OPEN ACCESS

Rehabilitation Communications

DOI: doi.org/10.55627/rehab.003.001.0775

Research Article

Association of Sleep Quality with Musculoskeletal Discomfort in Young Adults

Zoya Mehmood*, Iqra Imtiaz, Syeda Ruqayyah Fatima, Fatima Hadi, Naveed Ahmad

Department of Rehabilitation Sciences, Shifa Tameer-e-Millat University, Islamabad, Pakistan

***Correspondence**: zoya_dpt.ahs@stmu.edu.pk

Abstract

The purpose of the study was to determine the prevalence of sleep quality and musculoskeletal discomfort and to investigate the association of sleep quality with musculoskeletal discomfort in young adults. This was a cross-sectional study, conducted online on young adults in twin cities of Rawalpindi and Islamabad, Pakistan. 354 participants were selected through a convenient sampling technique on the basis of inclusion criteria of healthy adults of both genders with an age range of 18-24 years. Participants with diagnosed neurological/cognitive impairment and musculoskeletal injuries were excluded from the study. A self-structured questionnaire was used to obtain demographic data. Pittsburg sleep quality index and Nordic scale were used to assess sleep quality and musculoskeletal discomfort. Results showed that the mean age of the participants was 21.57± 1.74. Among 354 individuals, only 46 participants (13 %) exhibited sound sleep duration with no sleep disturbance whereas 251 participants (71%) reported mild sleep disturbance. Neck (46.6%) and lower back (36.2) regions have been mostly affected due to sleep disturbances. A significant association (p-value <0.05) between sleep quality and musculoskeletal discomfort has been observed for all body regions except for the neck (p-value 0.94). It is concluded that the prevalence of musculoskeletal discomfort is not common in all body regions however, neck, shoulder, upper, and lower back pain showed the most frequent discomfort. Sleep quality of the majority of young adults was also poor and disturbed and a significant association between the two factors has been observed.

Keywords: Back pain, discomfort, musculoskeletal pain, sleep hygiene, young adults

1. Introduction

Lower Sleep is an essential physiological function for human life because it helps to restore a healthy body (Falbot et al. 2021). On average an adult should sleep seven or more hours per night to maintain good health (Rudnicka et al. 2017). The sleep cycle varies throughout human development in duration, stage distribution, and circadian rhythm (Keene and Duboue 2018). Sleep alterations may occur due to several factors, such as stress, anxiety, unhealthy eating habits, long working hours, and excessive use of technology (Yan et al. 2018, Matsunaga et al. 2021). These alterations could be related to the reduction of sleeping hours, their quality, and impact on the overall quality of life (Berhanu et al. 2018).

Decrement in sleep health is prevalent in the modern world and is related to a variety of disease risks and outcomes, including those contributing to health disparities (Bohnen and Hu 2019, Minakawa, Wada, and Nagai 2019, Ananthakrishnan et al. 2013). Various factors, such as work demands, can cut down the sleep duration below the recommended values stimulating a wide range of effects on mood, cognitive, and motor functions. It has been estimated that 50% to 88% of patients with musculoskeletal problems have poor sleep quality and significant sleep complaints (Esmero and Herdegen 2021). Disturbed sleep serves as a

Table 1: Frequency of component scores in Pittsburg sleep quality index (PQSI).

	Frequency (N)	Percentage (%)
Component 1: Subjective sleep quality		
Very good	**102**	**28.8**
Fairly good	**162**	**45.8**
Fairly bad	**71**	**20.1**
Very bad	**19**	**5.4**
Component 2: Sleep latency		
≤ 15 minutes	**66**	**18.6**
16-30 minutes	**119**	**33.6**
31-60 minutes	**91**	**25.7**
> 60 minutes	**78**	**22**
Component 3: Sleep duration		
> 7 hours	**243**	**68.6**
6-7 hours	**53**	**15**
5-6 hours	**36**	**10.2**
< 5 hours	**22**	**6.2**
Component 4: Habitual Sleep Efficacy		
> 85 %	**288**	**81.4**
75-84 %	**36**	**10.2**
65-74 %	**14**	**4**
< 65%	**16**	**4.5**
Component 5: Sleep disturbances		
No difficulty	**47**	**13.3**
Mild difficulty	**251**	**70.9**
Moderate difficulty	**55**	**15.5**
Severe difficulty	**1**	**3**
Component 6: Use of sleep medication		
Not during the last month	**306**	**86.4**
< once a week	**26**	**7.3**
Once or twice a week	**16**	**4.5**
Three or more times a week	**6**	**1.7**
Component 7: Daytime dysfunction		
No difficulty	**140**	**39.5**
Mild difficulty	**121**	**34.3**
Moderate difficulty	**68**	**19.2**
Severe difficulty	**25**	**7.1**

