Safety and Health at Work 12 (2021) 51–56

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.net

Original Article

Burden of Neck Pain and Associated Factors Among Sewing Machine Operators of Garment Factories in Mekelle City, Northern Part of Ethiopia, 2018, A Cross-Sectional Study

Gebremedhin H. Biadgo [1,*], Gebrerufael S. Tsegay [1], Sumeya A. Mohammednur [2], Berihu F. Gebremeskel [1]

[1] Department of Physiotherapy, School of Medicine, College of Health Sciences and Ayder Comprehensive Specialized Hospital, Mekelle University, Mekelle, Tigray, Ethiopia
[2] Department of Health System Management, School of Public Health, College of Health Sciences, Mekelle University, Mekelle, Tigray, Ethiopia

ARTICLE INFO

Article history:
Received 1 June 2020
Received in revised form
3 September 2020
Accepted 5 October 2020
Available online 10 October 2020

Keywords:
Garment workers
Neck pain
Sewing machine operators

ABSTRACT

Background: Neck pain is a major public health problem among sewing machine operators working in textile factories. Even though the textile industries are growing in number in Ethiopia, but there is a dearth of published studies on the prevalence of neck pain. Therefore, this study was aimed to assess the prevalence and associated factors of neck pain among sewing machine operators of garment factories in Mekelle city.

Method: An institutional-based cross-sectional study design was implemented among 297 sewing machine operators' working in garment factories in Mekelle city. A systematic random sampling technique was used. Data were collected through interviews and analyzed using Statistical Package for Social Science version 23. Finally, variables with 95% confidence interval (CI): $p < 0.05$ in the multivariate analysis were significantly declared.

Results: Two hundred ninety-seven sewing machine operators were enrolled, with 98.7% response rates. In this study, the 12-month prevalence rate of neck pain was found to be 42.3% (95% CI: 36.6%–47.9%), and variables like such as break time [adjusted odds ratio (AOR): 5.888, 95% CI: (2.775–12.493)], working hours per day [AOR: 6.495, 95% CI: (2.216–19.038)], static posture [AOR: 4.487, 95% CI (1.640–12.275)], and repetitive activity [AOR: 4.519, 95% CI:(2.057–9.924)] were associated with neck pain.

Conclusion: In this study, neck pain is a major public health problem. Continuous work without break time, working greater than 8 hours per day, sitting in the same position for greater than 2 hours, and high repetitive activities were found significantly associated with neck pain. Owners and governmental bodies need to focus on developing preventive strategies and safety guidelines.

1. Introduction

Neck pain (NP) is a common problem in which two-thirds of all populations experience NP at some point in their lives [1]. Around one-half of the NP episodes resolve within one year, and around 10% of cases become chronic [1].Globally, the overall 12 months and point prevalence of NP ranged between 0.4% and 86.8% (mean = 23.1%), 4.8% to 79.5% (mean = 25.8%) and 0.4% to 41.5% (mean = 14.45%), respectively. In general, as an effect of NP disability-adjusted life years have increased from 23.9 million in 1990 to 33.6 million in 2010 [2]. Based on the global burden of the diseases report in 2015, NP was one of the leading global causes of disability in most parts of the countries [3]. Globally, the point prevalence of NP was 4.9%. Of all 291 conditions studied in the global burden of

Abbreviations: CI, Confidence interval; NP, Neck pain; SPSS, Statistical Package for Social Science.

* Corresponding author. Department of Physiotherapy, School of Medicine, College of Health Sciences and Ayder Comprehensive Specialized Hospital, Mekelle University, P.O.BOX address: 1871, Mekelle, Tigray, Ethiopia.
E-mail addresses: gebremedhinhaile88@gmail.com (G.H. Biadgo), rafa.sol04@gmail.com (G.S. Tsegay), summemiri@gmail.com (S.A. Mohammednur), brishphysio@gmail.com (B.F. Gebremeskel).

2093-7911/$ – see front matter
https://doi.org/10.1016/j.shaw.2020.10.002

diseases in 2010, NP was placed the fourth greatest contributor to global disability as measured by years lived with disability and the twenty-one in terms of overall burden [2].

