ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF PREVENETIVE MEDICINE

PREVALENCE OF MUSCULOSKELETAL DISORDERS AMONG FEMALE WORKING IN SITTING AND STANDING WORK POSTURE OF GARMENT WORKERS IN GALAN CITY, OROMIA, ETHIOPIA, 2021.

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List of Acronyms and Abbreviations

AAU	Addis Ababa University
AOR	Adjusted Odd Ratio
BSC	Bachelor of Natural Sciences
BOLSA	Bureau of Labor and Social Affairs
BMI	Body Mass Index
COR	Crude Odd Ratio
CI	Confidence Interval Level
E.C	Ethiopian Calendar
ETB	Ethiopian Birr
FDRE	Federal Democratic Republic Of Ethiopia
FMHACA	Food, Medicine and Health Care Authority
HSE	Health and Safety Executive
ILO	International Labor Organization
MOLSA	Ministry Of Labor and Social Affairs
MSDS	Musculoskeletal Disorders
NIOSH	National Institute of Occupational Safety and Health
OHS	Occupational Health and Safety
SPH	School Of Public Health
SPSS	Statistical Package for Social Science
VIF	Variance inflation factor
WHO	World Health Organization
WRMSDS	Work Related Musculoskeletal Disorders

Abstract

Background: Musculoskeletal disorders are one of the serious health problems that frequently occur in workplaces. Female workers are engaged more dominantly in garment factories and highly affected in musculoskeletal disorder. The problem was frequently reported in the growing textile industries of developing countries especially among the garment workers. The magnitude and associated factor of work-related musculoskeletal disorder of female garment workers who worked in a prolonged sitting and standing work posture was not adequately investigated in Ethiopia.

Objective: The study aimed to assess the prevalence and associated factors with work-related musculoskeletal disorder among females working in sitting and standing work posture of the garment Galan city, Oromia, Ethiopia.

Methods: An institutional-based cross-sectional study was conducted from May 1, 2021 to 30, 2021 among 410 female garment workers selected from factories located at Galan city, Oromia, Ethiopia. Four data collectors and one supervisor were involved in data collection. A pre-tested standardized Nordic Musculoskeletal questionnaire was implemented by the interviewer-administered for data collection. A simple random sampling method was used to recruit study participants from the selected garments. Data was entered into EPI info version 7, analyzed, and cleaned by using SPSS version 23. Frequency tables, graphs, and descriptive summaries were produced to describe the study variables. A model fitness, collinearity test, and multiple logistic regression of variables were done. Independent variables with a p-value less than 0.05 under 95% CI were considered as having a significant association with the dependent variable.

Result: The overall prevalence of work-related musculoskeletal disorders during the last one year was 64% with 95% C.I: (59, 68). Lower back is the most commonly affected body region (51%), followed by neck (43%) and shoulder (38%). Factors such as always repetitive work [AOR: 2.6, 95% CI (1.1-5.2)] , working hour per week [AOR: 2.9, 95% CI (1.8-3.4)] ,Always high loaded work [AOR: 2.4, 95% CI (1.1-4.0)], sitting work posture [AOR: 1.8, 95% CI (1.1-3.0)] , ages above 29 years[AOR: 2.8, 95% CI (1.1-7.9)] , service above 10 years [AOR: 3.0, 95% CI (1.4-4.8)], other than garment work of doing home activities [AOR: 2.8, 95% CI (1.4-4.6)] , alcohol drinking behavior [AOR: 3.5, 95% CI (1.2-9.6)], ,job stress[AOR: 2.8, 95% CI (1.3-4.5)] and job satisfaction [AOR: 2.9, 95% CI (1.3-6.3)] were significantly associated with musculoskeletal disorder.

Conclusion: A higher prevalence of work-related musculoskeletal disorder is reported, about two-third of female garment workers had been suffering. Personal and work-related factors are significantly associated with work-related musculoskeletal disorders. Therefore, it should be use work rotation, to decrease repetitive and high loaded work exposure, give attention to health and safety rules of ergonomics issues.

Key words: female garment workers, work related musculoskeletal disorder, working posture

1. Introduction

1.1 Background

The musculoskeletal disorder comprises different parts of any compliant of bones and joints of human beings in their adjacent structures, muscles, tendons, and ligaments. Most study shows that musculoskeletal disorder is one of the most leading causes of human being disability problems and frequently occurs in work-related areas in the world (1, 2). The major study mainly concerned with disability injury and painful causes or associated factors by "work-related musculoskeletal disorder" (WRMSDs). A study report held in the world of Health and safety executes estimates that the total number of WRMSDs cases was 553,000 out of 1,243,000 all work-related illnesses in 2014/15. This accounts for 44% of the overall, which is a large burden even in developed countries(3).

Factors providing to the development of the work-related musculoskeletal disorder in female garment workers are widespread and most ergonomic occupational injuries had their own contributing factors in developing countries. Several studies in low and middle-income countries have reported a high prevalence of lower back, neck, and hand/wrist pain. Many jobs in the garment industries were arranged in prolonged static working postures (4-6). Garment workers are often standing long hours, sitting and bending/twisting their backs forward or sideways during their activities might increase the risk of back and lower limb disorders (7, 8).

Textile has a long history of tradition in Ethiopia as traditional weaving, which is still practiced in the rural and semi-urban communities for making traditional clothes. The textile industry encompasses cotton producing, ginning, spinning, weaving, knitting, dyeing and finishing, and garment. The first modern mill, Dire Dawa Textile Factory was established in 1939 but the number of factories did not expand until the 1990s (9). In nowadays garment industries are rapidly growing sectors in Ethiopia as reports show that until the end of 2018. There are 130 textile and garment industries in the country among these 22 of them found in Oromia regional state special zone. The ownership status of the garments shows 13 of them are owned by local investors and others are foreigners. Approximately more than 48,000 workers (above 75% female) were working in the sector that became a great source of employment(10).

Many investigations reveal that a number of occupational factors determine the development of musculoskeletal disorders in garment workers. Thus, this study aimed to determine the musculoskeletal disorder at different body regions and the factors associated with the problem. There are categories of

factors that affect work-related musculoskeletal disorder such as work-related factor includes (prolonged static work, workload, working hours, health and safety training, repetitive work and seat comfort), Socio demography factors (age, sex, educational level, service year, and marital status), personal factors (body mass index, alcohol drink behavioral, smoking, history of MSD, physical activity, job satisfaction, and job stress) were the main and an important factors under the progress of the work-related musculoskeletal disorder(4-10).

1.2 Statement of the problem

Globally, work-related musculoskeletal disorders account for around 40% of the total compensated cost of occupational diseases and injuries. It has a huge impact on the public health problems and economic loss of the society (4). WRMSDs cost the economy 6.9 million working days on average per case, with 498,000 cases of the work-related musculoskeletal disease out of 1,354,000 cases of work-related illness. Because of the long duration of job impairment and reduced productivity, it has an economic effect (3). WRMSDs are responsible for morbidity in many working populations and are known as an important occupational problem with increased compensation and health costs, reduced productivity, and lower quality of life. Therefore, work-related musculoskeletal disorders are one of the most important occupational health problems(3, 8).

Many studies state that above 75 % of the working force undergarment industries are female dominancy in the developing countries and they take risks mostly. For instance, a study conducted in Sri Lanka among 164 female garment workers showed that the prevalence of back, knees, shoulder, hand/wrist, and neck (57.3%, 31.7%, 9.1%, 7.3%, and 6.7% respectively) (8), and a study conducted among India garment reported that the prevalence of at least one musculoskeletal disorder problems among females during one year was 77.9%(6). In addition, the study conducted in Bangladesh among 168 female garment workers showed the prevalence of lower back pain (24.7%) and neck pain (23.7%) (11). And also a study conducted in Canada reported that females aged 15 and over, and working at least 25 hours per week had a high prevalence of musculoskeletal pain in the neck (18.4%), upper back (17.1%) ,and shoulders (15.0%)(12).

Again a study conducted in Pakistan shows that the female discomfort during the working time a mean of (M =28.73, SD=9.10) was higher than male (M=22.24, SD=7.17) at 95% CI (-10.60, -2.38) in garment manufacturing industries. A similar study reports that the discomfort of musculoskeletal disorder of female mean (M=25.39, SD=8.54) is more risks as compared to the male mean(M=23.62, SD=8.27) in the garment workers (13).

Many scholars show that there was a mixed-gender study conducted among garment workers to indicate the prevalence of musculoskeletal disorders in different working postures. However, very few studies were conducted and reported the prevalence of the musculoskeletal disorder in the female garment industries (5-8).

There is also a gap reported as well as information regarding the prevalence of WRMSD about garment female workers. To our knowledge, there were no published studies conducted in Ethiopia regarding female garment workers.

Therefore, the main aim of this study was to determine the prevalence of the work-related musculoskeletal disorder among female working in sitting and standing work postures of garment workers and the associated factors.

1.3 Significance of the study

Ethiopia, one of the developing countries, has established a strategy for the rapid growth of textile and garment industries as a major source of investment for the country's economic development. To meet these goals, the garment industry needs a stable and active workforce(10).

Therefore, there are different researches conducted in the area of garment industries regarding workplace exposure to occupational injuries and illness. Since the females were more at risk of musculoskeletal disorder problems. Hence, this finding is very important as the garment sector interims of high productivity and quality life issues among female workers in the factories. It also provides a suitable and healthy working environment for both organizational and social impacts. However, there is no study conducted on the prevalence of work-related musculoskeletal disorder focusing on the specific working group in female garment workers. However, this study was addressing the prevalence of musculoskeletal disorder in production workers of the selected female garment sectors among different body regions in the industries. Therefore, understanding what factors influence the prevalence of musculoskeletal disorders among female garment workers will help to prepare the strategy for the prevention and control of musculoskeletal disorders and disabilities.

Since there is no study found on female garment workers in a specific condition. Therefore, it provides significant baseline input for further similar detailed study settings and important information for the garment industry managers, employers, the policymakers of the government (MOLSA, BOLSA), Nongovernmental organizations, and other concerned bodies.