contributing factor to increased pain sensitivity and interferes with daily functioning (Sayar, Arikan, and Yontem 2002). Musculoskeletal pain and discomfort have been significantly augmented among young adults in a few decades with a range reported to be from 4% to 70% (Ozdemir et al. 2021). Musculoskeletal pain undermines night sleep, and poor sleep aggravates pain the next day (Gerhart et al. 2017). Pain in any region may have an adverse

Table 2: Frequency of musculoskeletal trouble in the last 7 days.

Body Region	Answers	Musculoskeletal trouble in the last 7 days (N)	Musculoskeletal trouble in the last 7 days (%)
Neck	Yes	93	26.3
	No	261	73.7
Shoulder	Yes	60	16.9
	No	294	83.1
Upper back	Yes	47	13.3
	No	307	86.7
Elbows	Yes	11	3.1
	No	343	96.9
Wrist/Hands	Yes	22	6.2
	No	332	93.8
Lower back	Yes	82	23.2
	No	272	76.8
Hips/thighs	Yes	26	7.3
	No	328	92.7
Knees	Yes	28	7.9
	No	328	92.1
Ankles/Feet	Yes	32	9
	No	322	91

effect on adolescents' daily activities, physical performance, and overall quality of life (Holden et al. 2018). To our knowledge, musculoskeletal pain has been widely increased among adults leading to absenteeism from their university or work and eventually, a decline in their academic performance (Huguet et al. 2016).

Musculoskeletal pain is found to be common among young adults and poor sleep quality can be a contributing factor to this condition. Moreover, literature has already emphasized the impact of sleep on muscular tone and postural control. Therefore, the purpose of this study was to determine the sleep quality and pattern of musculoskeletal discomfort and whether there is an association between sleep quality and musculoskeletal pain in a Pakistani context.

2. Methods & Materials

This cross-sectional survey was conducted online through social media applications like WhatsApp, and Facebook between February 2020 and July 2020 in the twin cities of Pakistan -Islamabad and Rawalpindi. The study was approved by the Institutional Review Board of Shifa Tameer-e-Millat University Islamabad (IRB approval date 22 April 2020 and number: 053-873-2020). Informed consent was taken from all the individuals before their enrollment in the study. All the study procedures followed the "Ethics Guidelines of the Declaration of Helsinki".

Young adults of either gender, aged between 18 to 24 years were included. Those with a previous history of musculoskeletal injury/trauma, history of structural deformity and/or bone diseases, amputations and/or diagnosed musculoskeletal disorders, and diagnosed neurological and/or cognitive impairment were excluded.

The sample size for this study was 384, calculated through Rao-soft online software. The

Table 3: Frequency of musculoskeletal trouble in the last 12 months.

Body Region	Answers	Musculoskeletal trouble in the last 12 months (N)	Musculoskeletal trouble in the last 12 months (%)
Neck	Yes	165	46.6
	No	189	53.4
Shoulder	Yes	105	29.7
	No	249	70.3
Upper back	Yes	80	22.6
	No	274	77.4
Elbows	Yes	16	4.5
	No	338	95.5
Wrist/Hands	Yes	42	11..9
	No	312	88.1
Lower back	Yes	128	36.2
	No	226	63.8
Hips/thighs	Yes	49	13.8
	No	305	86.2
Knees	Yes	42	11.9
	No	312	88.1
Ankles/Feet	Yes	43	12.1
	No	311	87.9

sample size was established on an expected number of young adults in the twin cities such as Islamabad and Rawalpindi with 95% confidence interval and 5% margin of error. All the participants were included in the study through non- probability convenient sampling technique.