Previous studies had reported a high prevalence of NP in sewing machine operators. A study done in Pakistan found that 78%% of sewing machine operators had NP within 12 months [4]. Studies conducted at Turkey, Iran, Sri Lanka, Estonia, India, and Bangladeshi found that 50%, 54.1%, 39.64%, 61.4%, 60.7%%, and 36.7% of sewing machine operators had to feel NP in the last 12 months, respectively [5–10]. Other studies in the two cities of Nigeria, the prevalence of NP were 34.8 % and 80%, respectively [11,12]. The magnitude of musculoskeletal disorders including NP in the textile and garment manufacturing industries due to unstandardized workstations is highly reported [13–16]. The burden of the work-related musculoskeletal disorder due to improperly working conditions leads millions of working population for disability and injury in both developing and developed countries [17].

Sewing machine operation is a highly repetitive and precision profession that needs an employer to bend forward to see the point of operation, at the same time using their hands to manage fabric feed to the needle and continuously operate foot and knee pedal [18]. Sewing machines like any other machinery do not cause adverse effects for the operator when properly used; however, if the machines used poorly match with the operator, they can contribute to major health problems. One of the health problems is NP which adversely affects the workers' quality of life, the efficiency of work, and results in decreasing production [19]. Considering the high expansion of garments industries in Ethiopia, it is important to monitor the health risk associated with occupational exposure. There were different researches conducted in the area of textile and garment industries regarding workplace exposure such as occupational injuries and illness. However, to our knowledge, there were no accessible studies on the prevalence and associated factors of neck among garment sewing machine operators in the study area. Therefore, the purpose of this study was designed to assess the magnitude and associated factors of NP which can provide potential practical guidance to prevent these health problems and could provide significant input for further study as a baseline, valuable information for the Bureau of Labor and Social Affairs, Institute of Ethiopian Textile Industry, and policymakers.

2. Objectives

2.1. General objective

The aim of this study is to assess the 12-month prevalence rate and associated factors of NP among sewing machine operators working at garment factories in Mekelle city, 2018.

2.2. Specific objectives

The aim of this study is to determine the 12-month prevalence rate of NP among sewing machine operators working at garment factories in Mekelle city, 2018.

The aim of this study is to identify the associated factors of NP among sewing machine operators working at garment factories in Mekelle city, 2018.

3. Materials and Methods

3.1. Study design and area

An institutional-based cross-sectional study was conducted in Mekelle city, Tigray, the northern part of Ethiopia from April 20, 2018, to May 16, 2018. The study was conducted in Mekelle town which is the capital city of Tigray National Regional State and located at 13o32′′ North latitude and 39o28′ East longitude. The altitude ranges from 2000 to 2257 meters above the sea level. Mekelle is 783 km away from the capital city of Ethiopia, Addis Ababa. Mekelle is one of the reform towns in the region with 7 subcities. Mekelle city is one of the industrial zone consisting of MAA garment factory and Velocity Apparelz company at the time of the study. Therefore, the study was conducted on two available garment factories namely MAA garment (N = 510) and Velocity Apparelz company (N = 400). Both garments consists 910 sewing machine operators among 2957 total staff of the organization.

3.2. Source of the population

All the sewing machine workers at the selected garment factories in Mekelle city were considered as a source of the population.

3.3. Sample size determination

The sample size for this study was determined by using those assumptions. Assuming a 5% margin of errors, 95% confidence level, the proportion of or expected frequency assumption with the 50% estimated number of population was 910 and by adding a 10% nonresponse rate. Finally, the total sample size was calculated by using Epi Info 7 statistical software. Therefore, the total sample size for this study was 297.

3.4. Sampling techniques and procedure

The sample population was selected using systematic random sampling. Two hundred ninety-seven sewing machines operators were allocated by proportional allocation to the garment factories. To select the actual participant, the systematic random sampling technique was used using their list (frame) from the production manager and line manager of the factories. The study participant was selected in every three intervals.

3.5. Operational definitions

3.5.1. Neck pain

Any self-reported pain, ache, or discomfort in the neck with or without pain referred into one or both upper limbs that last for at least one day in the past 12 months [2].

3.5.2. Highly repetitive activity

Work involving repeating the same motion with less than 30 seconds or no variation every few seconds for two or more hours [20].

3.5.3. Job satisfaction

A score measured using the job satisfaction scale as high satisfaction (39–50), medium satisfied (32–38), and low satisfaction (10–31) [21].

3.5.4. Job stress

A score measured using the workplace, the stress scale as yes with a total score of having stress (16 to 40) and no stress (lower than or equal 15) [22].

3.5.5. Static posture

Sitting in a restricted space for two or more hours without changing positions [20].

