

The Prevalence of Neck Pain Among Female Sewing Machine Operators

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ABSTRACT

Background: Female sewing machine operators are exposed to prolonged sitting, sustained cervical flexion, repetitive upper-limb movements, and potentially unsuitable workstation conditions, which may increase their risk of neck pain and functional limitation. **Objective:** To determine the prevalence and severity of neck pain among female sewing machine operators in Sukkur and examine its association with daily working hours. **Methods:** This descriptive cross-sectional study included 120 female sewing machine operators aged 18–40 years recruited from vocational training centres and tailoring workplaces through convenience sampling. Neck pain and related functional effects were assessed using the Northwick Park Neck Pain Questionnaire, while pain intensity was measured using the Visual Analog Scale. Categorical variables were summarized as frequencies and percentages. Pearson's chi-square test was used to assess the association between working-hour category and neck pain. **Results:** Neck pain was reported by 92 participants, giving a prevalence of 76.7% (95% CI: 68.3–83.3%). Moderate pain was reported by 35.0%, mild pain by 31.7%, and severe pain by 10.0%. Some degree of sleep disturbance was reported by 70.8%, while 75.0% experienced additional pain or limitation during work. Neck-pain prevalence was 88.6% among participants working more than six hours daily and 60.0% among those working six hours or less, $\chi^2(1)=13.31$, $p<0.001$. The prevalence ratio was 1.48 (95% CI: 1.16–1.88). **Conclusion:** Neck pain was common among female sewing machine operators and was associated with longer daily working duration. Ergonomic workplace improvements and structured rest opportunities may help reduce the occupational burden. **Keywords:** Neck pain; sewing machine operators; occupational health; ergonomics; musculoskeletal disorders; working hours.

INTRODUCTION

Neck pain is a common musculoskeletal complaint that may restrict movement, interfere with daily activities, reduce work capacity, and adversely affect quality of life. Occupational neck pain is particularly relevant in jobs involving prolonged sitting, sustained cervical flexion, repetitive upper-limb activity, poorly designed workstations, and insufficient recovery periods. Repeated exposure to these physical demands can increase fatigue in the cervical and shoulder musculature and contribute to persistent discomfort and functional limitation (1–5).

Sewing machine operation combines several recognized ergonomic risk factors for neck pain. Operators commonly remain seated for extended periods while maintaining a forward-flexed head and trunk

position to visually control detailed sewing tasks. Simultaneously, repetitive movements of the hands, arms, and shoulders and continuous use of the machine pedal place additional demands on the upper body. When the chair, sewing table, machine height, back support, or arm support is unsuitable, workers may be required to maintain awkward postures for prolonged periods, increasing mechanical loading of the cervical spine and surrounding soft tissues (6,7).

The burden of neck pain among sewing machine operators varies considerably across populations and occupational settings. Biadgo et al. reported a 12-month neck-pain prevalence of 42.3% among garment-factory sewing machine operators in Ethiopia, whereas Tafese et al. documented neck pain in 45.8% of self-employed sewing machine workers (8,9). Hassan Raza et al. reported a prevalence of 56% among sewing machine operators, while Kanniappan and Palani found that approximately 76% of workers experienced neck pain during the preceding year (10,11). An observational study among garment workers reported an even higher prevalence of mechanical neck pain, although differences in workplace conditions, participant selection, symptom definitions, exposure duration, and assessment instruments may partly explain the variability between studies (12).

Ergonomic and postural investigations further support the relationship between sewing work and cervical symptoms. Assessment studies have identified forward flexion of the head and trunk, sustained static posture, repetitive movement, and inadequate workstation design as important contributors to neck and shoulder discomfort among sewing machine operators (13–15). Long-term evidence also indicates that workers with baseline neck or shoulder complaints may remain at increased risk of persistent symptoms and impaired work participation, suggesting that initially mild occupational symptoms may develop into chronic problems when hazardous exposures continue (16,17).

Working duration may be an important indicator of cumulative occupational exposure. Longer working hours increase the time during which cervical muscles must sustain the weight of the head in a flexed position and reduce opportunities for movement, tissue recovery, and postural variation. Population-based evidence has also linked prolonged sedentary activity with neck pain, while studies of sewing machine workers have consistently identified limited rest periods and extended task duration as potentially modifiable occupational risk factors (18,19). Nevertheless, because most available studies have been conducted in industrial factories or populations outside Pakistan, their findings may not fully represent women working in vocational training centres and small tailoring workplaces.