Online Google forms were generated and data was collected using standardized tools such as a Nordic musculoskeletal questionnaire to identify discomfort across 9 regions of the body in the last 12 months (Crawford 2007) and Pittsburgh sleep quality index to measure the general sleep quality of the participants (Carpenter and Andrykowski 1998). Demographic information was added to the questionnaire. Quantitative variables were expressed as mean ± standard deviation whereas qualitative variables were noted as frequency and percentages. To find out the association between pain/discomfort with participation limitation Chi-square test was applied. Data was explored by using the Social Package for Statistical Sciences version 21.

3. Results

The mean age of the participants was 21.57± 1.77 years. Among them 110 (31.1%) were male and 244 (68.9%) were female. 246(68.6%) adults had a sleep duration of more than 7 hours and only 22(6.2%) participants used to have a sleep of less than 5 hours.

102 (28.8%) adults reported to have a very good subjective sleep quality whereas only 19(5.4%) participants had a poor sleep quality. The majority (86.4%) of them didn't use sleep medication and 47(13.3%) of the total adults found no disturbance during their sleep. Various components of sleep including subjective sleep quality, sleep duration, sleep disturbance, use of medication, habitual sleep efficacy, and daytime

Table 4: Frequency of visit to physician in the last 12 months because of musculoskeletal discomfort.

Body Region	Answers	Visit a doctor in last 12 months (N)	Visit a doctor in last 12 months (%)
Neck	Yes	29	8.2
	No	325	91.8
Shoulder	Yes	20	5.6
	No	334	94.6
Upper back	Yes	25	7.1
	No	329	92.9
Elbows	Yes	3	0.8
	No	351	99.2
Wrist/Hands	Yes	7	2
	No	347	98
Lower back	Yes	27	7.6
	No	327	92.4
Hips/thighs	Yes	6	1.7
	No	348	98.3
Knees	Yes	7	2
	No	347	98
Ankles/Feet	Yes	7	2
	No	347	98

dysfunction were assessed by using the Pittsburg Sleep Quality Index and were represented in the form of frequency and percentages (Table 1)

The results of the Nordic Musculoskeletal questionnaire showed that neck pain and lower back pain are most common among young adults during the last 7 days with frequency of 93 and 82 (26.3% and 23.2%) respectively. Only 16 (4.5%) participants had musculoskeletal discomfort at the level of the Elbow joint. The frequency and percentages of other body regions' discomfort are summarized in Table 2.

Results of musculoskeletal discomfort over the last 12 months showed that the majority of the population encountered musculoskeletal discomfort in the neck 165 (46.6%), shoulder 105 (29.7%), lower back 128 (36.2%), and upper back 80 (22.5%) regions (Table 3).

Association between major components of the sleep quality index including subjective sleep quality, use of sleep medication, sleep disturbance, and daytime dysfunction with musculoskeletal discomfort of the last 7 days was found by applying Chi-square as shown in Table 4. The results showed a significant association (p-value <0.01.) of these four sleep variables with all regions of the body except for the neck region which showed a non-significant association with sleep exhibiting a p-value greater than 0.05(0.94).

4. Discussion

The majority of young adults had mild difficulty in falling asleep and few of them had sleep disturbances whereas musculoskeletal discomfort was found to be common in shoulders, upper, and lower back areas. Elbows were least commonly involved. A cross-sectional survey was conducted by (Bleyer et al. 2015) on the elite athletes of Santa Catarina and found a significant association between poor sleep quality and musculoskeletal problems commonly reported in the knee, shoulder, back,

Table 5: Association between subjective sleep quality and musculoskeletal discomfort.