3.6. Data collection methods and quality control

The data were collected using face-to-face interviews by an interviewer-administered structured questionnaire. The questions to assess NP were adapted from the Standardized Nordic Questionnaire [23]. Those questionnaires were used as an instrument to collect detailed information about NP. Questions about NP in the past twelve months were asked. The Likert scale was used to measure job satisfaction and stress of the participants. Physical measurements also had been done to measure the participants' height and weight. Four B.Sc. physiotherapy and two postgraduate physiotherapy supervisors were involved in the data collection period. The questionnaire was first prepared in English, translated into the local language "Tigrigna", and then back to English to ensure consistency. A pretest was conducted among 5% of the study population five days before actual data collection in ITACA textile private limited company, Enderta, Woreda. To assure the quality of the data, data collectors and supervisors were trained for one day. Regular supervision and follow-up were conducted by supervisors and were also done on the spot by the principal investigator. In addition, a regular check-up for completeness and consistency of the data was made daily. Data were coded, entered into Statistical Package for Social Science (SPSS) version 23; then data clean up and cross-checking were done before analysis.

3.7. Data management and analysis

The data were analyzed by using SPSS version 23, Analysis was done by the investigator using the same computer package. The data were edited, coded, and entered into the SPSS version 23 software program for analysis. The descriptive findings were presented by frequency tables, percentage, and proportion with 95% confidence interval (CI). The normal distribution of data was checked using histograms and normal Q-Q plots. Bivariate logistic regression was used to explore the presence of a statistical association between different independent variables and outcome variables using the crude odds ratio with 95% CI. A multicollinearity test was also checked to assess the correlation between the independent variables. Only variables that reached a p value of less than 0.25 on bivariate analysis were candidates to multivariate logistic regression analysis. Model fitting was checked using log-likelihood and Hosmer–Lemeshow tests, and it was a fit model. Finally, variables with $p < 0.05$ in the multivariate analysis were considered significant and presented by the adjusted odds ratio (AOR) with 95% CI.

3.7.1. Ethical approval

Ethical clearance was obtained from the ethical review committee of the College of Health Sciences of Mekelle University. Written informed consent was obtained from each of the study participants after being informed in detail about the objectives of the study and the confidentiality of the information maintained.

4. Results

4.1. Sociodemographic and individual characteristics of the respondents

Two hundred ninety-seven sewing machine operators were enrolled with 293 (98.7%) response rates. Almost all 282 (96.2%) of the respondents were female with a mean age of 22.8 ± 3 years. Of the study participants, 183(77.1%) had a secondary educational level and 193 (65.9%) were single. All study participants had low income with an average income of 1166.75 ± 166 Ethiopia Birr. Two hundred thirty-two (79.2%) sewing machine operators had 1–5 years' experience, and 250 (85.3%) had a normal body mass index. Almost all of the participants, 276 (94.2%), did not have any known medical systemic diseases; 273 (93.2%) respondents were not involved in regular sports and physical activities; and the entire participants were nonsmokers (Table 1).

Table 1
Sociodemographic and individual characteristics sewing machine operators of garment factories in Mekelle, Ethiopia, 20 April, 2018–16 May, 2018(n = 293).

Variables	Frequency n (%)
Gender	
Female	282(96.2)
Male	11(3.8)
Age group (years)	
18–25	235(80.2)
>25	58(19.8)
Marital status	
Married	100(34.1)
Single	193(65.9)
Educational status	
Primary school (1–8)	16(5.5)
Secondary school(9–12)	226(77.1)
Diploma	51(17.4)
Work experience (years)	
1–5 years	232(79.2)
>5 years	61(20.8)
Body mass index (BMI)	
Underweight	33(11.3)
Healthy/normal	250(85.3)
Overweight	10(3.4)
Known systemic disease	
No	276(94.2)
Yes	17(5.8)
Doing physical activity	
No	273(93.2)
Yes	20(6.8)

4.1.1. Working environment, ergonomic, and psychosocial characteristics of the respondents

The majority of participants, 181 (61.8%), were performing their work activity in a sitting position for greater than two hours per day. Regarding working hours, 167 (57%) of participants reported that they were working for 8 hours per day. More than half of the respondents, 164 (56%), were taking break time. About three-forth, 212 (72.4%), of the respondents were working less than50 hours weekly. The majority of the respondents, 197 (67.2%), were using an adjustable chair and, 196 (66.9%) were comfortable with their working machine. More than half of the respondents 162 (55.3%) were given general training and ergonomics considerations during their recruitments. According to the present study of more than half of the participants, 174 (59.4%) were low satisfied and 176 (60.1%) of them had job stress (Table 2).