2. Literature review

2.1 General over view

Musculoskeletal disorder denotes health problems in terms of their muscles, tendons, skeleton, cartilage, ligaments, and nerves. It is the main cause of occupational injury and disability in working places for both developed and developing countries of the world. This health problem particularly if the mechanical workload is higher than the load-bearing capacity of the components of the musculoskeletal system and increases occupational stress injuries (3, 4, 6). The study conduct in Bangladesh the common health problem in female garment workers shows that musculoskeletal disorder was the leading health problem, which was 57.5% of workers that had in different sites of the body (14). Another study in Bangladesh also shows 57% of female workers in the garment factory had to work by sitting for a long time that causes problems in their bones. These two studies show that the findings were in line with how much the female was at risk of MSDs(15). According to the study of Cambodia and Sweden 92% and 75% respectively, having reported musculoskeletal disorder symptoms at least in one of the body regions due to work in garment industries(4, 16). Most workers in Cambodia had poor posture due to prolonged static work posture for 10 to 12 hours per day, according to the report. Sewing workers had prolonged sitting periods of around 10 to 12 hours per day in which they used both hands and afoot to control clothes and a sewing machine(4).

According to various reports, MSD is the most common health issue among adults in developing countries, affecting 20-40% of the adult working population. In developed countries, poor working posture and the lack of an effective job injury was prevention program contributes to a very high incidence of musculoskeletal disorders. Musculoskeletal disorders have an effect on workers, employers, and culture, as well as occupational health issues. As a result, it has direct and indirect effects on a country's economic activities. In Europe, over 40 million employees are affected by work-related musculoskeletal disorders (3, 17, 18).

2.1 .1 Burden of work related musculoskeletal disorder

The global burden of disease study estimates that low back pain was among the top ten diseases and the highest number of daily-adjusted life year's injuries worldwide. So Low Back Pain arising from work-related exposures at working place is an important cause of disability around the globe(3, 7).

The common risk factors of WRMSDs are awkward postures, prolonged static work posture, and repetitive movements of the work in the garment industries faced by workers. A study conducted in Sri Lanka shows that from musculoskeletal disorder among these 57.3 %(back pain), 31.7 %(knee), and 9.1 %(shoulder) have problems in 2013(8). In another study conducted in Ethiopia, in 2014, the prevalence of self-reported work-related neck and shoulder musculoskeletal disorders was 42.7% and 50.0% respectively(7). In 2018, a survey in Bangladesh found that 24.7 % of people had lower back pain and 23.7 % had neck pain (11).

The disease burden of musculoskeletal disorders is a major concern for both developed and developing countries when it comes to occupational exposure. Musculoskeletal disorders, for example, are one of the most common forms of collective occupational diseases, according to the European Agency for Safety and Health at Work(17, 19). Between 2009 and 2010, 2% of the working population in the UK, or nearly 572,000 jobs, had WRMSDs; on average, each worker missed 13.4 days of work(17). Work-related MSDs accounted for 34 % (487,900) of all work-related accidents and illnesses in the United States in 2008. As a result, the number of people disabled by work-related MSDs has gradually increased, making it one of the most costly health issues in modern industrial societies (20). A cross-sectional analysis in Ghana found that female garment workers often experience pain in their lower back, shoulder, neck, and upper back (37.5 %, 44.3 %, 33 %, and 30.7 %, respectively)(21).

2.1.2 Magnitude of work related musculoskeletal disorder in garment workers

According to a survey of 325 female garment workers conducted in Dhaka, The prevalence of back pain was found to be 37.7%, neck and shoulder pain 26.4 %, chest 15.1 %, wrist and hand 14.2 %, lower abdomen 3.9 %, and lower limb 3.77% in Bangladesh. The vast majority of the respondents (60.0%) claimed that they had musculoskeletal disorders in various parts of their bodies(14). Another research in Bangladesh found that above half of female garment workers suffer from musculoskeletal disorders, with an overall prevalence of 51.7 %(22). The prevalence of musculoskeletal disorders among garment workers was found to be 58.5 % in a study of 172 small-scale garment workers in India. The most

frequently identified disorders were neck (46.1 %), upper back (27.0%), lower back (24.0 %), shoulder (18.3 %), and hand/wrist (17.3 %) most common reported prevalence(23). Again a study held in the USA (California) reported that the prevalence of musculoskeletal disorder among female garment workers in the neck (33%), back pain(48%), and shoulder (23%) (24). A study conducted in South Korea showed that the prevalence among 156 women garment workers 34.6% had the musculoskeletal disorder in at least one of the body region (25). Moreover, the study conducted in China reports showed that musculoskeletal disorder of most commonly affected lower back, neck, shoulder, and upper back, with prevalence rates of 28.0%, 24.0%, 18.6% ,and 15.5%, respectively(26). Another study conducted in Bangladesh shows that the prevalence of musculoskeletal disorder was highest in the lower back (24.7%) followed by the neck (23.7%) and knees (17.7%) among readymade garment workers (11). In addition, a study held in Ghana reported that the most often pain-body regions were shoulder 44.3%, lower back 37.5%, neck 33.0%, and upper back 30.7% in the past year (21). Similarly, two studies conducted at a different time in Bangladesh reported that garment workers suffer from back pain 68.5%, neck pain 65.5%(2), and the prevalence of musculoskeletal disorder 58.7% with the most commonly affected body regions were lower back 24.7%, neck 14.0% ,and shoulder 5.3% in the past 12 months among garment workers(18).

In a study of 422 garment workers in Galan, Ethiopia, the prevalence of self-reported work-related elbow, wrist, neck, and shoulder pain was 37%, 35%, 42.7%, and 50 %, among female workers (1, 7).

2.2 Factors associated with work related musculoskeletal disorder in garment workers

2.2.1 Socio demographic factors

The WRMSD and a variety of socio-demographic factors have been well established in a large body of literature. For example, a study conducted in Bangladesh among female garment workers revealed that there is a strong connection between age, year of experience with work-related musculoskeletal disorders (15). In a study conducted in India among female textile workers, there is a strong relation of age, marital status, and educational level with work-related musculoskeletal disorders(27). Another study held in Iran among sewing machine operators showed that more female workers reported in their upper back, and hand/wrist pain symptoms were higher in females than males. The prevalence of shoulder, knee, and ankle/foot symptoms increased with age (28). According to a study conducted in Bangladesh, the prevalence of female illness sufferers was higher (33.6%) than males (10%) in the age groups of 21-25 years(29). Women, rather than men, in high-strain jobs were more likely to experience back problems

odds ratio (OR 1.60, 95 % CI 1.14 - 2.28) and restricted operation (OR 1.98, 95 % CI 1.16 - 3.48) than those in low-strain jobs, according to a study conducted in Turkey among textile industries (30).

2.2.2 Personal factors

Personal factors such as increasing age, education, alcohol drinking, and personal smoking history were established as significant predictors of WRMSDs in a cross-sectional study conducted in Sri Lanka, Bangladesh, the United States of America, the United Kingdom (UK), and Thailand (8, 14, 31-33).

Factors such as quality of life, health satisfaction, and perceived general health were also found to be significantly linked to the incidence of MSD in most (54.4 %) women who classified their overall quality of life as either very well or good; 63.8 % were satisfied with their health in a study conducted in Sri Lanka among female garment workers. The physical domain received the highest average score of 70.2 %, while the psychological domain received the lowest score of 42.5 % (8). A two-year follow-up study of sewing operators in Denmark measured job stress in relation to MSDs, finding that high-stress workers had a more than 2-fold higher prevalence than low-stress workers (34).

According to a study conducted in India with golden staff, the prevalence of MSDs, body part stress ratings, and postural stress were all lower when sitting on the floor with folded legs compared to squatting and sitting on the floor with extended legs(35) .

2.2.3 Work related factors

The Research conducted in the United States of America (USA) to determine work-related risk factors for the sewing operator machine revealed that the worker normally sits in nonadjustable workstation furniture for the entire shift (eight to ten hours per day, five to six days per week), causing neck and trunk flexion. The higher incidence of hand/wrist and knee/ankle pain in female garment workers could be attributed to higher force exertion and wrist velocity of workers' hands and legs, as well as prolonged exposure (36). Another research in the United Kingdom found an association between MSD and work-related musculoskeletal disorders. According to the UK Health and Safety Executive (HSE), 4.7 million working days (full-day equivalent) were lost in 2018/19, mostly due to back pain that was worsened (37). Weak workstation layout (i.e. incorrect table and chair heights, and nonadjustable equipment) and the extremely repetitive nature of the work are likely to be the primary contributors to the high incidences of MSDs, a study held in Botswana on ergonomics under sewing operator machines (33). In addition, in a study conducted in Turkey, WMSDs are substantially correlated with operating at 4.6 times the risk of

never feeling pressed (OR: 4.68, CI: 2.11-10.40).Women had a high rate of MSDs as well as high ergonomic risks, and the majority (65%) had MSDs in different sections of the body in the previous six months (38). A study held in Australia found that working related factors workplace design (workstation, design of seats, lighting, and job design) were associated with WMSDs (32).

A study conducted in Pakistan, female staff recorded higher levels of pain (mean = 2.96, S.D. = 1.39) than their male colleagues (mean = 1.27, S.D. = 0.65). In the garment manufacturing industry, standing staff experienced more pain (mean = 2.73, S.D. = 1.31) than sitting workers (mean = 1.09, S.D. = 0.38) (13). In a study conducted in Ghana, participants were observed bending, spinning, sitting for long periods, and stretching. Awkward postures can cause muscle pain and decrease productivity performance (21) . Another research in India found that 58.8% of 480 standing and sitting work posture staff (82.1 % and 17.9%, respectively) had at least one form of musculoskeletal condition. The most common type was weakness/pain of limb (40.2%) followed by back pain (34.2%), joint pain (17.9%), and pain/ stiffness in the neck (16%) (27) .

In a study held in South Africa, working posture exposures in the workplace were significantly associated with musculoskeletal pain. Among these the neck and shoulders odds ratio (OR) 5.38 (95% CI) 1.16 - 25.0) for repetition, and OR 3.91 (95% CI 1.11- 13.7) for seated compared with the standing job; the pain of the wrists and hands OR 10.2 (95% CI 1.39 - 75.6) for a high summed score of dynamic postures of the wrist have been reported (39).

Generally, for female garment workers, occupational exposure to work-related musculoskeletal disorders factors can be categorized as socio-demographic, work-related factors, personal factors. Therefore, we can differentiate the main factors associated with MSDs of the workers after the findings.