Body Region	Variables	P value
Neck		
	Discomfort in the last 12 months	0.94
	Discomfort in the last 7 days	< 0.01
Shoulder		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Upper back		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Elbow		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Wrist/Hand		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Lowback		
	Discomfort in the last 12 months	0.01
	Discomfort in the last 7 days	< 0.01
Hip/Thigh		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Knee		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01
Ankle/Feet		
	Discomfort in the last 12 months	< 0.01
	Discomfort in the last 7 days	< 0.01

and ankle/feet region. The results of their study showed that athletes with poor sleep quality experienced increased pain than those with poor sleep duration (Bleyer et al. 2015). Our study's results also showed a significant association between subjective sleep quality and musculoskeletal discomfort in all body regions except for the neck as evaluated by the Nordic Musculoskeletal Questionnaire for both acute and chronic musculoskeletal discomfort.

A systematic review by (Kelly et al. 2011) found significant associations between chronic low-back pain and dimensions of sleep including sleep disturbance, reduced sleep duration and sleep quality, and poor daytime functioning with more sleep dissatisfaction and distress. Although they found a non-significant association between sleep efficacy and activities with chronic low-back pain (Kelly et al. 2011). Contrary to this study, the results of our study showed a significant association between daytime dysfunction and chronic low-back pain. The reason for this contrast could be due to their small sample size and geographical differences.

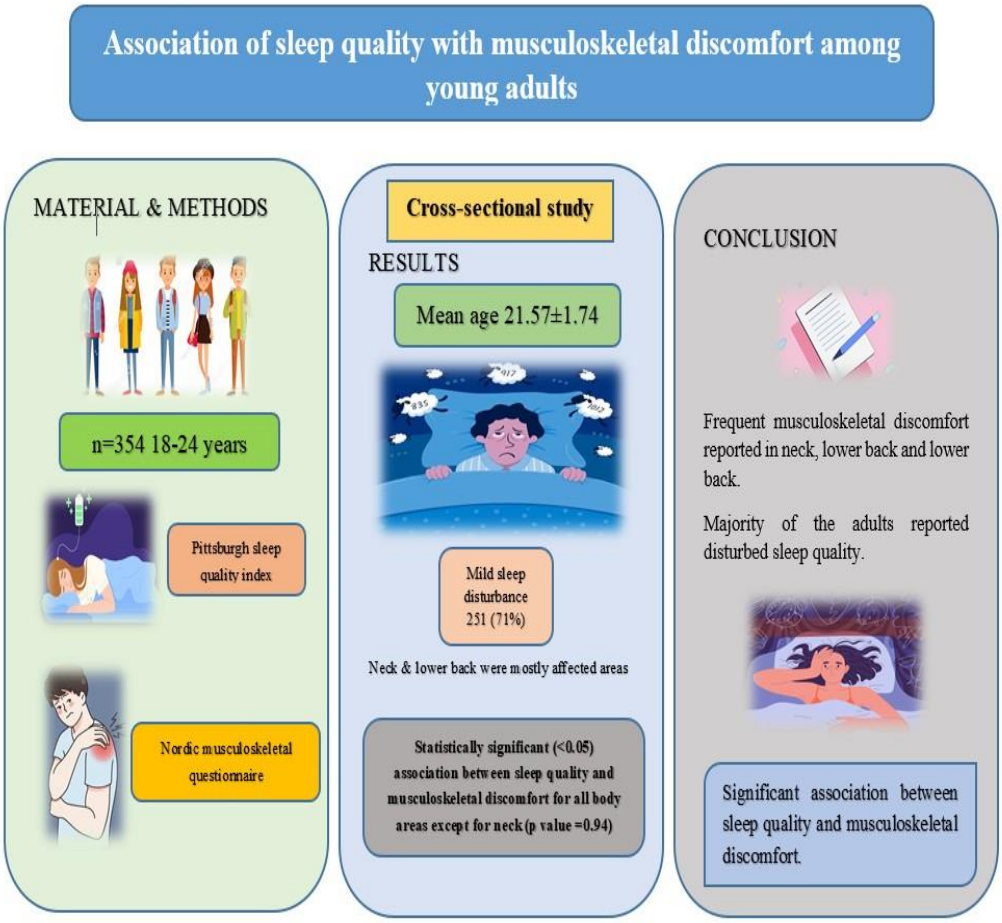

Figure 1. A summary of this study.