4.1.2. Prevalence of NP among sewing machine operators

This study revealed that 42.3 % (95% CI: 36.6%–47.9%) sewing machine operators had pain, ache, or discomfort around the neck area at least one day in the last 12 months. Of the study participants, 68 (23.2%) had NP in the last seven days. Of the total, 65 (22.2%) participants wanted to change their working area, and 67 (22.9%) of them hinder their working activity because of pain. Almost one-fourth of participants, 59(20.1%), reported that in the last one year the total length days during which the pain was felt was greater than a month.

Table 2
Working environment, ergonomic, and psychosocial characteristics among sewing machine operators of garment factories in Mekelle city, Ethiopia, 20April, 2018–16 May, 2018 (n = 293).

Variables	Frequency n (%)	Neck pain	
		No	Yes
Static posture			
No	112(38.2)	97(86.6%)	15(13.4%)
Yes	181(61.8)	72(39.8%)	109(60.2%)
Awkward posture			
No	88(30)	76(86.4)	12(13.6%)
Yes	205(70)	93(45.4%)	112(54.6)
Repeating activity			
No	204(69.6)	143(70.1%)	61(29.9%)
Yes	89(30.4)	26(29.2%)	63(70.8%)
Working hours per day			
= 8 hours	167(57)	142(85%)	25(15%)
>8hours	126(43)	27(21.4%)	99(78.6%)
Working hours per week			
40–50 hours	212(72.4)	152(71.7%)	60(28.3%)
>50hours	81(27.60	17(21%)	64(79%)
Break time			
No	129(44)	31(24%	98(76%)
Yes	164(56)	138(84.1%)	26(15.9%)
Adjustable chair			
No	96(32.8)	28(29.2%)	68(70.8%)
Yes	197(67.2)	141(71.6%)	56(28.4%)
Comfortable of working machine			
No	97(33.1)	32(33 %)	65(67%)
Yes	196(66.9)	137(69.9%)	59(30.1%)
Ergonomics training			
No	131(44.7)	56(42.7%)	75(57.3%)
Yes	162(55.3)	113(69.8%)	49(30.2%)
Job stress			
≤ 15(no)	117(39.95)	83(70.9%)	34(29.1%)
16–40(yes)	176(60.1)	86(48.9%)	90(51.1%)
Job satisfaction			
10–31(low)	174(59.4)	90(51.7%)	84(48.3%)
32–38(moderate)	72(24.6)	22(30.6%)	84(48.3%)
39–50(high)	47(16)	12(25.5%)	35(74.5%)

4.1.3. Bivariate and multivariate logistic regression analysis of associated factors with NP

In these study variables with the *p* value, less than 0.25 in the bivariate were taken into multivariate logistic analysis. The multivariate logistic regression analysis confirms that static posture [AOR: 4.487; 95% CI (1.640–12.275), $p < .003$], working hours per day [AOR: 6.495, 95% CI: (2.216–19.038), $p < .001$], highly repetitive work [AOR: 4.519, 95% CI: (2.057–9.924), $p < .001$], and breaks time [AOR: 5.888, 95% CI: (2.775–12.493), p <0.001] were statically associated with NP. Table 3.

5. Discussion

This study revealed NP occurs commonly among sewing machine operators of garment factories in Mekelle city. The 12-month prevalence of self-reported NP among sewing machine operators 42.3 % (95% CI: 36.6%–47.9%) was observed. This finding was consistent with studies done at Bangladesh (36.7%) [10], Sir Lanka (39.64%) [7], and India (41.8%) [24].The possible similarity with those studies could be due to using the same study design and data collection method. The seven-day prevalence of NP was also consistent with the study done in Nigeria (23% and 25.3%) [11,12].However, the prevalence of the present study was found to be lower than that of the study done in Nigeria (80%) [12], Cambodia (74.4%) [25], Estonia (61.4%) [8], Turkey (50%) [5], Iran (54.1%) [6], Pakistan (78%) [4], Tamilnadu, India (51%) [26], and Kolkata, India (60.7%) [9].The possible difference among three countries Estonia, Pakistan, and India (Kolkata) could be due to sample size difference and methodology variations. A particular study done in the seven largest cities of Tamilnadu (India) was a comparative study design. The other possible difference could be, for instance, the study done in Estonia with a response rate lower than that in the present study with a small sample size. All the study participants in Turkey and Iran were female. In addition, the main difference could be that the practice of occupational health and safety in Ethiopia is in its early stage; work-related disorders are under-diagnosed and beneath-reported. Therefore, participants may undermine their self-reported NP.