2.3 Conceptual framework

This conceptual framework of work-related musculoskeletal disorder was developed by reviewing different kinds of literature regarding the associated factors of dependent and independent variables. The associated factors were divided into three groups based on the literature review of musculoskeletal disorders in the garment workers. Work-related musculoskeletal disorder is mainly caused by different factors. Among these associated factors with WRMSD are socio-demographic factors (age, sex, marital status, educational level, work experience, and monthly income); work-related factors (like job category, payment methods, workload, repetitive movement, working hours, break times/rest, work posture and professional training), personal factors (BMI, smoking, drinking, physical activity, past MSD history,

job satisfaction and job stress) (1-8, 38). Socio-demographic factors, Behavioral and Psychosocial factors, work-related factors affect musculoskeletal disorder either directly or indirectly. In another case, fixed work posture factors affect directly work-related musculoskeletal disorders. For detailed understanding and explanation, the conceptual framework model was shown below (Figure 1).

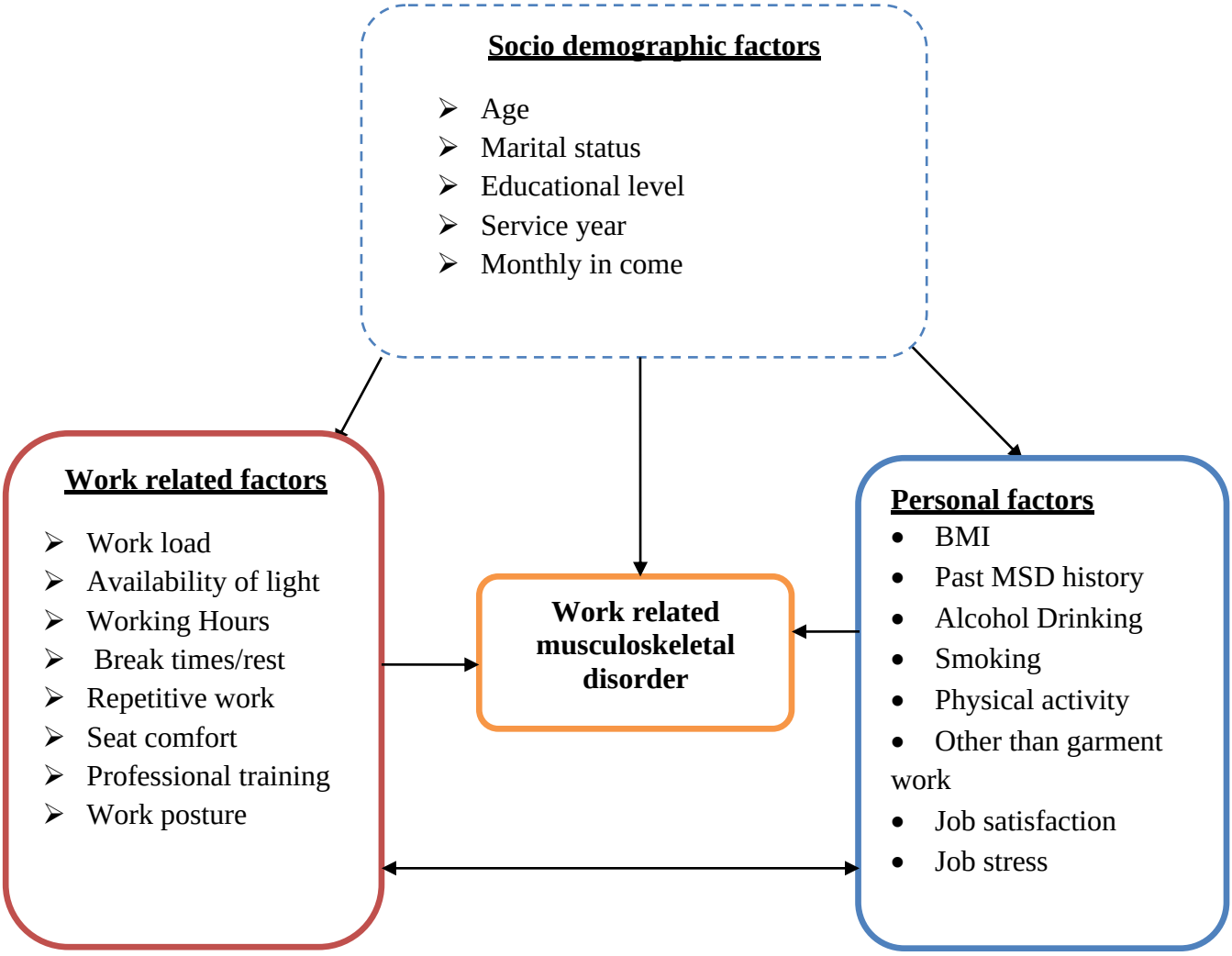


Figure 1 : Conceptual framework on musculoskeletal disorder and associated factor adopted and modified from different literature review

3. Objectives

3.1 General objective

❖ To assess the prevalence and associated factors with work-related musculoskeletal disorder among females working in sitting and standing work posture of the garment Galan city, Oromia, Ethiopia 2021.

3.2 Specific objectives

- To determine the prevalence of the work-related musculoskeletal disorder among female working in sitting and standing work posture of the garment workers in Galan City.

- To identify the factors associated with the work-related musculoskeletal disorder among female working in sitting and standing work posture of the garment workers in Galan City.

4. Methods

4.1 Study design

An institutional-based cross-sectional study was used to assess the work-related musculoskeletal disorder among female working in sitting and standing work posture of the garment workers in Galan city, Oromia, eastern parts of Ethiopia.

4.2 Study area and period

From May 1 , 2021 to 30, 2021, the study was performed in Galan city administration, Oromia special zone. According to the city administration, it has composed of four kebeles and is situated at a height of 2373 meters above sea level. The total land area is 9068.35 hectares (9km2) in size. Galan city is one of the industrial zones in Oromia regional state, which was located southeast direction of 25 km far from Addis Ababa, the capital city of Ethiopia (40). Most of the foreigners and domestic investors were investing in different industrial activities. Among these industrial activities, the garment factories were the most common industries in the city. So based on our study we have selected two large female dominant garment industries among twenty two factories owned by foreign investors, which have 342 and 539 employed workers.

This study was conducted in these two garment industries in which were selected purposely in Galan city. Among twenty two industries located in the area, we chose two large factories that have more female workers. According to our agreement with the factories were labeled as Garment A, and Garment B in this study. The detailed characteristics of factories are presented below.

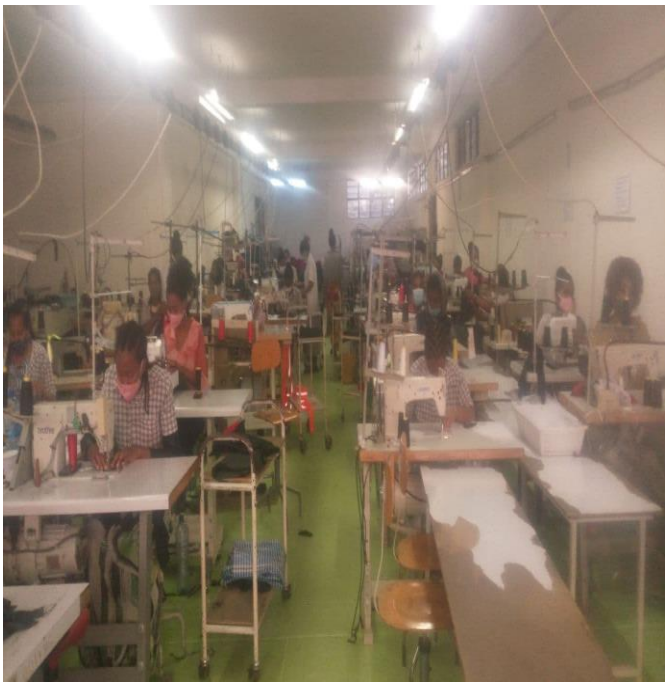
Garment A: Have 342 employees and 296 production unit female workers. It was established in 2008. Garment B: Have 539 employees and it has 480 production unit female workers. It was established in 2004

Both factories follow the same production process flow of raw material preparation, pattern and sample preparation, cutting, makeup, and finishing. To address these entire tasks, they have different working sections. Such as the Cutting section, finishing section, and Sewing section. However, based on our study subject we grouped into three major task sections with their working positions (Table 1).

Table 1 : Department, job group and main task of garment industries of workers with their work position.

work posture	Work section	Job group	Tasks
Standing position	Cutting section	Cutting personnel	Spread fabric , cutting & fusing, bundling , cut panels and quality check
	Finishing section	Finishing personnel	Final pressing, numbering, printing, ironing and packing
Sitting position	Sewing section	Operators	works sewing and pressing activities

Source: - Ethiopian Textile Industry Development Institute (TIDI)



Cutting section sample photos sewing section sample photos

Figure 2: Sample photos of workers working in cutting and sewing sections in the garments, June 2021.

4.3 Source population:

All production female garment workers located in Galan city were source of population.

4.4 Study population:

The study population was all female workers among the selected garments.

4.5 Eligibility criteria

4. 5.1 Inclusion criteria

- The female workers who have worked at least 1 year.
- All-female production workers deployed in the selected garments.

4.5.2 Exclusion criteria

- Workers, who were sick, annual rest, have maternity and family leaves.
- Those who had a previous history of sever car accident, and injuries.

4.6 Variables

4.6.1 Dependent variable

Work related musculoskeletal disorders

4.6.2 Independent variables

Socio demographic variables: age, marital status, educational level, service year and monthly income.

Work related variables: work load, seat comfort, available of light, repetitive movement, and health and safety training, working hours, work posture and rest.

Personal variables: Alcohol drinking, smoking, physical activity, BMI, past MSD history, job satisfaction and job stress.

