



Prevalence of Musculoskeletal disorders in Electronic-Gadget users: A Review

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ABSTRACT:

BACKGROUND: The term electronic gadget indicates commonly used portable electronic devices. E-gadgets are commonly used for socializing, gaming, entertainment, academics, news, business, governance etc. Inappropriate electronic gadget usage leads to many musculoskeletal disorders(MSDs), due to prolonged static posture or overuse injury of certain muscle groups due to increased effort because of faulty posture like carpal tunnel syndrome(CTS), pain at thumb, wrist, elbow, shoulder and back. MSDs are group of diverse conditions affecting bones, joints, muscles and connective tissues causing pain and loss of functions.

OBJECTIVE: Identification of prevalence of MSDs in E-gadget users.

METHODOLOGY : Various search engines like google scholar, Pubmed, COCHRANE, MEDLINE, PEDRO, electronic journals and print sources were used. Studies were included if their subject matter was pain or MSDs due to E-gadget use and were available in English literature. Studies on pain due to any underlying conditions, congenital deformities were excluded.

RESULT: 48 articles available were reviewed initially; out of which 15 studies were considered for this review after reading their abstracts.

CONCLUSION: Reviewed articles suggested that commonly associated MSDs due to excessive electronic gadget usage were neck(86.4%), shoulder(78.1%), lower back(75.9%), upper back(70.3%), wrist(68.7%), elbow(18.7%). Various studies reported myofascial pain syndrome and CTS(13.13%). Prevalence of MSD on hand was noted as (61%) on right side(dominant), left side(12.85%) and (25.7%)bilaterally. Females were having more wrist pain whereas males had pain at the shoulder and back. Commonly used electronic devices were Smartphones(85%), Ipad(74%), Laptops(70%), Desktop computers(69%), and Gaming devices(63%).

KEYWORDS: MSD, e-gadget, cumulative trauma, awkward postures.

INTRODUCTION:

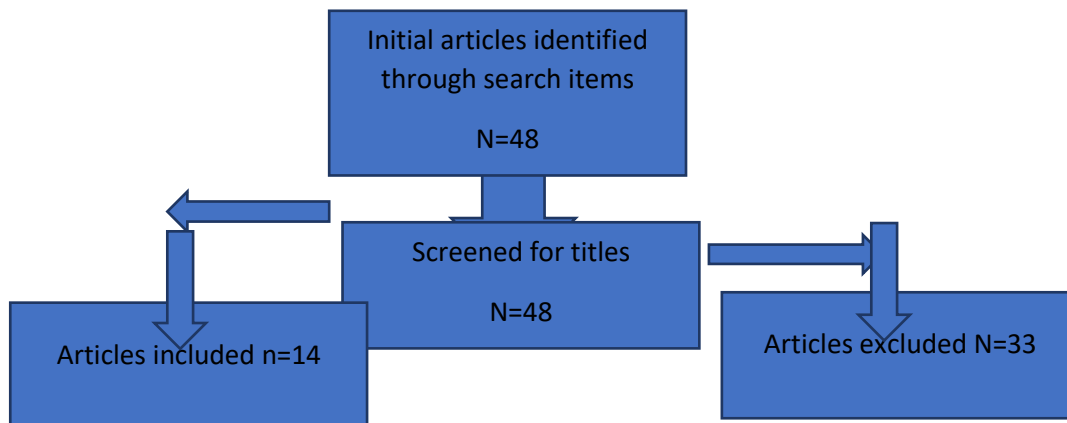
The term electronic gadget indicates commonly used portable electronic devices. E-gadgets are commonly used for socializing, gaming, entertainment, academics, news, business, governance etc^[1,2]. Inappropriate electronic gadget usage leads to, deviation of center of gravity of body segments which are interlinked proximally and distally in a closed kinematic chain, leading to postural abnormalities, such prolonged static faulty postures causes overuse injury of certain muscle groups due to increased effort production by these muscle groups leading to musculoskeletal disorders. Awkward postures that involve forward bending and repeated rotation of the head, neck and trunk to one side commonly lead to the MSDs like carpal tunnel syndrome(CTS), pain at thumb, wrist, elbow, shoulder and back. MSDs are group of diverse conditions affecting bones, joints, muscles and connective tissues causing pain and loss of functions. MSDs can range from pain in the upper limbs, such as the forearm and wrist, to postural muscles such as the upper and lower back, neck and shoulders^[3]. Most common causative factors for MSDs are prolonged faulty postures like laying down on sofa or mattress (34.6%), standing with table as support (2.8%), standing without table as support(5.8%), sitting on floor(27.3%), sitting without table as support(16.8%), sitting with table as support(27.2%), laying on stomach(15.6%) or walking(2.4%) which is common in E-gadget users leading to MSDs^[3]. Few studies have been done on poor postures which lead to MSDs whereas few studies have been done on poor postures in E-gadget users, so here is a review of the available literature to determine the prevalence of the musculoskeletal disorders in E-gadget users.