In Sukkur, female sewing machine operators commonly work in vocational centres and small-scale tailoring environments where access to adjustable furniture, ergonomic training, structured rest periods, and occupational health services may be limited. Although work-related musculoskeletal symptoms have been investigated among sewing machine operators in Sindh, locally specific evidence regarding the prevalence and severity of neck pain among female operators and its relationship with daily working hours remains limited (20). Regional evidence is needed to guide workplace education, ergonomic modification, early physiotherapy referral, and preventive occupational-health strategies.

Therefore, this study aimed to determine the prevalence and severity of neck pain among female sewing machine operators in Sukkur, assess its reported effects on sleep and work-related functioning, and examine whether neck pain was associated with daily working hours. The null hypothesis was that daily working hours would have no statistically significant association with neck pain, whereas the alternative hypothesis was that longer working hours would be significantly associated with neck pain.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted from January to June 2024 to determine the prevalence and severity of neck pain among female sewing machine operators and to examine its association with daily working hours. The study was undertaken at vocational training centres and tailoring workplaces in Sukkur, Pakistan, where women routinely performed sewing activities for several

hours per day. The cross-sectional design was selected because the study sought to measure neck pain and occupational exposure characteristics within the target population during a defined study period.

The target population consisted of female sewing machine operators working in vocational centres and tailoring workplaces in Sukkur. A total of 120 participants were enrolled through non-probability convenience sampling according to their availability and eligibility during the data-collection period. Women were eligible if they were 18–40 years of age, had worked as sewing machine operators for at least one year, and voluntarily agreed to participate. Participants were excluded if they had a history of cervical trauma or fracture, previous cervical spine surgery, a neurological disorder affecting the neck or upper limbs, or a systemic musculoskeletal disease. These criteria were applied to reduce the likelihood that reported symptoms were primarily attributable to major pre-existing cervical, neurological, or systemic conditions rather than occupational exposure.

Permission to conduct the study was obtained from the administrations of the participating vocational centres and workplaces before recruitment commenced. Potential participants were approached at the study sites, informed about the purpose and procedures of the research, and assessed against the eligibility criteria. Women who agreed to participate provided written informed consent before completing the study questionnaire. Participation was voluntary, and participants were informed that they could withdraw from the study without penalty.

Data were collected using a structured questionnaire comprising demographic and occupational information, the Northwick Park Neck Pain Questionnaire, and the Visual Analog Scale. Demographic information included age and educational level, while occupational information included the number of hours worked per day. For the association analysis, daily working duration was categorized as six hours or less and more than six hours. The principal study outcome was the presence of self-reported neck pain. Secondary outcomes included pain intensity, functional effects associated with neck pain, sleep disturbance, and limitations experienced during work.

The Northwick Park Neck Pain Questionnaire was used to evaluate neck-pain-related functional impairment. The instrument contains nine domains covering pain intensity, sleep disturbance, numbness or tingling, symptom duration, carrying objects, reading or watching television, work and household activities, social activities, and driving. Each domain is scored from 0, indicating no difficulty, to 4, indicating maximum difficulty or disability. The item scores are combined and converted into a percentage representing the degree of neck-pain-related disability. Scores were interpreted as no disability at 0–8%, mild disability at 10–28%, moderate disability at 30–48%, severe disability at 50–68%, and complete disability at more than 70%.

Pain intensity was assessed using the Visual Analog Scale, represented by a 10-cm horizontal line anchored by “no pain” at 0 and “worst imaginable pain” at 10. Participants marked the point that best represented the intensity of their current neck pain, and the distance from the zero anchor was recorded as the pain score. Scores were categorized as no pain at 0, mild pain at 1–3, moderate pain at 4–6, and severe pain at 7–10.

Questionnaires were completed under the supervision of the researcher. Standardized instructions were provided, and clarification was given when participants had difficulty understanding an item. The completed questionnaires were reviewed for completeness before data entry. The use of predefined eligibility criteria, standardized assessment instruments, uniform administration procedures, and verification of completed questionnaires was intended to improve consistency and reduce avoidable measurement and data-entry errors.