4.7 Sample size determination

For objective one:

The sample size was computed using a single population proportion formula by taking the proportion of musculoskeletal disorder of 58.8 %, which was a previous study, conducted in India 2019, among female garment workers (27).By considering confidence interval level 95% and margin error of 5% assumptions.

$$n=\frac{\left(Z\frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

Where

- n= Initial sample size for the study population
- Z α/2 = Confidence interval level at 95% = 1.96, using a significance level of α=0.05.
- P = prevalence of musculoskeletal disorder among garment workers (0.59%).
- d = margin of error = 5%
- Z = A standard normal distribution value = 1.96

$$\mathbf{n = \frac{(1.96)^2 0.59(1-0.59)}{(0.05)^2}}$$

n= 372 x0.1=38

n= 372+38 = <u>410</u>

For objective two: **To assess the associated factor of musculoskeletal disorder**

This was computed by using the double population proportion formula based on the following assumptions, confidence interval at 95%, and marginal error of 5%.

$$n_1=\frac{\left[Z_{\frac{\alpha}{2}}\sqrt{\left(1+\frac{1}{r}\right)P(1-P)}+Z_{\beta}\sqrt{P_1(1-P_1)+\frac{P_2(1-P_2)}{r}}\right]^2}{(P_1-P_2)^2} \qquad P=\frac{P_1+rP_2}{1+r}$$

Where

- p = a pooled proportion, α = Type 1 error with a value of 5%,
- p1= the probability of event in the exposed which is 54%(27),
- p2= the probability of event in the non- exposed which is 37%(27),
- Zα/2= critical value of 95 % level of significance , r = ratio of exposed to unexposed
- Zβ = power of study to detect difference between the two groups ,
- Power at 80%, which is the value of 0.84.
- Odd ratio =2

$$n1 = \frac{[1.96\sqrt{\left(1+\frac{1}{1.5}\right)0.44(1-0.44)} + 0.84\sqrt{0.54(1-0.54)+\frac{0.37(1-0.37)}{1.5}}]^2}{(0.54-0.37)^2} = 112$$

$n1$ = 112 where as

$n2$ = r $n1$ 1.5 x112 =168, then total was n= $n1 + n2$ = 112 +168= 280

From the calculation, the sample size could be (280+28) =308 with including a 10% non-response rate. Therefore, by comparing the two sample sizes, we take an appropriate sample of the largest of 410 respondents as the study population.

4.8 Sampling procedures

The two garment industries were purposely selected from the whole industries that exist in the city by considering based on our objectives. We also consider the long working service years of the female workers in different departments of the garment industries. Then the study sample size was distributed into three different departments of the garments according to the worker proportion. A stratified random sampling technique was used for a reasonable representation of all workers in the three working departments. Workers' registrations were used as the sampling frame. Finally, a simple random sampling technique was applied to select the study participants from a list of their payment sheets in each section according to their proportion in the two garments. Then by the proportion of the garment, it was selected the number of representation study participants by using a simple random sampling technique.

Table 2: Sample size stratification based on their size with working positions and departments in two garment industries in Galan City.

Working department	Garment A		Garment B	
	Source	Sample	Source	Sample
Cutting section	92	48	132	70
Finishing section	68	36	96	51
Sewing section	136	72	252	133
Total	296	156	480	254

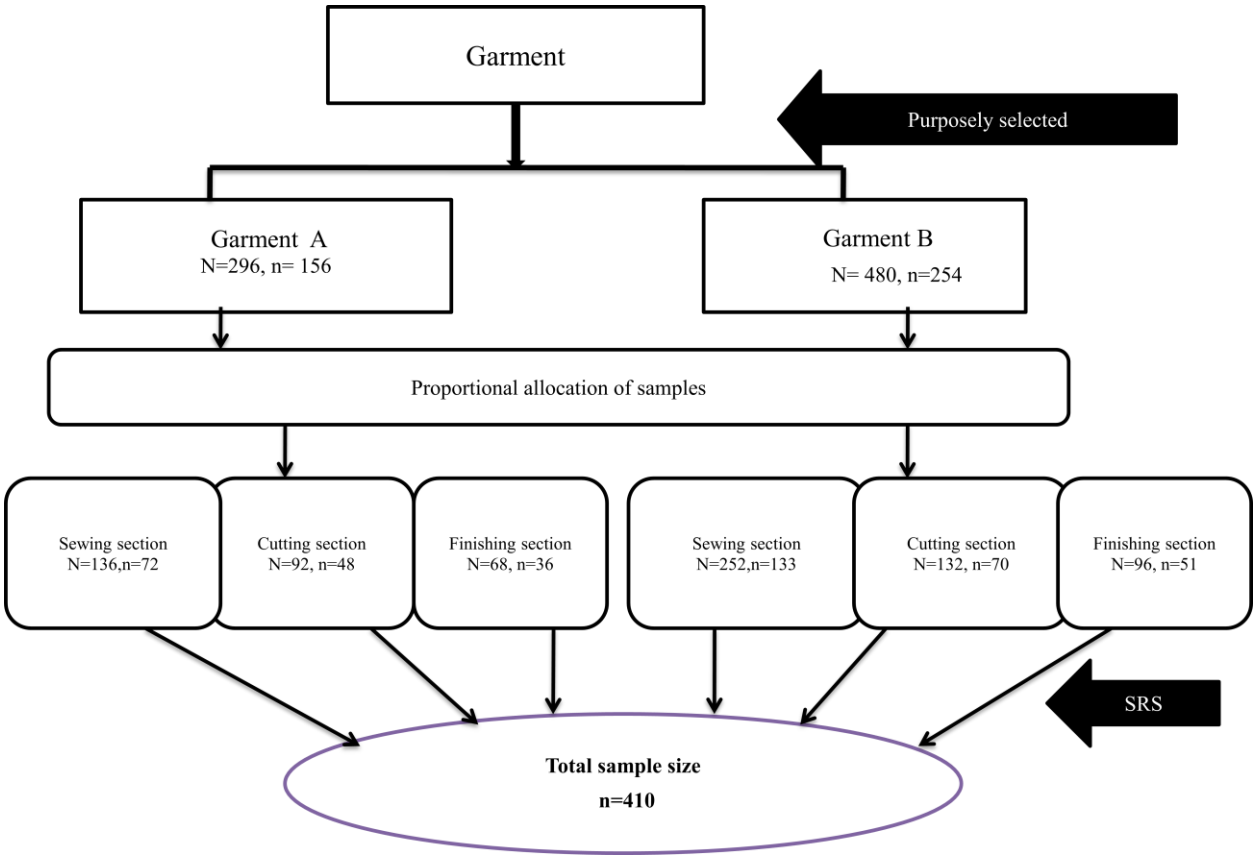


Figure 3: Schematic diagram of sampling procedure by tasks in garment factories of Galan city, Ethiopia May 2021.

4.9 Data collection procedure

4.9.1Questionnaire

The workers were face-to-face interviewed by using adopted Standardized Nordic musculoskeletal questionnaires for assessing the prevalence of work-related musculoskeletal disorders in different body regions. It is repeatable, sensitive, and useful as a screening and surveillance tool for musculoskeletal disorders. It also assesses the associated factors, which includes socio-demographic characteristics, work-related and behavioral factors, and assessing the prevalence of musculoskeletal disorders (18, 41-45). By using a standard translation procedure, the questionnaire was translated from English to Afaan Oromo and Amharic language for data collection, again translated back to English to ensure consistency as well as analysis.

4.9.2 Data collectors and supervisors

For data collection, purpose four data collectors their qualification is first-degree Environmental Health Professional and one supervisor qualified with Masters of Public Health was included in data collection activities. The interviews were managed face to face in Amharic as well as Afan Oromo language using trained data collectors.

4.9.3 Operational definition

Body segments: It includes neck, shoulder, upper back, lower back, hip /thigh, knee/leg and ankle/foot, wrist /hand of the body (46, 47).

Work related musculoskeletal disorders: is a self reported pain, discomfort for at least 2-3 work days during the past week and the last 12 months in any part of neck, shoulder, upper back, lower back, hip /thigh, knee/leg and ankle/foot and wrist/hand or at least shown on one of the body parts (13).

Job satisfaction: A score measured using the generic job satisfaction scale as yes (32 - 50) and no (10 – 31)(1, 48) .

Job stress: A score measured using the workplace stress scale as yes (16 to 40) and no (lower than or equal 15) (1, 49).

Body mass index: human weight in kilograms divided by the square of the height in meters (kg/m2)(1, 2).

- Underweight= BMI <18.50
- Normal range= BMI b/n 18.50-24.99

- Overweight = BMI b/n 25.00-29.99
- Obese= BMI ≥30.00

Cigarette Smoking: is a practice of smoking cigarette by female garment workers for at least one sticks of cigarette per day(1).

Alcohol drinking: it is a consumption of any kind of alcohol by garment female workers at least for two times per week for different purpose (1, 7).

Physical exercise: Performing any kinds of physical exercise at list two times per week for 30 minutes (1, 50).

Repetitive work within greater than 30 second- when workers exposed to repetitive task which repeat itself every 30 second in the same direction(50).

Availability of Lighting: - The presence of visible light which allow workers to move about easily and to carry out their work effectively(8).

Sitting posture: is a position of garment workers who perform activities by prolonged sitting in a restricted space for 2 hours or above without changing their positions (47, 50).

Standing posture: is a position of garment workers who perform activities by prolonged standing in a limited space for 2 hours or above without changing their positions (47, 50).

4.10 Data management

The collection of data was checked for completeness for each questionnaire, then coded, and stored in the appropriate place. The principal investigator did this checked completeness during and after the data collection every day. A data was entered into the prepared Epi-info 7 templates and exported to SPSS.V.23 for further cleaning and analysis.

A simple frequency and cross-tabulation were used for editing and cleaning the data to check for inconsistencies and completeness of outliers. Again, we checked missing values and outliers for the accuracy of the study analysis. The worker's job satisfaction was assessed using a five-point Likert scale standard contents to identify the level of satisfaction with their work. These options were (very dissatisfied, dissatisfied, neutral, satisfied, and very satisfied by giving weights from 1-5 each respectively) content with ten components. Then, this was computed according to Macdonald's workplace job satisfaction scale. The workers were classified into two categories by using the demarcation threshold as satisfied (32-50) and not satisfied (10-31) (48). In addition, the employee job

stress was assessed by using Marlin Company and the American Institute of Stress scale calculation. The employees were categorized into two as no stress (≤ 15) and had stress (16-40)(49). This job satisfaction and stress were calculated from ten components and eight components for each group respectively. Each participant's response could be summed and grouped under the above demarcation of job satisfaction and stress.

