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IDENTIFYING RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL SYMPTOMS IN FREQUENT COMPUTER USERS IN PATHANAMTHITTA, KERALA: A COMMUNITY-BASED PROSPECTIVE STUDY

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ABSTRACT

Background: Globally, musculoskeletal conditions has increased by 25 percent over the past decade and makes up 2% of the global disease burden. As the use of computer at school, work and for social media is growing, people are suffering from musculoskeletal symptoms and its disorders underscoring the necessity to identify the risk factors. **Aims:** To identify the major risk factors contributing to the development of musculoskeletal symptoms in frequent computer users. **Settings and Design:** This community-based prospective study was conducted in Pathanamthitta district, Kerala, India, over six months (December 2024 to May 2025). The study protocol was approved by the Institutional Review Board of Nazareth College of Pharmacy, Othera, Thiruvalla. **Methods and Material:** A total of 382 participants were enrolled following a set of pre-determined criteria. Data were collected using a pre-designed data collection form. **Statistical analysis used:** Cochran formula; N = 4 PQ / d2 [where, N - population size, P - prevalence obtained from pilot study, Q = 100 – P, and d - allowable error (5–20% of P)]. **Results:** Result showed prolonged computer use, incorrect workstation ergonomics and lack of regular breaks as major risk factors. The type of workspace and sedentary behaviour further influenced MSS prevalence. **Conclusions:** Our study revealed that MSS are commonly reported among participants. The results demonstrate that key risk factors- prolonged computer use, poor ergonomics, and sedentary lifestyle, substantially contribute to the development of MSS. Adopting an ergonomic workstation, proper posture, taking adequate breaks between work, following exercises can help reduce MSS.

KEYWORDS: Musculoskeletal Symptoms, Risk Factors, Ergonomics, IT Professionals, Engineering Students.

INTRODUCTION

The usage of computers and the internet have significantly risen in recent decades and is associated with various musculoskeletal issues. As technology advances and becomes more affordable, its use has become widespread across all age demographics, both in workplaces and at home, a trend that is likely to continue in the future. Additionally, inadequate ergonomic design for computer is a key factor contributing to not just musculoskeletal disorders but also visual complications. The word ergonomics “the science of work” is derived from the Greek words, ergon (work) and nomos (laws).

Numerous studies have examined the connection between computer use and musculoskeletal symptoms (MSS), which is becoming a serious public health issue. One of the main causes of the worldwide requirement for rehabilitation and disability support is musculoskeletal disorders, which place a significant strain on healthcare systems and have an impact on population productivity.

Several risk factors have been consistently associated with the development of MSS among frequent computer users. These include awkward or static body postures, poorly designed workstations lacking ergonomic support, prolonged hours of continuous work with inadequate

breaks, and high body mass index (BMI), among others. The cumulative effect of these factors increases muscle fatigue, joint stress, and overall musculoskeletal strain, making individuals more susceptible to both acute and chronic symptoms.

It's important to note that most musculoskeletal symptoms among computer users can be prevented. Research indicates that incorporating movement or exercise into everyday activities, taking regular breaks, maintaining neutral postures, and adopting proper ergonomic techniques can considerably reduce discomfort and enhance overall wellbeing. In particular, a well-designed workstation minimizes stress and strain on muscles, tendons, and the skeletal system by promoting a neutral body position where joints are naturally aligned. These interventions improve productivity, comfort, and quality of life in computer-dependent people by not only alleviating current symptoms but also playing a vital role in preventing the onset of MSS.

Given the growing prevalence of computer use in modern life, identifying and mitigating the key risk factors for MSS has become a necessary public health objective. This study aims to examine the risk factors associated with musculoskeletal symptoms among frequent computer users in a community-based population in Pathanamthitta, Kerala.

MATERIALS AND METHODS

Study design: This study was designed as a Prospective Study, which was carried out in Colleges and Offices in Pathanamthitta district, Kerala for a time-period of 6 months (December 2024 - May 2025). The study was conducted after receiving approval from the Institutional Review Board of Nazareth College of Pharmacy, Othera, Thiruvalla.