Data were entered and analysed using IBM SPSS Statistics version 26.0. Categorical variables, including age group, educational level, daily working-hour category, neck-pain status, pain-severity category, sleep disturbance, and work limitation, were summarized using frequencies and percentages. Continuous

variables, including age and pain scores, were intended to be summarized using the mean and standard deviation where appropriate. The association between categorized daily working hours and the presence of neck pain was examined using the Pearson chi-square test. Statistical significance was assessed using a two-sided threshold of $p < 0.05$. Results were presented in tables and figures using the total number of participants as the denominator unless otherwise specified.

Ethical approval was obtained from the relevant institutional ethical review committee before initiation of the study. Participants received information about the study purpose, procedures, anticipated benefits, and possible risks before providing written informed consent. No personal identifiers were recorded in the study questionnaire. Participant confidentiality and anonymity were maintained, and collected information was used exclusively for research purposes.

RESULTS

A total of 120 female sewing machine operators were included in the analysis. The largest age group was 21–25 years, comprising 42 participants (35.0%), followed by those aged 26–30 years, who accounted for 31 participants (25.8%). Most participants had completed matric-level education (38.3%), while 28 (23.3%) had completed intermediate education. Seventy participants (58.3%) worked for more than six hours per day, whereas 50 (41.7%) worked for six hours or less.

Neck pain was reported by 92 of the 120 participants, corresponding to a prevalence of 76.7% (95% CI: 68.3–83.3%). On the Visual Analog Scale, moderate pain was the most frequently reported category, affecting 42 participants (35.0%), followed by mild pain in 38 (31.7%) and severe pain in 12 (10.0%). The remaining 28 participants (23.3%) reported no pain. Thus, 80 of the 92 participants with neck pain reported pain within the mild-to-moderate range.

Sleep and work-related functioning were also affected. Occasional sleep disturbance was reported by 40 participants (33.3%), regular disturbance by 28 (23.3%), and severe disturbance by 17 (14.2%). Overall, 85 participants (70.8%) reported some degree of sleep disturbance. During work, 40 participants (33.3%) experienced additional pain, 32 (26.7%) reported reduced work capacity, and 18 (15.0%) reported severe limitation. Consequently, 90 participants (75.0%) reported at least some work-related limitation or additional pain.

Table 1. Demographic and Occupational Characteristics of Female Sewing Machine Operators (N=120)

Characteristic	Category	n (%)
Age group, years	18–20	28 (23.3)
	21–25	42 (35.0)
	26–30	31 (25.8)
	31–35	12 (10.0)
	>35	7 (5.8)
Educational level	Primary	10 (8.3)
	Middle	24 (20.0)
	Matric	46 (38.3)
	Intermediate	28 (23.3)
	Bachelor's degree	12 (10.0)
Daily working hours	≤6 hours	50 (41.7)
	>6 hours	70 (58.3)

Percentages may not total exactly 100.0 because of rounding.

Table 2. Prevalence and Severity of Neck Pain Among Participants (N=120)

Outcome	Category	n (%)	95% CI
Neck pain	Present	92 (76.7)	68.3–83.3
	Absent	28 (23.3)	16.7–31.7
VAS pain category	No pain	28 (23.3)	
	Mild pain	38 (31.7)	
	Moderate pain	42 (35.0)	

Outcome	Category	n (%)	95% CI
	Severe pain	12 (10.0)	

CI: confidence interval; VAS: Visual Analog Scale. The 95% confidence interval for overall neck-pain prevalence was calculated using the Wilson method.

The ≤ 6 -hours category was used as the reference category. Estimates were calculated from the complete 2×2 contingency table. CI: confidence interval; df: degrees of freedom. The odds ratio describes the odds of neck pain, whereas the prevalence ratio compares the observed proportions with neck pain in the two working-hour categories. Neck-pain prevalence differed substantially according to daily working duration. Among participants working for six hours or less, 30 of 50 had neck pain, corresponding to a prevalence of 60.0% (95% CI: 46.2–72.4%). Among those working for more than six hours, 62 of 70 reported neck pain, corresponding to a prevalence of 88.6% (95% CI: 79.0–94.1%). The absolute difference between the two groups was 28.6 percentage points (95% CI: 13.1–44.1).