A prospective cross-sectional study assessed hip osteoarthritis with sleep quality. Patients were evaluated using Western Ontario and McMaster University Osteoarthritis Index (WOMAC), hip outcome score (HOS), and modified Harris hip score (mHHS). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) (Kelly et al. 2011). A significant association was found between reduced sleep quality and worse hip pain and dysfunction. The result of this study also showed a significant association between acute and chronic hip region pain and sleep disturbance.

Valenza and colleagues (Valenza et al. 2012) studied variations in sleep quality between mechanical neck pain patients, patients with whiplash injuries, and healthy adults to identify the association between different variables including sleep quality, pain, and limitation in activities. Sleep quality and pattern were determined by using the Pittsburg Sleep Quality Index while NPRS and Neck Disability Index were used for the evaluation of neck pain and disability respectively. A statistically significant association was found between different sleep parameters including quality, latency, sleep efficacy, disturbance, use of sleep medication, and daytime dysfunction with mechanical neck pain (Valenza et al. 2012). The results of this investigation do not support our study results where we found a non-significant association between subjective sleep quality, sleep disturbances, use of sleep medication, and daytime dysfunction with acute and chronic neck pain. This contrast may be explained by our comparatively larger sample size, the online

nature of the survey, and no history of musculoskeletal injuries in the participants.

5. Conclusion

It is concluded that young adults with affected sleep quality experience musculoskeletal discomfort commonly in the shoulders, upper, and lower back regions. However, discomfort in the neck is the least frequent. Therefore, it is recommended that healthcare professionals should educate young adults about the effects of sleep disturbance on musculoskeletal discomfort.

Conflict of Interest

All the authors declare no conflicts of interest.

Funding

There were no funding contributions for this research from any source.

Study Approval

The study was approved by the Institutional Review Board of Shifa Tameer-e-Millat University Islamabad (IRB approval number: 053-873-2020).

Consent Forms

Every participant signed a consent form before participating in the research.

Authors Contributions

ZM conceptualized the study, II and SRF did the experimental part, FH and NA performed analysis of the results, and ZM supervised the whole project and wrote the final manuscript.

Data Availability

All the data relevant to this study is with the authors.

Acknowledgments

The corresponding author acknowledges the contribution of all the authors for their support and assistance throughout the project

References

Ananthakrishnan, Ashwin N, Millie D Long, Christopher F Martin, Robert S Sandler, and Michael D Kappelman. 2013. "Sleep disturbance and risk of active disease in patients with Crohn's disease and ulcerative colitis." *Clinical Gastroenterology and Hepatology* no. 11 (8):965-971.

Berhanu, Hiwot, Andualem Mossie, Samuel Tadesse, and Daniel Geleta. 2018. "Prevalence and Associated Factors of Sleep Quality among Adults in Jimma Town, Southwest Ethiopia: A Community-Based Cross-Sectional Study." *Sleep Disorders* no. 2018:8342328. doi: 10.1155/2018/8342328.

Bleyer, Fernanda Tolentino de Souza, Diego Grasel Barbosa, Rubian Diego Andrade, Clarissa Stefani Teixeira, and Érico Pereira Gomes Felden. 2015. "Sleep and musculoskeletal complaints among elite athletes of Santa Catarina." *Revista Dor* no. 16 (2):102-108.

Bohnen, Nicolaas I, and Michele Hu. 2019. "Sleep disturbance as potential risk and progression factor for Parkinson's disease." *Journal of Parkinson's disease* no. 9 (3):603-614.

Carpenter, Janet S, and Michael A Andrykowski. 1998. "Psychometric evaluation of the Pittsburgh sleep quality index." *Journal of psychosomatic research* no. 45 (1):5-13.

Crawford, Joanne O. 2007. "The Nordic musculoskeletal questionnaire." *Occupational medicine* no. 57 (4):300-301.

Esmero, Veronica, and James Herdegen. 2021. "705 PAP Use Pattern Change During the COVID-19 Lockdown." *Sleep* no. 44 (Supplement_2):A275-A275. doi: 10.1093/sleep/zsab072.703.