For this study, a set of pre-determined criteria was developed:

Inclusion Criteria

- Individuals between 18-65 years of age.
- College students and office workers who use computer on a regular basis.

Exclusion Criteria

- Participants suffering from pre-existing musculoskeletal disorders
- Having any previous musculoskeletal surgery or injury
- Pregnant and breastfeeding women.

Sample Size: A sample size of 382 participants was selected. The sample size has been calculated by the formula;

$$N = 4PQ / d2$$

Where,
N = Population Size
P = Prevalence (from pilot study)
Q = 100 – P
d = allowable error (5-20% of P)

Study Materials: Pre-designed data collection form.

Data Analysis: The data was statically analyzed in MS Excel 2021 and results were obtained.

RESULT

1. Data on distribution of age group-based difference in MSS.

Table 1: Distribution of age group-based difference in MSS.

Sl. No.	AGE GROUP	YES	(n = 331)	NO	(n=51)
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	18-27	226	68.28	37	72.55
2	28-37	58	17.52	4	7.84
3	38-47	35	10.57	6	11.76
4	48-57	8	2.42	3	5.88
5	58-67	4	1.21	1	1.96

The above table shows that MSS is most prevalent among individuals aged 18–27, with 68% of them having MSS and 73% not having it. In the 28–37 age group, 18% have MSS while 8% do not; in the 38–47 group, 11% have it and 12% do not; in the 48–57 group, 2% have MSS and 6% do not; and in the 58–67 age group, only 1% have it while 2% do not. Young individuals are more likely to have MSS compared to older age groups.

2. Data on distribution of gender*-based *difference in MSS

Table 2: Distribution of gender-based difference in MSS.

Sl. No.	MSS	MALE	(n = 201)	FEMALE	(n=181)
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	YES	162	81	169	93
2	NO	39	19	12	7

The above table shows that 382 participants comprised of 201 males and 181 females. The prevalence of MSS was found to be higher in females (93%) compared to males (81%). Among male participants, 162 experienced

MSS, while 39 did not. In contrast, 169 females experienced MSS, while 12 did not.

3. *Data on distribution of BMI based difference in MSS*

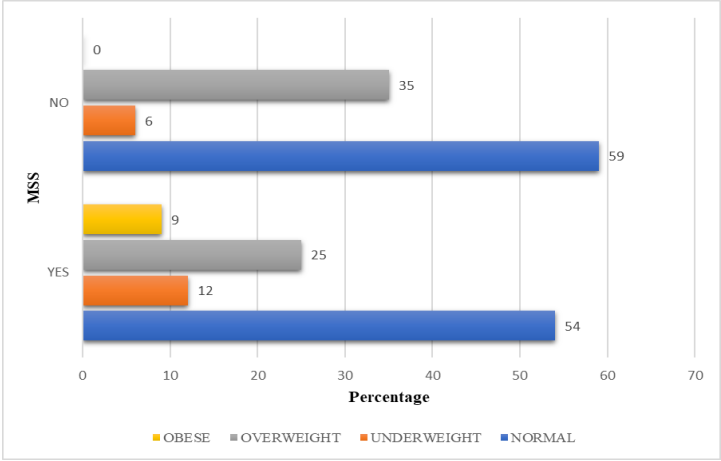

Figure 1: Distribution of BMI based difference in MSS.

The above graph shows that among participants with MSS, 54% had normal BMI, 25% were overweight, 12% were underweight, and 9% were obese. In case of those without MSS, 59% had normal BMI while 36% was overweight, 6% was underweight and no obese participants. Although MSS was most frequently observed among individuals with normal BMI due to their larger representation in the study population, participants in higher BMI categories, particularly those who were overweight or obese showed a greater likelihood of experiencing MSS.