METHODOLOGY:

This is a review of literature pertaining to the prevalence of musculoskeletal disorders among E-Gadget users. For this review literatures related to the topic were searched in various search engines from year 2000 to 2022 and keywords were finalized as: MSD, e-gadget, cumulative trauma, awkward postures.

Studies were included if their subject matter was pain, poor postures or MSDs due to E-gadget use and were available in English literature. Studies on pain due to any underlying conditions, congenital deformities were excluded. Comprehensive literature screening was undertaken. Source of the data was from electronic sources i.e., Databases, Electronic Libraries, Electronic Journals and from Print Sources and from Print sources i.e., Journals, Textbooks, and Hand searching. Various search engines like google scholar, PubMed, Pedro, MEDLINE, CINAHL were used. 48 articles available were reviewed initially; out of which 15 studies were considered for this review after reading their abstracts.

Following this the included articles were critically appraised using the appraisal tools. The purpose is to combine the available information from various to fulfill the objective of this review.



FLOWCHART ON SEARCH STRATEGY

RESULTS:

Reviewed articles suggested that commonly associated MSDs due to excessive electronic gadget usage were neck(86.4%), shoulder(78.1%), lower back(75.9%), upper back(70.3%), wrist(68.7%), elbow(18.7%)^[4-6]. Various studies reported myofascial pain syndrome and CTS (13.13%). Prevalence of MSD on hand was noted as (61%) on right side(dominant), compared to left side (12.85%) and (25.7%) bilaterally^[7-11]. Females were having more wrist pain whereas males had pain at the shoulder and back comparatively^[12]

Table 1: Description of reviewed articles on MSD

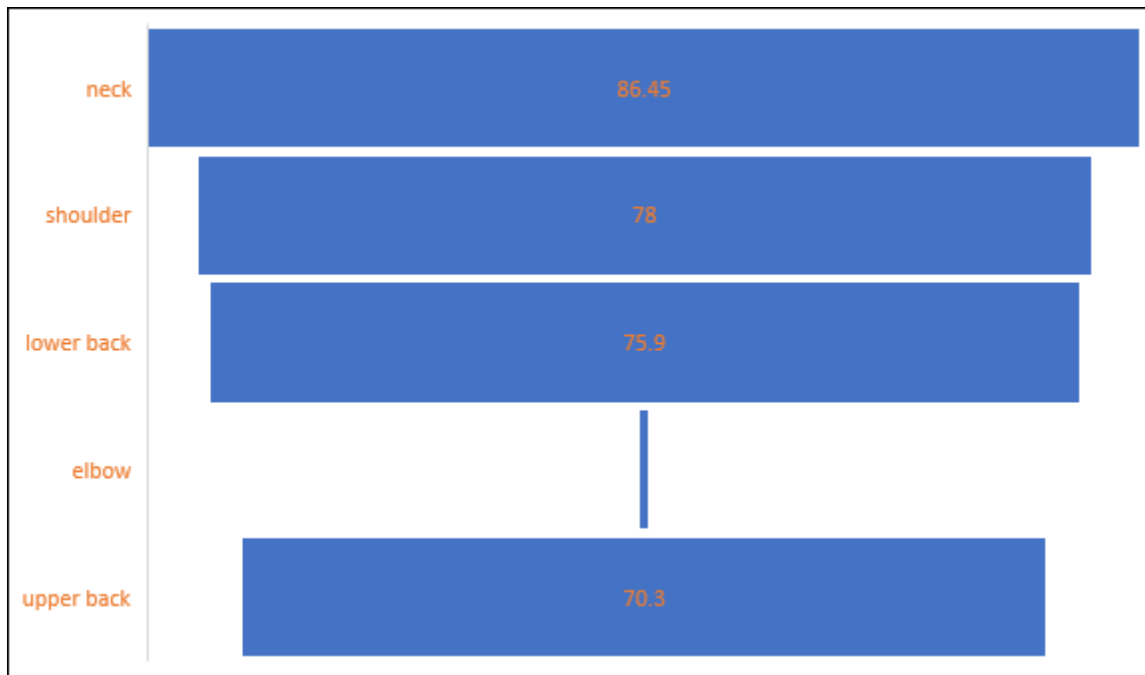
Title	Author	Commonly affected region for MSD and its prevalence	Journal	Date of publication
The prevalence of bad posture and musculoskeletal symptoms originating from the use of gadgets as an impact of the work from home program of the university community	Indri HapsariSusilowati, L. MeilyKurniawidjaja et al	Neck (86.4%), lower back (75.9%), and right and left shoulders (76.2%)	Heliyon ltd	August 2022
Computers users and postural issues amid COVID-19: A study of WFH	Anjali Gairola and Garima Pant	(54%) reported lower back pain, neck pain (36%), wrist ache (26%).	The Pharma Innovation Journal	2021
The relationship between smartphone addiction and musculoskeletal pain prevalence among young population: a cross-sectional study	Rustem Mustafaoglu, ZeynalYasaci et al	The body parts that were reported with highest prevalence of musculoskeletal pain were the upper back (70.3%), neck (65.9%), and wrists/hands (68.7%).	The Korean Pain Society	September 2021
Computer-related health	Mohamed Sherif	The pattern of MSDs	Biomedica	March 2018