Table 3. Reported Effects of Neck Pain on Sleep and Work-Related Functioning (N=120)

Outcome	Category	n (%)
Sleep disturbance	No disturbance	35 (29.2)
	Occasional disturbance	40 (33.3)
	Regular disturbance	28 (23.3)
	Severe disturbance	17 (14.2)
Work limitation	No limitation	30 (25.0)
	Additional pain during work	40 (33.3)
	Reduced work capacity	32 (26.7)
	Severe limitation	18 (15.0)

Table 4. Association Between Daily Working Hours and Neck Pain (N=120)

Daily working hours	Neck pain, n (%)	No neck pain, n (%)	Total, n	Neck-pain prevalence, % (95% CI)
≤ 6 hours	30 (60.0)	20 (40.0)	50	60.0 (46.2–72.4)
> 6 hours	62 (88.6)	8 (11.4)	70	88.6 (79.0–94.1)
Total	92 (76.7)	28 (23.3)	120	76.7 (68.3–83.3)

Percentages in the neck-pain and no-neck-pain columns were calculated within each working-hour category. CI: confidence interval.

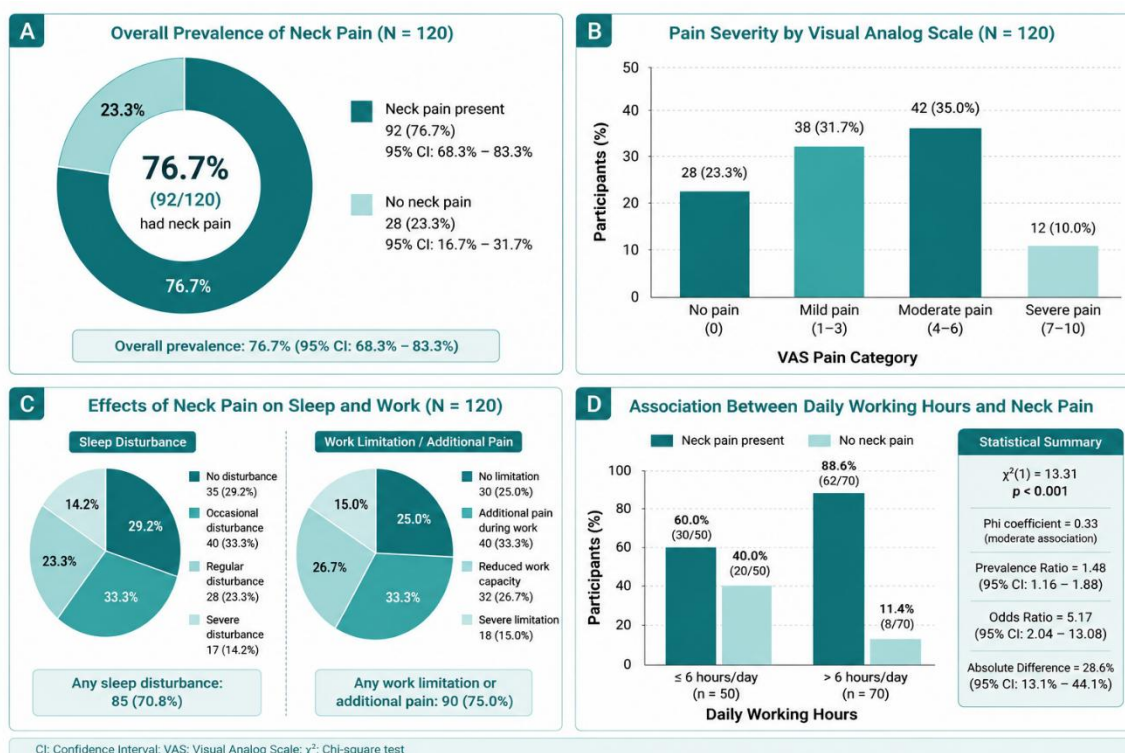


Figure 1 presents a comprehensive overview of the burden of neck pain among female sewing machine operators. Panel A demonstrates that neck pain was highly prevalent, affecting 92 of 120 participants (76.7%; 95% CI: 68.3–83.3%), while 23.3% reported no neck pain. Panel B shows the distribution of pain severity measured using the Visual Analog Scale, with moderate pain being the most frequent category (35.0%), followed by mild pain (31.7%), no pain (23.3%), and severe pain (10.0%). Panel C illustrates the functional impact of neck pain, revealing that 70.8% of participants experienced some degree of sleep disturbance and 75.0% reported additional pain or work-related limitation, indicating a substantial effect on daily functioning. Panel D demonstrates a significantly higher prevalence of neck pain among participants working more than six hours per day (88.6%) compared with those working six hours or less (60.0%). Statistical analysis confirmed a significant association between prolonged daily working hours and neck pain ($\chi^2(1)=13.31$, $p<0.001$), with participants working more than six hours exhibiting a 1.48-fold higher prevalence of neck pain (95% CI: 1.16–1.88) and an odds ratio of 5.17 (95% CI: 2.04–13.08), highlighting prolonged occupational exposure as an important factor associated with neck pain in this population.

Table 5. Effect Estimates for the Association Between Working More Than Six Hours Daily and Neck Pain

Statistical measure	Estimate	95% CI	p-value
Pearson χ^2 , df=1	13.31	—	<0.001
Phi coefficient	0.33	—	—
Odds ratio	5.17	2.04–13.08	—
Prevalence ratio	1.48	1.16–1.88	—
Absolute prevalence difference	28.6 percentage points	13.1–44.1	—

Pearson chi-square analysis demonstrated an association between daily working-hour category and neck-pain status, $\chi^2(1)=13.31$, $p<0.001$. The phi coefficient was 0.33, indicating a moderate association. Participants working for more than six hours per day had 1.48 times the prevalence of neck pain compared with those working for six hours or less (prevalence ratio=1.48; 95% CI: 1.16–1.88). The corresponding odds ratio was 5.17 (95% CI: 2.04–13.08). These findings supported rejection of the null hypothesis of no association between daily working hours and neck pain.