4. *Data on distribution of breaks*

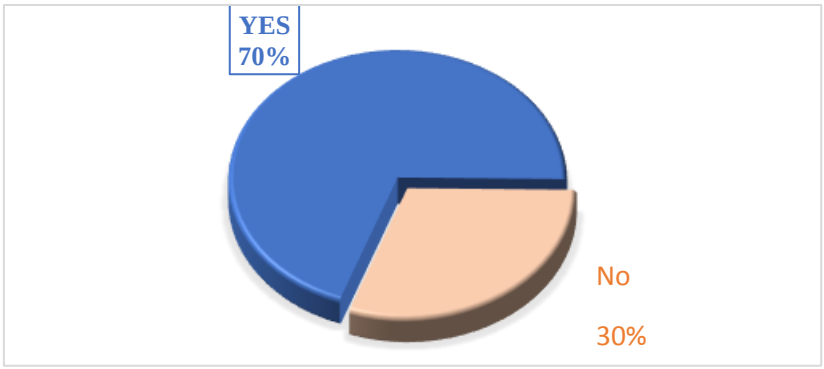

Figure 2: Distribution of breaks.

As shown in Figure 2, out of a total of 382 subjects, 266 participants (70%) reported that they take regular breaks, whereas 116 participants (30%) reported that they do not.

5. *Data on ergonomic practices*

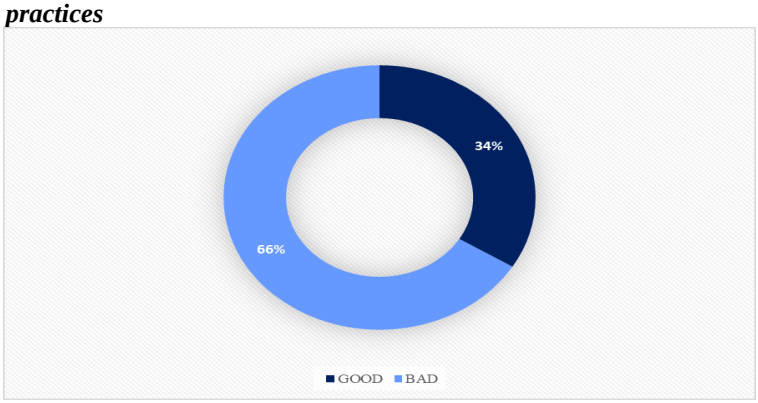

Figure 3: Distribution of ergonomic practices.

The above graph shows that 66% of participants have bad ergonomics and 34% of participants have good ergonomic practices.

6. Data on distribution of working hours-based difference in MSS

Table 3: Distribution of working hours-based difference in MSS.

Sl. No.	WORKING HOURS	YES	(n = 331)	NO	(n=51)
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	0-2 HOURS	52	15.71	18	35
2	2-4 HOURS	88	26.59	10	20
3	4-6 HOURS	92	27.79	10	20
4	6-8 HOURS	99	29.91	13	25

The above graph reveals that participants working 6–8 hours reported the highest MSS incidence (30%), then by those working 4–6 hours (28%) and 2–4 hours (27%). The lowest MSS occurrence was among individuals working 0–2 hours (16%). This suggests that longer working hours contribute to a higher risk of developing MSS.

Among the 51 participants without MSS, 18 participants (35%) worked 0-2 hours, which was the highest proportion. Then 13 participants (25%) in the 6-8 hours group and 10 participants each (20%) in the 2-4 hours and 4-6 hours groups.

DISCUSSION

The data revealed an age-based difference in MSS, with younger age groups showing a higher tendency to experience MSS compared to older groups, while older age groups are more likely to report no MSS. This variation may be influenced by physiological factors, as younger individuals often engage in more physically demanding activities or have developing MSS that are more prone to strain. Older adults might experience less MSS due to reduced physical activity or adaptation over time. Lifestyle factors, such as prolonged screen time or poor posture common among younger age groups, may also contribute.

Our study highlights a gender-based difference in MSS, with females showing a higher tendency to experience it compared to males, while males are more likely to report no MSS. This disparity may stem from biological factors, such as hormonal influences like oestrogen, which can impact musculoskeletal health in females. Sociocultural aspects could also play a role, as females might be more inclined to report symptoms due to greater health awareness or differing pain perception. Additionally, lifestyle or occupational differences, such as prolonged sedentary behaviour or caregiving roles often linked to females, may contribute to higher MSS prevalence.