problems among university students in Majmaah region, Saudi Arabia.	Sirajudeen, Hariraja Muthusamy et al	among the participants showed that highest prevalence was neck disorders (45.9%) followed by upper back (29.4%), lower back (26.7%), shoulders (21.2%), wrists/ hand (20.5%), knee (20.5%)	I research	
Prevalence of Neck Pain and Back Pain in Computer Users Working from Home during COVID-19 Pandemic: A Web-Based Survey	Manali Shah, Ruchi Desai et al	70.5% participants had pain or discomfort in body out of which 42.9% had pain in neck and upper back region, 36.3% had pain in the lower back region and legs whereas 16.5% had pain or discomfort in both region.	International Journal of Health Sciences and Research	February 2021
The Posture Comparison between Students and Staff Members at University of Indonesia Based on their Laptop Usage in the E-Learning System during the COVID-19 Pandemic	Ida AyuGede Jyotidiwy, Indri Hapsari Susilowati et al	The percentage of participants who experienced body pains, pains in their necks, right and left shoulders, and lower waists were 70.5%, 86.4%, 76.2%, and 75.9%	Italianisch h	Published in 2022
A study on impact of electronic devices on youngsters	CH B Praveena Devi, ShahestaSamreen, et al	84% of participants reported pain in at least one part of the body and the most common pain was at the bottom of the right hand thumb	Pharma Innovation Journal	9 April 2019
Prevalence Study of the Risk for Musculoskeletal Disorders Among University Students During the Covid-19 Pandemic	Abdul Kareem Basil Alkolak, Ammar Adnan, et al	The most crucial body parts experienced MSD symptoms reported were the neck (89.05%), shoulder (79.56%), lower back (78.83%), and upper back (72.99%).	Human Factors and Ergonomics Journal	2021
Comparison of posture and muscle control pattern between male and female computer users with	Jeng-Feng Yang, Chiung-Yu Cho et al	Females also tended to have more frequent complaints of musculoskeletal symptoms	2011 Elsevier Ltd and The Ergonomi	14 November 2011

musculoskeletal symptoms		comparatively. for the upper trunk and extremities, but only the wrist area reached the significant level	cs Society.	
Effects of Computer-Based Work on the Musculoskeletal Discomfort Among College Students	Maria Angelica D. Bare, Francee Mae F. Castro, et al	prevalence of staff reported musculoskeletal discomfort were as follows neck (60%), shoulder (53%), and lower back discomfort (47%) being the most common.	Proceedings of the International Conference on Industrial Engineering and Operations Management Rome, Italy.	August 2-5, 2021
Prevalence and associated factors of neck, shoulder, and low back pains among students of Jazan University, Saudi Arabia, during the COVID-19 pandemic	Mahmoud Mohammed Hassaan, Khalid Ahmed Bakri. et al	the most reported area was found to be lower back as reported by less than half (42.2%) of the participants, followed by the shoulder area (31.3%); Neck pain was experienced by more than half (56.8%) of the participants	International Journal of Medicine in Developing Countries	11 august 2022
Prevalence and associated risk factors of neck pain among university students in kuantan, pahang during covid-19 pandemic.	Tan Yea Huey, Sharmila Gopala et al	The findings of the current study revealed prevalence of neck pain among female undergraduate students as 33.8% while male undergraduate students as 19.8%	Asian Journal of Medicine and Health Sciences	1 October 2021
Prevalence of neck, shoulder and back pain and its associated risk factors in secondary school female students in Hayatabad, Peshawar	Zainab Anum, Qurat Ul Ain Khan et al	neck pain was experienced by 72% of the computer users. pain in upper back-neck-shoulder (40%, 27%, 20% respectively) were the most affected bodregions	S Rehman Journal of Health Sciences.	September 14, 2021