DISCUSSION

This study found a high burden of neck pain among female sewing machine operators in Sukkur. More than three-quarters of the participants reported neck pain, and most symptomatic participants experienced pain of mild or moderate intensity. Neck pain was also accompanied by substantial functional consequences, including disturbed sleep, additional pain during work, reduced work capacity, and severe work limitation in a smaller proportion of participants. Daily working duration was significantly associated with neck pain, with participants working for more than six hours having a markedly higher prevalence than those working for six hours or less.

The overall prevalence of neck pain was 76.7%, indicating that cervical musculoskeletal symptoms are common among women engaged in sewing work in vocational and tailoring environments. This estimate is almost identical to the 76% prevalence reported by Kanniappan and Palani among sewing machine workers in the leather industry (11). It is higher than the prevalence reported by Biadgo et al., who found neck pain in 42.3% of garment-factory sewing machine operators, and the 45.8% reported among self-employed sewing machine workers by Tafese et al. (8,9). Hassan Raza et al. also documented a lower prevalence of approximately 56% among sewing machine operators (10). Differences in participant characteristics, workplace organization, symptom recall periods, ergonomic conditions, exposure duration, pain definitions, and assessment instruments may explain the variation between studies.

The high prevalence observed in the present study is biologically and ergonomically plausible. Sewing requires sustained visual attention to work positioned below eye level, encouraging forward flexion of the head and upper trunk. This posture increases the external moment acting on the cervical spine and requires prolonged activation of the posterior cervical and shoulder musculature. When maintained for extended periods, static muscle loading may reduce local circulation, accelerate fatigue, increase tissue sensitivity, and contribute to pain and stiffness. Repetitive movements of the arms and shoulders may further increase cervical and scapular muscle demand, particularly when the workstation does not provide adequate back, forearm, or upper-limb support (6,7).

Previous ergonomic studies support this interpretation. Gahlot et al. identified postural discomfort and considerable forward flexion among female sewing machine operators, while Dianat and Karimi reported substantial musculoskeletal exposure among workers engaged in hand-sewing tasks (13,14). Bulduk et al. demonstrated that ergonomic education could reduce work-related musculoskeletal risk factors among sewing machine operators, suggesting that at least part of the occupational exposure is modifiable (15). These findings indicate that workstation design, posture, task organization, and rest opportunities should be considered together rather than treating neck pain solely as an individual clinical problem.