The annual prevalence of the present study was relatively higher than that of the study done in Nigeria (34.7%) [11]. The possible difference could be the present study used a higher sample size than Nigeria, whereas the study done in Nigeria sampling procedures used nonprobability sampling of the convenience technique. This observed study revealed that the annual prevalence was higher than the study conducted in the USA (24%) [27]. The observed discrepancy could be due to methodological variations, socioeconomic, and technology differences. Another reason for the differences may be that USA sewing machine operators observe occupational safety more than those of Ethiopia. Previous studies have confirmed that a high prevalence of NP was related to low-quality working conditions, poor workstation, tool design, high workload, and biomechanical factors while working [28,29]. In

Table 3
Bivariate and multivariate logistic regression analysis of associated factors with the neck pain among sewing machine operators of garment factories Mekelle city, Ethiopia 25 April, 2018–16 May, 2018 (n = 293).

Variables	COR (95% CI)	*p* value	AOR (95% CI)	*p* value
Repetitive activity				
No	Ref		Ref	
Yes	5.680(3.29–9.81)*	<0.001	4.519(2.057–9.924)**	<0.001
Known systemic diseases				
No	Ref		Ref	
Yes	2.645(.961–7.358)	0.062	2.246(.485–10.393)	0.301
Physical activity				
No	2.318(.819–6.559)	0.113	0.662(0.135–3.239)	0.611
Yes	Ref		Ref	
static posture				
No	Ref		Ref	
Yes	9.790(5.27–18.97)*	<0.001	4.487(1.64–12.275)**	0.003
Awkward posture				
No	Ref		Ref	
Yes	7.627(3.91–14.88)*	<0.001	1.101(.348–3.488)	0.870
Working hours(hs) per day				
= 8 hs	Ref		Ref	
>8hs	20.837(11.4–38.1)*	<0.001	6.495(2.216–19.038)**	<0.001
Working hours per week				
40–50 hs	Ref		Ref	
>50hs	9.537(5.17–17.60)*	<0.001	1.543(0.533–4.463)	0.424
Break time				
No	16.779(9.376–30.028)*	<0.001	5.888(2.775–12.493)**	<0.001
Yes	Ref		Ref	
Adjustable chair used				
No	6.115(3.570–10.473)*	<0.001	2.373(0.712–7.913)	0.160
Yes	Ref		Ref	
Training of ergonomics				
No	3.089(1.908–5.001)*	<0.001	0.955(0.422–2.160)	0.955
Yes	Ref		Ref	
Job stress				
No	1.00		Ref	
Yes	2.555(1.56–4.20.)*	<0.001	0.719(0.278–1.860)	0.496
Job satisfaction				
Low	3.125(1.521–6.420)*	.002	1.136(0 .302–4.273)	0.850
Moderate	1.283(.562–2.930)	0.554	1.190(0.295–4.801)	0.807
High	Ref		Ref	
Comfortable of a working machine				
No	4.717(2.799–7.948)*	<0.001	0.963(0 .276–3.357)	0.953
Yes	Ref		Ref	

* = significant association (bivariate), ** = significant association (multivariate), COR = crude odds ratio, AOR = adjusted odds ratio, Ref = references, statistically significant $p < 0.05$.

general, the possible difference among the studies could be the study area, set-up, organization, operational definition, methodology variations, and assessment tools.

In the present study, four major associated factors were reported that caused NP in sewing machine operators garment factories workers in the northern part of Ethiopia. Those were highly repetitive work, static posture, working greater than eight hours per day, and continuous work without break time.. In this study, the length of working hours strongly associated with the prevalence of NP among sewing machine operators. This is in consistent with the results of two studies done in India [24,30]. The possible similarity may be that both of them have used a similar study design and data collection method. Another possible explanation could be that as the number of working hours increased, the workload exceeds. The employees might be influenced by their owners to work greater than that allowed hours sated by the labor proclamation. In addition, workers who are working greater than 8 hours had 6.5 times higher chance to have NP than those who work the normal hours a day. These hours also contradict the standards set by the Ethiopian Labor Proclamation which indicates normal hours of work shall not exceed eight hours a day or forty-eight hours a week [31].