Use of Smartphones, ipads, Laptops and Desktops as A Risk Factor for Non-Specific Neck Pain among Undergraduate University Students	MeshariMusaad Almalki, Saad Saleh Algarni et al	8.2% suffered from neck pain The findings of this study showed significant associations between neck pain and gender, type of devices used for entertainment, 44% of female students reported the neck pain in comparison with only 29% of male students.	The Egyptian Journal of Hospital Medicine	October 2017
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Fig 2: Gender difference in MSD



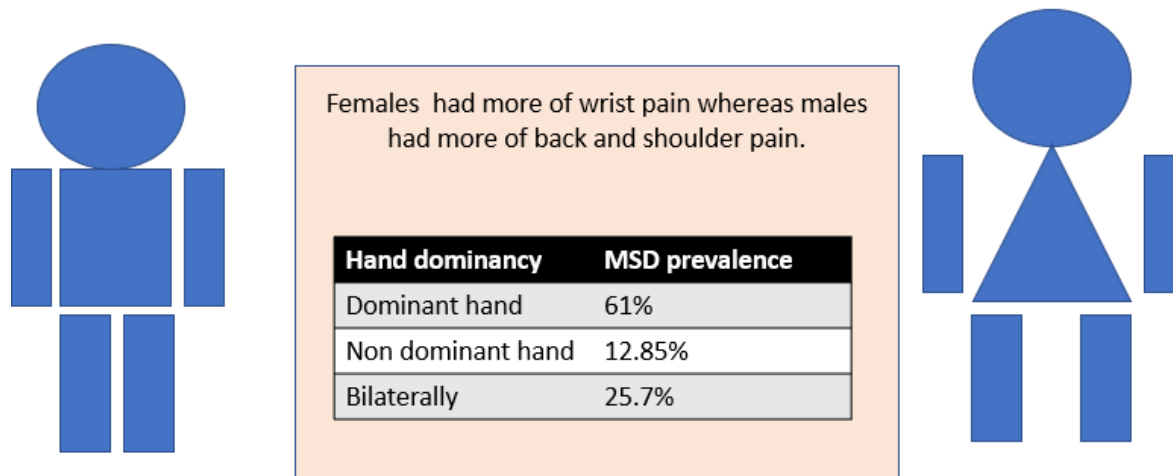


Fig 3: joint wise Distribution of MSD

DISCUSSION:

Reviewed articles suggested that commonly associated MSDs due to excessive electronic gadget usage were neck(86.4%), shoulder(78.1%), lower back(75.9%), upper back(70.3%), wrist(68.7%), elbow(18.7%). Various studies reported myofascial pain syndrome and CTS (13.13%). Prevalence of MSD on hand was noted as (61%) on right side(dominant), compared to left side (12.85%) and (25.7%) bilaterally^[4-11]. Females were having more wrist pain whereas males had pain at the shoulder and back comparatively^[12].

Due to poor ergonomics for using electronic gadgets like Smart phones(85%), I-pad(74%), Laptops(70%), Desktop computers(69%), and Gaming devices(63%), prolonged static faulty postures are adapted which causes adverse effects on the musculoskeletal system of the user which gradually develops into musculoskeletal discomfort and further aggravates to musculoskeletal disorder over prolonged usage.^[1,2] E-gadget users most commonly engage their distal body segments which are linked in a closed kinematic chain to their proximal body segments hence, most commonly occurring musculoskeletal disorders are that of wrist (CTS), elbow, shoulder, cervical spine, upper and lower back.

Neck pain was exceedingly higher in E-gadget users because while using these gadgets there is a need of proper visual accommodation, hence the user must adjust their neck position to achieve the necessary visual field, however if proper ergonomics are not taken into consideration then the user ends into prolonged flexed cervical posture which might end in MSD eventually over prolonged period of time^[11].