4.11 Data analysis procedures

After the data was coded, and entered into prepared EPI info 7 templates and exported to SPSS version 23 software programs for analysis, an odds ratio with a 95% confidence interval is used to measure the association between work-related musculoskeletal disorders and the independent (socio-demographic, behavioral and psychosocial and work-related) variables.

For specific objective one: descriptive findings were presented by frequency tables, graphs, percentage, and the proportion with 95% C. I and mean, the standard deviation was used to summarize the socio-demographic, behavioral, and psychosocial factors, work-related factors.

For specific objective two: To determine the independent factors associated with WRMSDs. Cross tabulation, bivariate logistic regression was used to explore the presence of a statistical association between different independent variables and outcome variables using crude odds ratio (COR) with 95% C.I. Bivariate logistic regression analysis and chi-square test was performed to see the existence and significance of association between dependent and independent variables. For both dependent and independent variables, descriptive analysis was performed, and a binary logistic regression model was used to examine the statistical relationship between different predictors and outcome variables. Independent variables with a p-value <0.2 under 95% CI was considered as further analysis having a significant association with the dependent variable in bivariate analysis were included in multivariable logistic regression analysis model to control the effect of confounders(1, 50). To determine the independent factors associated with musculoskeletal disorders, a multivariate logistic regression model with the hierarchical entry of variables was done. Variables with P <0.05 in the multivariate analysis were considered significant and presented in adjusted odds ratio (AOR) with 95% C.I.

Model fitting – By using Hosmer- Lemeshow goodness of test was done that showed x^2 =6.82 with df= 8 and a significant value of= 0.56. Since the chi-square test, values of the independent variables were smaller and the p-value was above the standardized p-value of 0.05. This indicated that the Hosmer-Lemeshow test could be insignificant at a p-value of <0.05 that describes the variable entered fits the

model. Therefore, the result of the regression analysis has suggested evidence for model adequacy well fitted with the predictors.

Collinearity test - was checked using the Variance Inflation Factors (VIF) and all values were below 2.4 indicated that the absences of collinearity among predictors (51).

4.12 Data quality management

The quality of data would assure before, during, and after the data collection by consecutive supervision. The questionnaire was prepared first in English and then translated into Amharic and Afan Oromo, finally retranslated back to English by independent translators to check for consistency. Following that, four data collectors and one supervisor received two days of instruction to familiarize them with the data collection procedures. Finally, a pre-test was conducted on 5% of the overall sample size (n = 21) of those who worked in two working areas of sitting and standing work positions of the garment. This was done in order for those who did not take part in the key study would be contacted. Uncertain questions were identified during the pre-test study were changed. Supervisors and prosecutors assessed the situation completeness, precision, and clarity of the data collected on a regular basis.

4.13 Ethical consideration

Ethical clearance was obtained from the Ethical Review Committee (REC) of Addis Ababa University School of Public Health. Permission was asked from the concerned body (MOLSA, BOLSA, and the industries). Verbal consent was obtained from respected participants after a necessary explanation about the purpose, benefit, and risk of the study and their right on the decision of whether or not to participate in the study. The study participants were strongly informed that there is no direct financial benefit and risk from this study, on the other hand, the study findings would be used to design strategies for the prevention and control mechanism of musculoskeletal disorder in the female garment workers. Concerning confidentiality, the names of respondents were not included in the questionnaire.

4.14 Dissemination of the results

The finding of this study will be presented to the School of Public Health, College of Health Sciences of Addis Ababa University. Again, it will be disseminated to the respective ministry of health (MOH), Ministry of labors and social affairs (MOLSA), and BOLSA of Oromia, Ethiopia. Further efforts will be made to publish the findings in a national or international journal.

5. Results

5.1 Socio-demographic characteristics of the study participants

The response rate is 100%. Above half of the respondents, 232(56.6%) were single and 167(40.7%) had married for both working postures. Almost majority 312 (76.1%) of the participants were in the younger age group which is less than 30 years and the mean age of the study subjects was 26.49 ±5.06SD. The study participants of 121(29.5%) and 267(65.1%) had completed primary and secondary school education respectively. Regarding the work experience of the respondent shows that the majority of 209(51.0%), 145 (35.3%) had served from 1-5 and 6- 10 years respectively. Concerning monthly salary 156(38.0%) of the workers had a monthly income below 1500 Ethiopian birr and 132(32.2%) had a monthly income of between 1501-2000 Ethiopian birr (Table 3).

Table 3: Distribution of Socio-demographic characteristic factors among participants in the selected garment in Galan city, 2021

Categories of variables	Frequency (n=410)	(%)
Age in years		
<20	23	5.6
21_24	157	38.3
25_29	132	32.2
≥ 30	98	23.9
Marital status		
Married	167	40.7
Single	232	56.6
Divorced	11	2.7
Education level		
Primary School Completed(1-8)	121	29.5
Secondary School Completed(9-12)	267	65.1
Certificate/diploma and above	22	5.4
Service year		
≤ 5 Years	209	51.0
6_10 Years	145	35.3
>10 Years	56	13.7
Monthly salary		
≤1500 ETB	156	38.0
1500_2000 ETB	132	32.2
2001_2500 ETB	66	16.1
≥2501 ETB	56	13.7

5.2 Personal characteristics of the study participants

Based on self-reported data of the study subject 350 (85.4 %) workers have body mass index (BMI) of normal weight (18.5-24.9kg/m²), forty-four (10.7%) overweight (25-29.9kg/m²) and sixteen (3.9%) had underweight according to WHO classification. Among workers in the two garments, 25(6.1%) of them had a habit of doing physical exercise at least two times per week. Most of the respondents 246(60.0%) were watching movies after leaving the garment. Almost all of the participants 410(100%) had no behavior of smoking cigarettes. However, regarding alcohol drinking behavior, 55(13.4%) of the participants had drunk at least two times per week for different purposes. Twenty (4.9%) of the respondents have a medical history of illness. On the other hand, about 239(58.3%) of the respondents were had job stress, and similarly above half of the total 222(54.1%) of them were not satisfied with their job (Table 4).

Table 4: Behavioral and psychosocial characteristics of the study participants among female garment workers in Galan city, 2021

Categories of variables	Frequency (n=410)	(%)
Body mass index		
Under Weight	16	3.9
Normal Weight	350	85.4
Over Weight	44	10.7
Habit of doing Physical Exercise		
None	385	93.9
Two times per week	25	6.1
Other than garment work		
Watching Movies	246	60.0
Reading Books	58	14.1
Doing home activities	106	25.9
Habit of alcohol drink behavior		
Yes	55	13.4
No	355	86.6
Medical history of illness		
Yes	20	4.9
No	390	95.1
Job stress		
≤ 15(No)	171	41.7
16-40(Yes)	239	58.3
Job satisfaction score		
10-31(Low)	222	54.1
32-50(High)	188	45.9

5.3 Work related characteristics of the respondents

Almost the majority of the workers, 373 (91%) were always exposed to repetitive work with the same task within 30 seconds. Three hundred and sixty-one (88%) of them had not taken training on health and safety issues at the workplace. About one hundred and ninety-four (47.4%) and 67 (16.3%) of the respondents were sometimes and always doing high-loaded work within hours respectively.

From the total, three hundred and forty-one (83.2%) of them had worked ≤48 hours per week, and sixty-nine (16.8%) had worked above 48 hours per week and had not broken period except lunchtime. Among this, the majority of the respondents 177(43.2%) had worked their task ≤ 48 hours and the study subjects of 28(6.8%) had worked more than 48 hours per week in the standing work position undercutting and finishing sectors. Again one hundred sixty-four (40.0%) had worked their tasks ≤ 48 hours and forty-one (10.0%) of the respondents were worked above 48 hours in sitting work position per week. The majority of 130(31.7%) of the respondents from the sitting work posture, the seat comfort was non-comfortable. Similarly, one hundred and forty-one (34.4%) respondents had worked in the same position above 2 hours in a bend over way (Table 5).

Table 5: Work related characteristics of study participants among female garment workers in Galan city, 2021.

Categories of variables	Frequency (n=410)	(%)
Repetitive work movement within <30 seconds		
Sometimes	37	9.0
Always	373	91.0
Train on health and safety		
Yes	49	12.0
No	361	88.0
Doing high loaded work		
Never	149	36.3
Some times	194	47.4
Always	67	16.3
Working hours per week		
≤48Hour	341	83.2
>48 Hour	69	16.8
Work position		
Standing	205	50
Sitting	205	50
Standing posture working hour per week		
≤ 48 hour	177	43.2
>48 hour	28	6.8
Sitting posture working hour per week		
≤ 48 hour	164	40
>48 hour	41	10
Seat comfort		
Comfortable	75	18.3
Non _Comfortable	130	31.7
Working the same position for 2 hour in bend over		
Yes	141	34.4
No	269	65.6

5.4 Prevalence of work related musculoskeletal disorder among different body segments

Among self-reported pain of the respondent in the past 12 months, lower back (51.0%), neck (43.2%), shoulder (38.0%), knees (36.8%), wrists/hands (35.4%), followed by upper back pain (33.2%) were the highest score prevalence results. Regarding the 7-day prevalence lower back (35.1%), neck (28.8%), shoulder (24.9%), wrists/hands (24.4%), and knees (19.5%) had scored high pain as shown in (Figure 3).