Moderate pain was the most frequently reported severity category, followed by mild pain. Severe pain affected a smaller but clinically important proportion of the sample. This distribution suggests that many workers may continue performing their occupational duties despite ongoing symptoms. Similar patterns have been reported by Raza et al., who found mild pain to be more common than moderate or severe pain among sewing machine operators. Persistent exposure in the presence of initially mild symptoms may be important because longitudinal evidence suggests that workers with baseline neck and shoulder complaints are more likely to experience continuing symptoms and impaired work participation over time (16,17).

Neck pain was also associated with effects beyond pain intensity. More than two-thirds of participants reported some degree of sleep disturbance, and three-quarters reported additional pain or limitation during work. Sleep disturbance may reflect discomfort during positioning, difficulty finding a comfortable sleeping posture, or persistence of symptoms after occupational activity. Work limitation is particularly relevant because reduced capacity, pain-related slowing, and difficulty sustaining posture may affect productivity, attendance, and continued employment. Although the cross-sectional design does not establish the temporal direction of these relationships, the findings demonstrate that neck pain and functional disturbance coexist in a substantial proportion of this occupational group.

The association between working duration and neck pain was one of the most important findings. Neck-pain prevalence was 88.6% among participants working for more than six hours per day compared with 60.0% among those working for six hours or less. Participants in the longer-duration category had approximately 1.48 times the prevalence and more than five times the odds of neck pain. The absolute prevalence difference of 28.6 percentage points indicates a clinically meaningful exposure gradient. Prolonged working time may increase cumulative static loading, limit postural variation, reduce muscular recovery, and decrease opportunities for rest and stretching. Population-based evidence has similarly associated prolonged sedentary activity with neck pain, while occupational studies have identified long working duration and insufficient rest as relevant contributors to musculoskeletal symptoms (18,19).

The magnitude of the observed association should nevertheless be interpreted cautiously. Working hours may be related to other unmeasured occupational characteristics, including workstation quality, production targets, years of sewing experience, break frequency, psychosocial stress, physical activity, and pre-existing pain. Because these factors were not included in an adjusted analysis, the reported prevalence ratio and odds ratio represent crude associations. The results therefore support an occupational relationship but do not demonstrate that longer working hours independently caused neck pain.

The findings have practical implications for occupational health and physiotherapy. Low-cost preventive measures may include adjustment of chair and table height, appropriate back and forearm support, improved positioning of the sewing task, scheduled microbreaks, alternating activities where feasible, and education regarding neutral cervical posture. Workers with persistent or function-limiting symptoms may benefit from early musculoskeletal assessment and targeted physiotherapy. Workplace interventions are likely to be more effective when ergonomic modification is combined with worker education and organizational changes rather than relying exclusively on exercise advice.

This study has several strengths. It focused on an underrepresented female occupational population in Sukkur, used a clearly defined study sample, and applied standardized pain and neck-related functional assessment instruments. All reported category totals were internally consistent, and the complete working-hours contingency table allowed calculation of prevalence estimates, confidence intervals, effect measures, and the chi-square statistic.

Several limitations should also be acknowledged. Convenience sampling may have introduced selection bias and limits the generalizability of the findings beyond the participating vocational centres and tailoring workplaces. The cross-sectional design prevents determination of temporality or causality. Neck pain, sleep disturbance, and work limitation were self-reported and may have been affected by recall or response bias. Working duration was analysed using a broad two-category classification, which may not fully capture cumulative exposure. Potential confounders such as years of employment, workstation dimensions, break frequency, physical activity, psychosocial stress, body mass index, and previous episodes of neck pain were not evaluated in adjusted models. The study also did not include direct ergonomic observation or objective postural assessment. Future multicentre research should use probability-based recruitment where feasible, detailed ergonomic exposure measurement, validated occupational questionnaires, and multivariable analysis.

CONCLUSION

Neck pain was highly prevalent among female sewing machine operators in Sukkur, with most affected participants reporting mild-to-moderate pain and many experiencing associated sleep disturbance and work-related limitation. Working for more than six hours per day was significantly associated with a higher prevalence of neck pain; however, the cross-sectional design supports an association rather than a causal relationship. These findings identify female sewing machine operators as an occupational group that may benefit from improved workstation ergonomics, structured rest opportunities, posture education, and early assessment of persistent cervical symptoms.