Most of the E-gadgets requires active engagement of the fingers, wrist and elbow for the typing activities which requires certain degrees of extended wrist, flexed shoulders which over prolonged periods develops into protracted shoulders due to compensatory shortening of the protractor group of muscles simultaneously causing weakness and elongation of the retractor group, and extensors of the back musculature, which might lead to MSDs like CTS, Rounded shoulders, and hunched back since these joints are linked with each other in a closed kinematic chain any prolonged faulty posture at a particular joint will lead to compensatory changes so that

there is proper alignment of body segments with respect to center of gravity so that minimum effort needs to be produced to maintain the body posture^[13-15].

CONCLUSION:

This review suggests that prolonged usage of electronic gadget leads to prolonged faulty static postures like laying down on sofa or mattress, sitting with table as support, sitting without table as support followed by sitting with table as support, standing with or without table as support and laying on stomach, such awkward static posture causes various musculoskeletal disorders due to overuse injury of muscle groups most commonly at neck, shoulder and upper back followed by lower back, wrist and thumb.

References

1. Kumar AK, Sherkhane M. Assessment of gadgets addiction and its impact on health among undergraduates. *International Journal of Community Medicine And Public Health*. 2018 Aug 7;5(8):3624-8.
2. Patel P, Shukla M, Kumar G. Presence of Musculoskeletal Pain In Health Education Teachers Due To Online Teaching During Covid 19 Pandemic. *Eur. Chem. Bull*. 2023,12(Issue 7), 3524-3530
3. Susilowati IH, Kurniawidjaja LM, Nugraha S, Nasri SM, Pujiriani I, Hasiholan BP. The prevalence of bad posture and musculoskeletal symptoms originating from the use of gadgets as an impact of the work from home program of the university community. *Heliyon*. 2022 Oct 1;8(10):e11059
4. Sirajudeen MS, Muthusamy H, Alqahtani M, Waly M, Jilani AK. Computer-related health problems among university students in Majmaah region, Saudi Arabia. *Biomedical Research*. 2018;29(11):2405-15.
5. Bare MA, Castro FM, Quimio GL, Gumasing MJ. Effects of Computer-Based Work on the Musculoskeletal Discomfort Among College Students. In *Proceedings of the International Conference on Industrial Engineering and Operations Management Rome, Italy, August 2021* (pp. 2-5).
6. Anum Z, Khan QU, Hunaid Z, Rahman MU. Prevalence of neck, shoulder and back pain and its associated risk factors in secondary school female students in Hayatabad, Peshawar. *Rehman Journal of Health Sciences*. 2019 Dec 31;1(2):37-40.
7. Huey TY, Pillai SG. Prevalence and associated risk factors of neck pain among university students in kuantan, pahang during covid-19 pandemic. *Asian Journal of Medicine and Health Sciences Vol*. 2021 Oct 1;4:229.
8. Shah M, Desai R. Prevalence of neck pain and back pain in computer users working from home during COVID-19 pandemic: a web-based survey. *International Journal of Health Sciences and Research*. 2021 Feb;11(2):26-31.
9. Mustafaoglu R, Yasaci Z, Zirek E, Griffiths MD, Ozdincler AR. The relationship between smartphone addiction and musculoskeletal pain prevalence among young population: a cross-sectional study. *The Korean journal of pain*. 2021 Jan 1;34(1):72-81.
10. Hassaan MM, Bakri KA, Najmi MH, Atiah AF, Madkhali EA, Jali AM, Alhazmi SM, Hayyan RD. Prevalence and associated factors of neck, shoulder, and low back pains among students of Jazan University, Saudi Arabia, during the COVID-19 pandemic.
11. Jyotidiwy IA, Susilowati IH, Hasiholan BP, Sitanggang AN, Satria N. The posture comparison between students and staff members at University of Indonesia based on their

laptop usage in the e-learning system during the COVID-19 pandemic. ITALIENISCH. 2022 Mar 25;12(1):851-6.

12. Yang JF, Cho CY. Comparison of posture and muscle control pattern between male and female computer users with musculoskeletal symptoms. *Applied ergonomics*. 2012 Jul 1;43(4):785-91.
13. Almalki MM, Algarni SS, Almansouri BH, Aldowsari MA. Use of smartphones, ipads, laptops and desktops as a risk factor for non-specific neck pain among undergraduate university students. *The Egyptian Journal of Hospital Medicine*. 2017 Oct 1;69(5):2438-41
14. Gairola A, Pant G. Computers users and postural issues amid COVID-19: a study of WFH. people. 1998;1000:36.
15. P Patel, M Shukla. Presence of Musculoskeletal Pain in students due To Online study during Covid 19 Pandemic. *Eur. Chem. Bull*. 2023, 12(Issue 10), 6468-6472.