This might expose the sewing machine operators to develop NP because of muscle fatigue, decrease fitness, or increase discomfort in the musculoskeletal system.

This study revealed that sewing machine operators who were continuously working without break time 5.888 times are more likely to develop NP than who were taking break time effectively. This study is in line with a study done in Iran [6].The possible similarities in both studies are the relative sample size, response rate, data collection tool, and similar study design. In addition, a possible explanation could be continuous work without break develops NP because of stress imposed on the cervical vertebral structures and muscles while working in a forward bending position to operate the machine.

This study found that sewing machine operators who were working in prolonged sitting (in the same position for greater two hours) were 4.5 times more likely to develop NP than those who did not had prolonged sitting. This is supported by the study conducted in Iran among sewing machine operators [6].The possible similarity might be due to the similar sample size, study design, and data collection tool. This body region neck is frequently affected because the sewing operation is characterized by a static sitting posture, a forward inclined posture of the head and trunk, and relatively uncomfortable ankle and knee angles [32]. Another possible explanation is prolonged sitting in an awkward position and forced upper limb movements with up-lifted shoulders, causing strain in the neck. On the other hand, working actively in the same position for a longer time results in structural damages in the skeletal muscles, tendons, joints, and nerves, causing NP. The static and inflexible posture as working position for an extended time might also develop muscle stiffness, leading to NP.

Moreover, in this study, sewing machine operators who were involved in repetitive movement/activities were 4.5 times more likely to develop neck than those who were not involved. This study is in line with the research conducted in Estonia [8]. The possible similarity could be the usage of similar study design and data collection methods. This is possibly not amazing because of those doing a highly repetitive tasks involve in frequent head and trunk bending movements for a prolonged time. Therefore this imposes unacceptable postural loading on the neck. Another explanation might be that repetitive work of the muscles produce tension due to overuse, and this leads to having muscle fatigue and pain. In general, finding an appropriate workplace and working conditions, physically and mentally, for sewing machine operators can help in preventing NP.

6. Limitations of the study

This is a self-reported pain; there might be underestimation of the prevalence of NP. There may be a recall bias because respondents tend to remember recent events and the cross-sectional nature does not show cause and effect. In addition, the results of this study may not represent for male workers as they have small proportion and small sample sizes in the present study.

7. Conclusion

This study had showed that NP was a major public health problem. In this study, continuous work without break, prolonged sitting for greater than two hours in the same position, working greater than eight hours per day, and highly repetitive activity are associated with NP.

8. Recommendations

The government and the owner of the garment industries should give special attention to prevent and control the problems through proper occupational health and safety policy implementation in the country. It is recommended to study using observational and longitudinal study design for further research.

Consent for publication

Not applicable.

Availability of data and materials

Data will be available upon request from the corresponding author.

Funding

This study was funded by Mekelle University. The funder had no role in the study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

Author's contributions

GHB* and GRT designed the study, developed the tool, and supervised the data collection activity. GHB*, SAM, and BFG revised the proposal, carried out the statistical analysis, interpretation of the finding, and writing of the manuscript. All authors revised and approved the final manuscript.

Conflicts of interest

All authors have no conflicts of interest to declare.

Acknowledgments

The auhtors thank the Mekelle University College of health sciences for their cooperation and financial support to conduct this research. They also thank the study participants for their trust and collaboration during data collection.

References

[1] Binder AI. Cervical spondylosis and neck pain. Bmj 2007;334(7592):527–31.
[2] Hoy D, et al. The global burden of neck pain: estimates from the global burden of disease 2010 study. Ann Rheum Disease 2014;73(7):1309–15.
[3] Vos T, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic

analysis for the global burden of disease study 2015. The Lancet 2016;388(10053):1545–602.
[4] Hassan K, et al. Prevalence, risk factors, description and intensity of neck pain in sewing machine operators. Int J Scient Eng Res 2017;8(7):1040.
[5] Öztürk N, Esin MN. Investigation of musculoskeletal symptoms and ergonomic risk factors among female sewing machine operators in Turkey. Int J Indust Ergon 2011;41(6):585–91.
[6] Dianat I, et al. Association of individual and work-related risk factors with musculoskeletal symptoms among Iranian sewing machine operators. Appl Ergon 2015;51:180–8.
[7] Senarath M, et al. Prevalence of neck pain among female sewing workers due to bad posture in garment factories of Kurunegala; 2014.
[8] Merisalu E, et al. Predictors and prevalence of musculoskeletal disorders among sewing machine operators. Agron Res 2016;14(4):1417–26.
[9] Bandyopadhyay L, et al. Musculoskeletal and other health problems in workers of small scale garment industry–an experience from an urban Slum, Kolkata. IOSR Journal of Dental and Medical Sciences 2012;2(6):23–8.
[10] Jahan N, et al. Prevalence of musculoskeletal disorders among the Bangladeshi garments workers. SMU Med J 2015;2(1):102–13.
[11] Maduagwu S, et al. Work-related musculoskeletal disorders among self employed sewing machine operators in Maiduguri, Nigeria. Occup Med Health Aff 2015.
[12] Akinpelu AO, et al. Work-related musculoskeletal pain and health-seeking behavior among Nigerian sewing machine operators. Trop J Med Res 2016;19(2):152.
[13] Balakamakshi K, Ganguli A, Parimalam P. Preliminary investigations into the impact of an ergonomics intervention for garment workers. Ergon SA: J Ergon Soc South Afr 2009;21(2):30–40.
[14] Shazzad MN, et al. Musculoskeletal symptoms and disorders among 350 garment workers in Bangladesh: a cross-sectional pilot study. Int J Rheum Diseases 2018;21(12):2063–70.
[15] Khan AR, Khan J. Musculoskeletal symptoms among female garmenmts worker: Working Environment; 2018.
[16] Bayzid B, et al. Prevalence and determinant factors OF musculoskeletal pain among female ready made garment workers residing IN northern Dhaka City: a cross-sectional study. Prevalence 2019;3(2).
[17] Hayes M, Cockrell D, Smith D. A systematic review of musculoskeletal disorders among dental professionals. Int J Dent Hyg 2009;7(3):159–65.
[18] Chan J, et al. Preventing musculoskeletal disorders in garment workers: preliminary results regarding ergonomics risk factors and proposed interventions among sewing machine operators in the San Francisco Bay Area. Appl Occup Environ Hyg 2002;17(4):247–53.
[19] Parimalam P, Kamalamma N, Ganguli A. Ergonomic interventions to improve work environment in garment manufacturing units. Ind J Occup Environ Med 2006;10(2):74.
[20] Kunda R, Frantz J, Karachi F. Prevalence and ergonomic risk factors of work-related musculoskeletal injuries amongst underground mine workers in Zambia. J Occup Health 2013;55(3):211–7.
[21] Macdonald S, MacIntyre P. The generic job satisfaction scale: scale development and its correlates. Empl Assist Quart 1997;13(2):1–16.
[22] https://teorionline.files.wordpress.com/2011/04/unit-3-the-workplace-stress-scale.pdf, 2020.
[23] Kuorinka I, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18(3):233–7.
[24] Banerjee S, et al. Work related musculoskeletal morbidity among tailors: a cross sectional study in a slum of Kolkata. Kathmandu Univ Med J (KUMJ) 2016;14(56):305–10.
[25] Van L, et al. Prevalence of musculoskeletal symptoms among garment workers in Kandal province, Cambodia. J Occup Health 2016;58(1):107–17.
[26] Neeraja Telaprolu MS. Visual and musculoskeletal problems among sewing machine operators in readymade garment industury; 2016.
[27] Wang P-C, et al. Work-organisational and personal factors associated with upper body musculoskeletal disorders among sewing machine operators. Occup Environ Med 2007;64(12):806–13.
[28] Yu W, et al. Work-related injuries and musculoskeletal disorders among factory workers in a major city of China. Accid Anal Prevent 2012;48:457–63.
[29] Niu S. Ergonomics and occupational safety and health: an ILO perspective. Appl Ergon 2010;41(6):744–53.
[30] Bandyopadhyay L, et al. Musculoskeletal and other health problems in workers of small scale garment industry-An experience from an urban slum, Kolkata. J Dent Med Sci 2012;2(6):23–8.
[31] https://chilot.me/2011/08/proclamation-no-3772003-labour-proclamation/ .2018.
[32] Polajnar A, Leber M, Herzog NV. Muscular-skeletal diseases require scientifically designed sewing workstations. Strojniski Vestnik/J Mech Eng 2010;56(1).