The data reveals a BMI-based difference in MSS, with individuals in higher BMI categories, particularly overweight and obese, more likely to experience MSS compared to those in normal or underweight categories, who are more prone to report no MSS. This disparity may be due to biomechanical factors, as higher body weight can increase stress on joints and muscles, leading to musculoskeletal strain. Obesity-related inflammation might also contribute to MSS in higher BMI groups. Conversely, individuals with normal or underweight BMI may have less physical strain on their musculoskeletal system, reducing MSS likelihood. Lifestyle factors, such as reduced physical activity in higher BMI groups, could further exacerbate the condition.

The presence or absence of regular work breaks plays a crucial role in the development of musculoskeletal symptoms (MSS). Our study showed that participants who took regular breaks showed significant reduction in MSS risk compared to those who did not take regular breaks. Regular breaks help reduce muscle strain by allowing changes in posture and short periods of movement, which can prevent or ease discomfort. In contrast, working without breaks increases the risk of MSS due to prolonged static postures and continuous muscle load.

Our study shows that there is a higher prevalence of MSS among participants with poor ergonomic conditions. In contrast, participants reporting good ergonomic practices demonstrated a significantly lower incidence of MSS. Therefore, poor ergonomics is a strong risk factor for MSS in occupational settings involving prolonged computer use.

The data indicates a working hours-based difference in MSS, with individuals working longer hours more likely to experience MSS, while those with shorter working hours are more prone to report no MSS. This variation may be due to the cumulative physical strain from extended periods of repetitive tasks or prolonged sitting, which can lead to musculoskeletal issues in those working longer hours. Shorter working hours might allow for more frequent breaks and reduced physical stress, lowering MSS risk. Additionally, longer hours could contribute to fatigue and poor posture, exacerbating MSS, while shorter hours may enable better recovery and ergonomic practices.

The high number of individuals experiencing MSS mostly due to prolonged sedentary behaviour, poor posture, and lack of ergonomic practices in daily routines or work environment. These factors can lead to strain

and discomfort over time, especially if regular movement or corrective exercises are not incorporated.

CONCLUSION

Our study was conducted in 382 participants where 47% of subjects were female. Most of the participants (87%) reported the presence of MSS.

Our research highlights the significant link between prolonged computer use with musculoskeletal symptoms (MSS), especially in young adults, office workers, and people with poor ergonomic practices. According to the statistics the major contributing risk factors for MSS include sedentary lifestyles, prolonged computer use, insufficient ergonomic awareness, poorly designed work environments, and irregular breaks. Even if symptoms are mild, their occurrence highlights the need for mechanisms to prevent chronic progression, which can be addressed through proactive measures, ergonomic education, and improved workplace policies to reduce the prevalence and intensity of musculoskeletal symptoms (MSS).

However, the study shows a clear need for an organized strategy to raise ergonomic awareness in colleges and workplaces. Incorporating ergonomics to syllabus and employee training, along with policies supporting ergonomic practices, is vital. These efforts can greatly reduce MSS, improving productivity and overall health.

As noted previously, despite the fact that MSS may be a well-known issue among computer users, it is a largely preventable ailment. Taking proactive measures to raise awareness, encourage healthy habits, and improve work or study environments can help prevent MSS. These efforts can benefit both individuals and institutions.

CONFLICT OF INTEREST

The authors declare that the study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ETHICS AND CONSENT

The study protocol was approved by the Institutional Review Board of Nazareth College of Pharmacy, Othera, Thiruvalla. All procedures were carried out in accordance with the ethical standards of the Declaration of Helsinki, and written informed consent was obtained from all participants prior to enrollment.

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Figures

1. Distribution of BMI based difference in MSS.
2. Distribution of breaks.
3. Distribution of ergonomic practices.

Tables

1. Distribution of age group-based difference in MSS.
2. Distribution of gender-based difference in MSS.
3. Distribution of working hours-based difference in MSS.