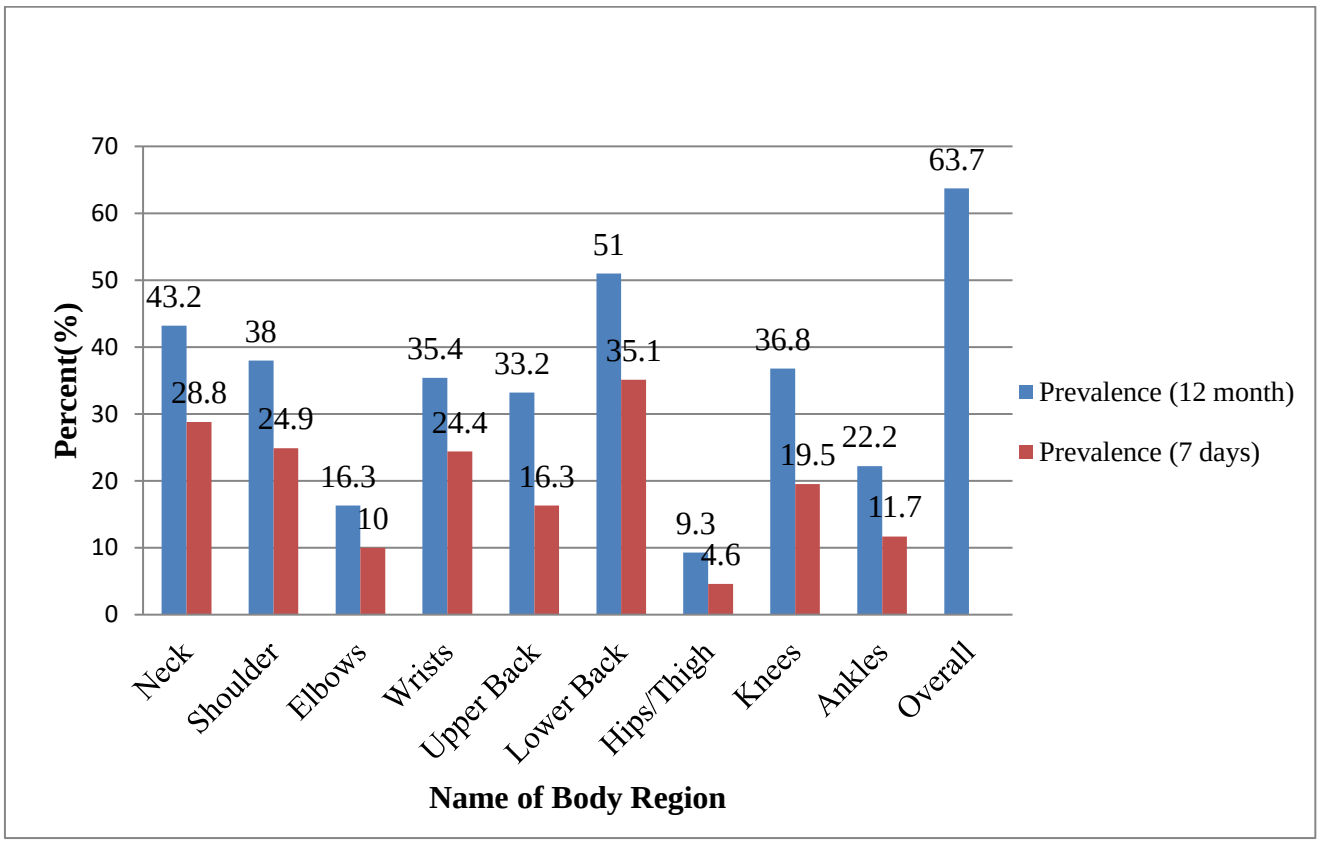


Figure 4: Prevalence of WRMSDs on different body segments in twelve month and 7 day among female garment worker (n=410) in Galan city, Ethiopia, 2021.

5.4.1 Prevalence of work related musculoskeletal disorder among two work postures in different body regions

The overall prevalence of musculoskeletal disorders were 127(62%) and 134(65%) in standing and sitting work posture respectively. The most commonly affected body regions were the lower back (46%, 56%) and neck (42%, 44%) in standing and sitting work postures respectively in the last year. Again the lower back (28%, 42%) and neck (27%, 30%) were the 7 days prevalence musculoskeletal disorder most commonly affected body regions of standing and sitting work position respectively (Table 6).

Table 6: Prevalence of musculoskeletal disorders in different body regions among two work postures

Body region	Standing position (n =205)				Sitting position (n =205)			
	In 12 month		In 7 days		In 12 month		In 7 days	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Neck	86(42)	119(58)	56(27)	149(73)	91(44)	114(56)	62(30)	143(70)
Shoulder	74(36)	131(64)	54(26)	151(74)	82(40)	123(60)	48(23)	157(77)
Elbows	28(14)	177(86)	16(8)	189(92)	39(19)	166(81)	25(12)	180(88)
Wrists	70(34)	135(66)	43(21)	162(79)	75(37)	130(63)	57(28)	148(72)
Upper Back	67(33)	138(67)	33(16)	172(84)	69(34)	136(66)	34(17)	171(83)
Lower Back	95(46)	110(54)	57(28)	148(72)	114(56)	91(44)	87(42)	118(58)
Hips/Thigh	4(2)	201(98)	2(1)	203(99)	34(17)	171(83)	17(8)	188(92)
Knees	68(33)	137(67)	35(17)	170(83)	83(41)	122(59)	45(22)	160(78)
Ankles	47(23)	158(77)	23(11)	182(89)	44(22)	161(78)	25(12)	180(88)
Overall	127(62)	78(38)	85(41)	120(59)	134(65)	71(35)	97(47)	108(53)

5.5 Factors associated with WRMSD

5.5.1 Bi-variate analysis

Socio demographic characteristics association with work related musculoskeletal disorder

Socio demographic factors: In the Bi-variate logistic regression analysis at p-value < 0.2, age, marital status, education status, service year, and monthly salaries were significantly associated with WRMSDs. By considering the odds of WRMSDs among female workers above 30 years of age had more than 6 times higher chance to develop WRMSDs than below 20 years of age [COR: 6.08, 95% CI: (2.16-17.14)]. In another way, monthly salary had a significant association with work-related musculoskeletal disorders. Their monthly salaries above 2000 birr have 5 times the odds of getting disorders than those who earn monthly salary below 1500 birr [COR: 4.76, 95% CI: (2.40-9.72)]. Service year was significantly associated with the dependent variable those who had service above 10 years were at higher risk of WRMSDs more than 7 times odd ratio than had service below 5 years [COR: 7.63, 95% CI: (3.30-17.62)]. However, workers who had been married, and education level were not significantly associated with a work-related musculoskeletal disorder (Table 7).

Table 7:Bi-variate analysis for socio-demographic factors with WRMSD among female garment workers in Galan city, 2021 (n=410).

Categories of variables	WRMSDs		COR 95% CI	P- value
	Yes	No		
Age in Years				
≤ 20	13	10	1	
21-24	56	101	0.43(0.18-1.04)	
25-29	105	27	2.99(1.18-7.56)	
≥30	87	11	6.08(2.16-17.14)	0.001
Marital Status				
Single	107	125	0.19(0.04-0.90)	0.036
Married	145	22	1.47(0.29-7.23)	
Divorced	9	2	1	
Educational Status				
Primary school(1-8)	84	37	1	
Secondary school(9-12)	161	106	0.67(0.40-1.06)	0.08
Above certificate	16	6	1.17(0.43-3.24)	
Monthly Salary				
≤1500 ETB	72	84	1	
1501-2000 ETB	86	46	2.18(1.35-3.51)	< 0.001
2001-2500 ETB	53	13	4.76(2.40-9.42)	
≥2501ETB	50	6	9.72 (3.94-23.99)	
Service year				
≤ 5 years	100	109	1	
6-10 years	112	33	3.70(2.30-5.94)	<0.001
>10 years	49	7	7.63(3.30-17.62)	

Personal factors associated with WRMSD among female garment workers

In these personal factors body mass index, recreation time, the habit of alcohol drink, medical history of illness, job stress, and job satisfaction were significantly associated with MSDs in Bi-variate analysis at a p-value of <0.2. Those workers who had passed their time other than garment work of doing home activities were nearly 3 times high risk of getting musculoskeletal disorder than of watching movies[COR: 2.72, 95% CI: (1.62-4.57)]. And also, study participants who have a habit of drinking alcohol had a 5 times higher chance to develop MSDs as compared to not drunk alcohol [COR: 5.51, 95% CI: (2.30-13.20)]. Medical history of illness was another factor show 5 times higher odds of getting pain from MSDs than non-illness [COR: 5.44, 95% CI: (1.25-23.80)].

Female garment workers who had stress by their job had 3 times more odds to develop WRMSDs than with no stress [COR: 3.39, 95% CI: (1.09-3.23)]. In the same way, those workers who didn't satisfy with their job had more than 4 times more likely to have WRMSDs compared to those satisfied by their job [COR: 4.01, 95% CI: (2.62-6.15)]. Body mass index and physical exercise were not significantly associated factors with a work-related musculoskeletal disorder (Table 8).

Table 8:Bi-variate behavioral and psychosocial related factors of WRMSDs among female garment workers in Galan city, 2021(n=410).

Categories of variables	WRMSDs		COR 95% CI	P- value
	Yes	No		
Body mass index				
Under Weight	11	5	1	
Normal Weight	211	139	0.69 (0. 24-2.03)	
Over Weight	39	5	3.55(0.87-14.50)	0.08
Habit of doing Physical Exercise				
Yes	11	14	1	
No	243	142	2.18(0.27-1.63)	**0.37***
Other than garment work				
Watching Movies	137	109	1	
Reading Books	42	16	2.09(1.11-3.92)	
Doing home activities	82	24	2.72(1.62-4.57)	< 0.001
Habit of alcohol drink behavior				
Yes	49	6	5.51(2.30-13.20)	< 0.001
No	212	143	1	
Medical history of illness				
Yes	18	2	5.44(1.25-23.80)	0.024
No	243	147	1	
Job stress				
16-40(Yes)	180	59	3.39(1.09-3.23)	<0.001
≤ 15(No)	81	90	1	
Job satisfaction score				
32-50(High)	88	100	1	
10-31(Low)	173	49	4.01(2.62-6.15)	<0.001

*Variables that were not significant at p value < 0.2 in bivariate logistic regression and were not candidates for multivariate logistic regression analysis.

Work related factors associated with WRMSDs

From out of work-related factors in Bivariate logistic regression analysis, repetitive work, training of health safety, working hours, doing high loaded work, work posture, seat comfort and bending over were significantly associated factors with a musculoskeletal disorder. Workers who were exposed to repetitive work within < 30 seconds always had 2 times odds more as compared to those sometimes exposed to repetitive tasks [COR: 2.84, 95% CI: (1.42-5.67)].