REFERENCES

1. Akinpelu A, Oyewole O, Odole A, Ogunbamowo FD. Work-related musculoskeletal pain and health-seeking behavior among Nigerian sewing machine operators. 2016.
2. Akodu A, John-Oparaji EP. Prevalence of work-related repetitive stress injuries with reference to working posture among sewing machine operators in a Nigerian community. 2019.
3. Al-Mohrej O, AlShaalan NS, Al-Bani WM, Masuadi E, Almodaimegh H. Prevalence of musculoskeletal pain of the neck, upper extremities and lower back among dental practitioners working in Riyadh, Saudi Arabia: a cross-sectional study. *BMJ Open*. 2016.
4. Rodríguez-Gude C, Taboada-Iglesias Y, Pino-Juste M. Musculoskeletal pain in musicians: prevalence and risk factors—a systematic review. *Int J Occup Saf Ergon*. 2022.
5. Celik S, Celik K, Dirimese E, Taşdemir N, Arik T, Büyükkara İ. Determination of pain in the musculoskeletal system reported by office workers and associated risk factors. *Int J Occup Med Environ Health*. 2017.
6. Ehsani F, Mosallanezhad Z, Vahedi G. The prevalence, risk factors and consequences of neck pain in office employees. 2017.
7. Gulraiz, Qurat ul A, Afzal F, Manzoor S. Chronic neck pain and its prevention among bankers through ergonomics. 2017.

8. Biadgo GH, Tsegay GS, Mohammednur SA, Gebremeskel BF. Burden of neck pain and associated factors among sewing machine operators of garment factories in Mekelle City, northern Ethiopia: a cross-sectional study. *Saf Health Work*. 2020.
9. Tafese A, Kebede G, Medhin G, Mariam T, Kindu M. Prevalence of neck pain among self-employed sewing machine workers in Northern Gondar, Amhara Region, Ethiopia. 2018.
10. Hassan Raza MK, Khalid M, Javed MA, Naseer R. Prevalence and intensity of neck pain in sewing machine operators. *Pak J Phys Ther*. 2021;14–8.
11. Kanniappan V, Palani V. Prevalence of musculoskeletal disorders among sewing machine workers in a leather industry. *J Lifestyle Med*. 2020;10(2):121–5.
12. Ghediya AK. Prevalence of mechanical neck pain in garment workers in Ahmedabad: an observational study. *Int J Health Sci Res*. 2024.
13. Gahlot N, Mehta M, Singh K. Assessment of postural discomfort among female sewing machine operators. 2016.
14. Dianat I, Karimi M. Musculoskeletal symptoms among handicraft workers engaged in hand-sewing tasks. *J Occup Health*. 2016.
15. Bulduk S, Bulduk E, Süren T. Reduction of work-related musculoskeletal risk factors following ergonomics education of sewing machine operators. *Int J Occup Saf Ergon*. 2017.
16. Jakobsen E, Biering K, Kærgaard A, Andersen JH. Neck–shoulder pain and work status among former sewing machine operators: a 14-year follow-up study. *J Occup Rehabil*. 2018.
17. Jakobsen E, Biering K, Kærgaard A, Dalbøge A, Andersen JH. Long-term prognosis for neck–shoulder pain and disorders: a 14-year follow-up study. *Occup Environ Med*. 2017.
18. Genebra CVDS, Maciel NM, Bento T, Simeão SFAP, Vitta A. Prevalence and factors associated with neck pain: a population-based study. *Braz J Phys Ther*. 2017.
19. Kiritkumar BK, Pothiraj P. Prevalence of work-related musculoskeletal disorders and analysis of working posture using the Rapid Entire Body Assessment tool among sewing machine operators in a garment industry: a cross-sectional study. *Int J Community Med Public Health*. 2023;10(11):4388–95.
20. Brohi S, Khokhar R, Marriam P, Rathor A, Memon AR. Prevalence of symptoms of work-related musculoskeletal disorders and associated factors: a cross-sectional survey of sewing machine operators in Sindh, Pakistan. *Work*. 2022;73(2):675–85.