Falbot, Lorena, Camila de Castro Corrêa, Ana Paula Dassie-Leite, Kelly Cristina Alves Silverio, and Larissa Thaís Donalonso

Siqueira. 2021. "Self-perception of insomnia, sleep quality, and musculoskeletal pain in dysphonic women: preliminary study." *Logopedics Phoniatrics Vocology*:1-8.

Gerhart, J. I., J. W. Burns, K. M. Post, D. A. Smith, L. S. Porter, H. J. Burgess, E. Schuster, A. Buvanendran, A. M. Fras, and F. J. Keefe. 2017. "Relationships Between Sleep Quality and Pain-Related Factors for People with Chronic Low Back Pain: Tests of Reciprocal and Time of Day Effects." *Ann Behav Med* no. 51 (3):365-375. doi: 10.1007/s12160-016-9860-2.

Holden, S., M.S. Rathleff, E.M. Roos, M.B. Jensen, N. Pourbordbari, and T. Graven-Nielsen. 2018. "Pain patterns during adolescence can be grouped into four pain classes with distinct profiles: A study on a population based cohort of 2953 adolescents." *European Journal of Pain* no. 22 (4):793-799. doi: https://doi.org/10.1002/ejp.1165.

Huguet, Anna, Michelle E Tougas, Jill Hayden, Patrick J McGrath, Jennifer N Stinson, and Christine T Chambers. 2016. "Systematic review with meta-analysis of childhood and adolescent risk and prognostic factors for musculoskeletal pain." *Pain* no. 157 (12):2640-2656.

Keene, Alex C, and Erik R Duboue. 2018. "The origins and evolution of sleep." *Journal of Experimental Biology* no. 221 (11):jeb159533.

Kelly, Gráinne A, Catherine Blake, Camillus K Power, Declan O'Keeffe, and Brona M Fullen. 2011. "The association between chronic low back pain and sleep: a systematic review." *The Clinical journal of pain* no. 27 (2):169-181.

Matsunaga, Tetsuro, Kazutaka Nishikawa, Tetsuya Adachi, and Koichiro Yasuda. 2021. "Associations between dietary consumption and sleep quality in young Japanese males." *Sleep and Breathing* no. 25 (1):199-206.

Minakawa, Eiko N, Keiji Wada, and Yoshitaka Nagai. 2019. "Sleep disturbance as a potential modifiable risk factor for Alzheimer's disease." *International journal of molecular sciences* no. 20 (4):803.

Ozdemir, Serpil, Dercan Gencbas, Betul Tosun, Hatice Bebis, and Ozlem Sinan. 2021. "Musculoskeletal Pain, Related Factors, and Posture Profiles Among Adolescents: A Cross-Sectional Study From Turkey." *Pain Management Nursing* no. 22 (4):522-530. doi: https://doi.org/10.1016/j.pmn.2020.11.013.

Rudnicka, Alicja R, Claire M Nightingale, Angela S Donin, Naveed Sattar, Derek G Cook, Peter H Whincup, and Christopher G Owen. 2017. "Sleep duration and risk of type 2 diabetes." *Pediatrics* no. 140 (3).

Sayar, Kemal, Meltem Arikan, and Tulin Yontem. 2002. "Sleep quality in chronic pain patients." *The Canadian Journal of Psychiatry* no. 47 (9):844-848.

Valenza, Marie Carmen, Gerad Valenza, Emilio González-Jiménez, Ana Isabel De-la-Llave-Rincón, Manuel Arroyo-Morales, and César Fernández-de-las-Peñas. 2012. "Alteration in sleep quality in patients with mechanical insidious neck pain and whiplash-associated neck pain." *American journal of physical medicine & rehabilitation* no. 91 (7):584-591.

Yan, You-Wei, Rong-Mao Lin, Yan-Kui Su, and Ming-Yan Liu. 2018. "The relationship between adolescent academic stress and sleep quality: A multiple mediation model." *Social Behavior and Personality: an international journal* no. 46 (1):63-77.