Garment workers who did not take health and safety training were at higher risk of pain in MSDs 3 times more than those who take safety training [COR: 3.28, 95% CI: (1.49-7.21)]. In the same way, workers who had worked for above 48 hours per week were at 3 times higher risk to develop MSDs than those who worked for 48hrs or less [COR: 3.19, 95% CI: (1.65-6.17)]. Doing highly loaded work for always was another factor significantly associated with work-related musculoskeletal disorders than not doing. It affects 4 times more to getting MSDs pain [COR: 4.16, 95% CI: (2.13-8.14)]. Work position of sitting workers was at higher risk of developing MSDs close to 2 times more than standing workers [COR: 1.90, 95% CI: (1.13-2.55)]. Similarly, those working in sitting posture for above 48 hours per week were 5 times higher risk to develop MSDs than those who worked for 48hrs or less [COR: 5.06, 95% CI: (1.72-14.91)]. Again the seat comfort was another factor, those workers who had not comfortable chairs were 3 times at higher risk to boost MSDs than comfortable chairs [COR: 2.74, 95% CI: (1.48-5.06)]. Workers who worked their tasks by bending over in the same position above 2 hours had 2 times more to develop MSDs as compared to not bending over the same manner [COR: 2.62, 95% CI: (1.65-4.16)]. Participants who had done their tasks in standing posture-working hour per week were no significantly associated factor with a musculoskeletal disorder (Table 9).

Table 9: Bi-variate analysis of work related factors for work related musculoskeletal disorder among garment female workers, Galan City,2021(n=410).

Categories of variables	WRMSDs		COR 95% CI	P- value
	Yes	No		
Repetitive work movement within <30 seconds				
Sometimes	15	22	1	
Always	246	127	2.84 (1.42-5.67)	0.003
Train on health and safety				
Yes	41	8	1	
No	220	141	3.28(1.49-7.21)	0.003
Over all working hours per week				
≤48Hour	204	137	1	
>48 Hour	57	12	3.19(1.65-6.17)	0.001
Doing high loaded work				
Never	71	78	1	
Some times	137	57	2.64(1.69-4.12)	
Always	53	14	4.16(2.13-8.14)	< 0.001
Work position				
Standing	118	87	1	
Sitting	143	62	1.90(1.13-2.55)	0.011
Standing posture working hour per week				
≤ 48 hour	98	79	1	
>48 hour	20	8	2.02(0.84-4.82)	**0.215***
Sitting posture working hour per week				
≤ 48 hour	106	58	1	
>48 hour	37	4	5.06(1.72-14.91)	0.003
Seat comfort				
Comfortable	42	33	1	
Non _Comfortable	101	29	2.74(1.48-5.06)	0.001
Working the same position for 2 hour in bend over				
Yes	109	32	2.62(1.65-4.16)	<0.001
No	152	117	1	

*Variables that were not significant at p value < 0.2 in bivariate logistic regression and were not candidates for multivariate logistic regression analysis.

5.5.2 Multivariate logistic regression

After bi-variate logistic regression was done for each variable to avoid the excessive amount of variables and unstable estimation of the final model, only variables with the p-value <0.2 were taken into multi-variate logistic regression analysis based on the conceptual frameworks. In the multivariable logistic regression analysis, enter method was used hierarchically to assess the relative effect of the descriptive factors on the work-related musculoskeletal disorders (outcome).

A Multi-variate logistic regression analysis was done in socio-demographic factors; age, monthly salary, and service year were significantly associated with a work-related musculoskeletal disorder. Workers whose age was above 30 years were nearly 3 times more affected by the work-related musculoskeletal disorder as compared to below 20 years [AOR (95% C.I): 2.79 (1.12- 7.87)]. Again also, those workers who had monthly income between 1501 -2000 ETB were significantly associated with musculoskeletal disorder 2 times more likely to develop as compared to workers paid below 1500 ETB [AOR (95% C.I): 2.45 (1.34- 4.56)]. Similarly, the service year factor was significantly associated with the musculoskeletal disorder from workers whose service was above 10 years were above 3 times more chance to develop MSDs compared to those less than 5 years[AOR (95% C.I): 3.25 (1.26-4.62)].

Among personal factors, the habit of alcohol drink, job stress, and job satisfaction were significantly associated with MSDs in the adjusted OR of multi-variate analysis. Workers who drink alcohol had more than 3 times higher odds to develop WRMSDs than those who did not have the habit of alcohol drinking behavior [AOR: 3.52, 95% CI (1.23-9.64)]. Similarly, the odds of MSDs among job stressed was more than 2 times higher risk from the non-stressed [AOR: 2.82, 95% CI (1.34-4.51)]. Moreover, the odds of which had MSDs of workers not satisfied by their job had 3 times higher than satisfied [AOR: 2.90, 95% CI (1.25-6.30)].

From work-related factors, other than garment work, repetitive work within <30 seconds, working hours, high loaded work, and work posture were significant factors. Those workers who had done home activities were an odd ratio of 3 times higher risk of developing MSDs than watching movies during other than garment work [AOR: 2.77, 95% CI (1.42-4.61)]. In the same way, workers who worked repetitive work within < 30 seconds and doing high loaded work were above 2 times more risk for WRMSDs as compared to not doing [AOR (95% C.I): 2.57 (1.12-5.19) and 2.04 (1.19-3.24)] respectively. Furthermore, the odds of MSDs among workers who worked >48 hours per week were

more than 3 times the risks of those who worked less [AOR: 2.85, 95% CI (1.82-3.42)]. Workers who had worked in sitting posture were nearly 2 times higher risk to develop the chance of musculoskeletal disorder than those worked in standing posture[AOR: 1.80, 95% CI (1.11-2.98)] (Table 10).

Table 10: Multivariate logistic regression analysis of the Adjusted effect of factors among female garment workers with work related musculoskeletal disorder, Galan city June, 2021(n=410)

Categories of variables	WRMSDs		AOR 95% CI	P- value
	Yes	No		
Age in Years				
≤ 20	13	10	1	
21-24	56	101	2.34(0.13-3.90)	0.108
25-29	105	27	2.55(0.54-5.16)	0.327
≥30	87	11	**2.79(1.12-7.87)**	**0.012***
Marital Status				
Single	107	125	1.27(0.13-4.42)	0.65
Married	145	22	1.47(0.18-12.14)	0.52
Divorced	9	2	1	
Educational Status				
Primary school(1-8)	84	37	1	
Secondary school(9-12)	161	106	1.94(0.57-1.69)	0.683
Above certificate	16	6	2.42(0.64-7.23)	0.17
Monthly Salary				
≤1500 ETB	72	84	1	
1501-2000 ETB	86	46	**2.45(1.34-4.56)**	**0.004****
2001-2500 ETB	53	13	1. 89(0.75-3.87)	0.123
≥2501ETB	50	6	2.47(0.74-6.59)	0.156
Service year				
≤ 5 years	100	109	1	
6-10 years	112	33	1.59(0.38-1.65)	0.53
>10 years	49	7	**3.25(1.26-4.62)**	**0.002****
Body mass index				
Under Weight	11	5	1	
Normal Weight	211	139	1.54(0.17-1.78)	0.30
Over Weight	39	5	2.32(0.29-6.18)	0.68
Other than garment work				
Watching Movies	137	109	1	
Reading Books	42	16	1.75(0.91-3.39)	0.08
Doing home activities	82	24	**2.77(1.42-4.61)**	**0.001****
Habit of alcohol drink				
Yes	49	6	**3.52(1.23-9.64)**	**0.017***
No	212	143	1	
Repetitive work movement within <30 seconds				
Sometimes	15	22	1	
Always	246	127	**2.57(1.12-5.19)**	**0.02***

Train on health and safety				
Yes	41	8	1	
No	220	141	1.64(0.23-1.26)	0.17
Working hours per week				
≤48Hour	204	137	1	
>48 Hour	57	12	**2.85(1.82-3.42)**	**0.003****
Doing high loaded work				
Never	71	78	1	
Some times	137	57	**2.04(1.19-3.24)**	**0.004****
Always	53	14	**2.44(1.12-3.96)**	**0.012***
Work posture				
Standing	118	87	**1**	
Sitting	143	62	**1.80(1.11-2.98)**	**0.013***
Working the same position for 2 hour in bend over				
Yes	109	32	2.72(0.96-6.80)	0.052
No	152	117	1	
Job stress				
16-40(Yes)	180	59	**2.82(1.34-4.51)**	**0.002****
≤ 15(No)	81	90	1	
Job satisfaction score				
32-50(High)	88	100	1	
10-31(Low)	173	49	**2.90(1.25-6.30)**	**0.001****

*Statistically significant at p value <0.05, **statistically significant at p value <0.005

6. Discussion

Work-related musculoskeletal disorders were common problems in garment industries, especially among those working in prolonged static work postures of different sectors. This study estimated that the overall prevalence of work-related musculoskeletal disorder within the past 12 months was 64% [95% C.I: (59, 68)].The annual prevalence of this study was the same with three different studies done in different years in Bangladesh from garment workers showing that the prevalence was 57.5%, 58.7%, and 60.7% (14, 18, 22) respectively. Again a study conducted in India shows that in line with this study 58.5% (23) . It was lower than a study conducted from small-scale garment workers in Cambodia showed that 82%, and also another study held in India garment workers showed that 77.9 %(4, 6). These two studies assessed the prevalence of female musculoskeletal disorder in different work positions in the garment. However, this study finding was the prevalence of the musculoskeletal disorder among female workers only in the prolonged static work postures (standing and sitting) in the garment. This difference could be due to variations in operational definitions of WRMSDs assumed by different studies, variety of the study setting, and sample size variation.

The annual highest prevalence of the specific body region in different study was neck in Cambodia (72.1%)(4), India (60.7%)(23) and Danish (57%)(31, 34). These results are higher than the results of the present study (43.2%).However; our study report is higher than a study conducted in Sri Lanka (6.7%)(8),Bangladesh (14%)(18) ,and India(32.1%)(6). This variation might be different in the study subjects, participants of the listed studies were of both genders. Because of the pain of musculoskeletal disorder in different body regions in males and females are different.

