/32486380>.
- [25] Sohail Ahmed, Nikita pokhrel, A.J.S. Swastik Roy, Impact of nomophobia: a nondrug addiction among students of physiotherapy course using an online cross-sectional survey, *Indian J. Psychiatr.* 61 (1) (2019) 77–80.
- [26] T. Kahraman, A. Genç, E. Göz, The Nordic Musculoskeletal Questionnaire: cross-cultural adaptation into Turkish assessing its psychometric properties, *Disabil. Rehabil.* 38 (21) (2016 Oct 8) 2153–2160.
- [27] M.B. Ferraz, M.R. Quaresma, L.R. Aquino, E. Atra, P. Tugwell, C.H. Goldsmith, Reliability of pain scales in the assessment of literate and illiterate patients with rheumatoid arthritis, *J. Rheumatol.* 17 (8) (1990 Aug) 1022–1024.
- [28] E. Rahman, S. Islam, S. Bishwas, M. Sabrina, D. Gozal, Physical inactivity and sedentary behaviors in the Bangladeshi population during the COVID-19 pandemic : an online cross-sectional survey, *Heliyon* [Internet] 6 (September) (2020), e05392.
- [29] C. Zheng, W.Y. Huang, S. Sheridan, C.H.-P. Sit, X.-K. Chen, S.H.-S. Wong, COVID-19 pandemic brings a sedentary lifestyle in young adults: a cross-sectional and longitudinal study, *Int. J. Environ. Res. Publ. Health* 17 (17) (2020 Aug).
- [30] G.F. Dunton, B. Do, S.D. Wang, Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S, *BMC Public Health* [Internet] 20 (1) (2020) 1351.
- [31] N. Owen, P.B. Sparling, G.N. Healy, D.W. Dunstan, C.E. Matthews, Sedentary behavior: emerging evidence for a new health risk, *Mayo Clin. Proc.* 85 (12) (2010 Dec) 1138–1141.
- [32] S. Ahmed, R. Akter, N. Pokhrel, A.J. Samuel, Prevalence of text neck syndrome and SMS thumb among smartphone users in college-going students: a cross-sectional survey study, *J. Publ. Health* 29 (2) (2021) 411–416.
- [33] P. Hendrick, S. Milosavljevic, L. Hale, D.A. Hurley, S. McDonough, B. Ryan, et al., The relationship between physical activity and low back pain outcomes: a systematic review of observational studies, *Eur. Spine J. Off. Publ. Eur. Spine Soc. Eur. Spinal Deform Soc. Eur. Sect. Cerv. Spine Res. Soc.* 20 (3) (2011 Mar) 464–474.
- [34] A.M. Lis, K.M. Black, H. Korn, M. Nordin, Association between sitting and occupational LBP, *Eur. Spine J. Off. Publ. Eur. Spine Soc. Eur. Spinal Deform Soc. Eur. Sect. Cerv. Spine Res. Soc.* 16 (2) (2007 Feb) 283–298.
- [35] R. Horton, Offline: COVID-19 is not a pandemic, *Lancet* [Internet] 396 (10255) (2020) 874.