From another body region, upper back pain prevalence (33.2%) is comparable with the study conducted in Bangladesh (37.7%), Ghana (30.7%), India (35.6%), and Botswana (32.5%) (14, 21, 23, 35) respectively. Moreover, shoulder pain (38.0%) in this study is slightly lower than a study conducted in Estonia (42.1%), Ethiopia (50.0%), and Ghana (44.3%) (5, 7, 21).However, it was higher than with another study in India by sewing operators that is 24.4%(23). Elbow pain (16.3%) in this study is comparable with a study conducted at different time in India found (13.7% & 11.1%)(6, 23) and it was lower with another study in Ethiopia by sewing operators, which is 40% (42). The prevalence of wrist and hand in Ethiopia was found 37.7% (1), which is consistent with result of this study (35.4%) and higher than a study in Sri Lanka (7.3%)(8) and Bangladesh (14.2%)(14). Prevalence of lower back pain (51%) is comparable with the study held in Ethiopia (53%)(52).However, it is higher than a study in Bangladesh and India found that the annual prevalence of lower back pain to be 37.7% and 31.1% (14,

23) respectively. This variance might be due to the difference in the study setting. Our study participants are only female workers combined from two large garment industries whose tasks are engaged under prolonged static work positions with different working sections. This nature of activities performed at different working sections and gender issues could bring variation in the prevalence of the work-related musculoskeletal disorder. In this study, it might be due to the repetitive task and prolonged bending away of high loaded static job doing sections become the disparity of this difference.

Globally different studies showed that several factors were related to the occurrence of work-related musculoskeletal disorders. Some of them are socio-demographic, work-related, personal factors. In this study, we have not observed a trend of increasing pain with increasing age. However, among age groups above 30 years are significant with the outcome which coincides in many researchers revealed that older age of workers have a higher risk than younger age of the employee (1, 4, 7, 23). From this study, those who had paid higher employees are high qualification and older age group workers are paid under the above salary ranges as well as shifted to the fewer workloads in the same sector. This may be decreased the level of different body region pains. The Probability to develop work-related musculoskeletal disorders could be higher among highly paid employees than those who were paid less (6, 7, 22). In another way, employees who had high service above 10 years in the garment were 3 times more likely to develop WRMSDs than employees who had short from1-5 years of service. This reveals that prolonged working in a fixed position for long years was strongly associated with increased work-related musculoskeletal disorders. This study is in line with the study conducted in Ethiopia, the USA, Denmark, and Turkey (1, 7, 20, 34, 38).

From the personal and work-related factors of the study participant, who had passed recreation time by doing home activities had 2 times more odds to develop musculoskeletal disorders as compared to watching movies. This report is supported by a study held in San Francisco the USA (36). Workers with habits of alcohol consumption had above 3 times higher odds of MSDs than those workers who do not drink alcohol. This is not supported by the study in Thailand among Cambodian garment workers which shows that no association with a musculoskeletal disorder(31). This inconsistency may be due to a small number of respondents for alcohol drinking habits. On the other hand, this study showed that repetitive work movement <30 seconds was significantly associated with a work-related musculoskeletal disorder. This is in agreement with the study conducted in the USA. (20) and Thailand (53). Training on health and safety is not significant in this study. It is in line with the study conducted in Ethiopia (1). However, this contradicts many study findings. This might be due to the reason that workers did not properly apply

their responsibilities of health and safety rules during working time and are more focused on payment work rather safety issues.

From the work-related and personal factors, many studies conducted among several garment industries around the globe showed that work-related factors are associated with the increased of prevalence in musculoskeletal disorders. A study conducted in different countries like Los Angeles USA, Turkey, Ethiopia, India, and Thailand (20, 36, 42, 52, 53) were reported that workers who worked above 48 hours per week were significantly affected by the occurrence of musculoskeletal disorders among the garment worker as compared to working for 48 hrs and below respectively. The result of the present study is consistent as compared to others countries, which had 3 times higher odds of musculoskeletal disorders. However, the study finding is also exceeded a now days improved standard set in Ethiopian labor proclamation number 1156/2019 that states as follows; "The time during which a worker actually performs work or avails herself/himself for work in accordance with the law, collective agreement or work rules shall not exceed 8 hours per day or a forty-eight-hour a week"(54).

Again, participants who have workload always in the workplace significant with WRMSDs above 2 times higher than those who do not have workload, and those who had workload sometimes were also 2 times higher risk to develop musculoskeletal disorders. This reveals working with the high demand of work was strongly associated and increased work-related musculoskeletal disorders. This is in line with the studies conducted in the USA, Los Angeles, Iran, and Ethiopia (20, 28, 52).And also workers who had worked in sitting posture was significantly associated with work-related musculoskeletal disorder than those who worked in standing posture. This is in agreement with the study done in Bangladesh(18).

A significant association exists between job satisfaction and job stress with the development of musculoskeletal disorders, those stressed by their job had more than 3 times the odds of developing WRMSDs than with no stress. Similarly, workers who are not satisfied with their job had 3 times higher odds MSDs than satisfied by their jobs. This finding is supported by studies done at Los Angles USA and India (20, 55). Earlier studies of personal factors, reviewed by different scholars suggest that job stress is positively associated with musculoskeletal disorder (37, 51). This is might be the difference in work setting, payment method salaries and safety standards availing for the workers. This is due to most of the standard questions regarding to job stress and satisfaction are focus on availability of safety and good facilities in the organization.

7. Strengths and Limitations of the study

7.1 Strengths of the study

The strength of this study has tried to assure the quality of the data using standardized data collection tools and pre _testing before starting the job and used qualified professionals to improve data quality. It also tried to exhaustively identify many factors that might affect the musculoskeletal disorder.

7.2 Limitation of the study

This study has been the following limitation. The past one-year musculoskeletal disorders prevalence may be under or over-estimated due to recall bias. Because it is across_ sectional study, that does not allow establishing the causation relationship between factors and musculoskeletal disorders. We have not used any measurement scale for estimating the intensity of the pain that was responded to by participants. Ergonomics risk assessment tools were not used to assess WMSDs in the different body part.

8. Conclusions and Recommendations

8.1 Conclusions

The overall prevalence of work-related musculoskeletal disorder from the last year was estimated to be 63.7%. In this study, it is evident that above half of the workers had been suffering from some kind of musculoskeletal disorder. Garment workers are among the most vulnerable as they have to work for long hours in perilous posture. The most common affected site was lower back pain, neck and shoulder pain are dominant among female garment workers. The musculoskeletal disorders were more common under-engaged in prolonged static workers in the sectors. The occurrence of musculoskeletal disorders is significantly associated with ages; monthly salaries, service year, other than garment work (doing home activities), the habit of alcohol drinking behavior, repetitive work within <30 seconds, working hours per week, work posture, job stress, job satisfaction, seat comfort and doing high loaded work.

8.2 Recommendation

Based on the findings of this study, the following recommendations are forward to the concern bodies accordingly.

To the garment industry managers

- It is better to use work rotation, to decrease repetitive and high loaded work exposure of body region by the same task
- Just to minimize extra working hour duties
- Better to give a break time to avoid muscle fatigue and refreshment to gain new force for the next tasks.
- Employers should create safe working environment for workers to be motivated interims of their need satisfying by different rewarding scheme.
- Give attention on health and safety rules and ergonomics issues.

To Bureau of labor and social affairs (BOLSA)

- Applying of health and safety policy in the country level is not visible. So BOLSA should consistently implement health and safety practice on the ground of garment industries. Further Research:
  - To get a strong conclusion it is better to include further studies with different ergonomic risk objective of measurement, large sample size, and longitudinal design set up.

9 REFERNCES

1. Deyyas WK, Tafese A. Environmental and organizational factors associated with elbow/forearm and hand/wrist disorder among sewing machine operators of garment industry in Ethiopia. Journal of environmental and public health. 2014;2014:27-31.
2. AHMED S, Raihan M. Health Status of the Female Workers in the Garment Sector of Bangladesh . Journal of The Faculty of Economics and Administrative Sciences. 2014;4(1):43-58.
3. health and safetyExecutive. Work related musculoskeletal disorder statistics (WRMSDs) in Great Britain, 2019 . Annual Statistics. 2019:2-9.
4. Van Leap, Chaiear N, Sumananont Chat ,Kannarath Chheng. Prevalence of musculoskeletal symptoms among garment workers in Kandal province, Cambodia. Journal of Occupational Health. 2016;58(1):107-17.
5. Merisalu E, Mannaste M, Hiir K , Traumann A . Predictors and prevalence of musculoskeletal disorders among sewing machine operators . Agronomy Research 2016;14:1417-26.
6. Ravichandran SP, Shah P, Lakshminarayanan K, Ravichandran AP. Musculoskeletal problems among workers in a garment industry, at Tirupur, Tamil Nadu. INDIAN JOURNAL OF COMMUNITY HEALTH 2016;28(03).
7. Tafese A, Nega A, Kifle M, Kebede W. Predictors of occupational exposure to neck and shoulder musculoskeletal disorders among sewing machine operators of garment industries in Ethiopia . Science Journal of Public Health 2014;2(6):577-83.
8. DeSilva PV,Lombardo S,Lipscomb H, Grad J , Østbye T . HealthstatusandqualityoflifeoffemalegarmentworkersinSriLanka. Galle Medical Journal. 2013;18(1).
9. Bewuket TW, Gashaw AW. Overview of Ethiopian Textile Industry,Industrial Report.: Journal Of Textiles And Polymers; 2018.
10. Ethiopian textile industry development. An Overview of Facts and Opportunities ,Ethiopian Textile Industry Development Institute (ETIDI). 2014.
11. Hossain MD, Aftab A, Al Imam MH, Mahmud Ilias, Chowdhury A, Kabir RI, et al. Prevalence of work related musculoskeletal disorders (WMSDs) and ergonomic risk assessment among readymade garment workers of Bangladesh: A cross sectional study. Plos One. 2018;13(7):200-22.
12. Ifath S, Farah A. A Scoping Literature Review of Work-Related Musculoskeletal Disorders Among South Asian Immigrant Women in Canada. Canada: spring; 2016.
13. Shah ZA, Amjad A, Ashraf M, Mushtaq F, Sheikh IA . PREVALENCE OF MUSCULOSKELETAL PROBLEMS AND AWKWARD POSTURE IN A PAKISTANI GARMENTS MANUFACTURING INDUSTRY . Malaysian Journal of Public Health Medicine. 2016;16:75-9.
14. Ahmad SK, Sayed M, Khan MH, Faruquee MH, Yesmin N, Sarwa AM, et al. Musculoskeletal Disorders And Ergonomic Factors Among The Garments Workers . JOPSOM. 2007;26(2):97-110.
15. Sikdar MH, Sarkar S, Sadeka S. Socio-Economic Conditions of the Female Garment Workers in the Capital City of Bangladesh . International Journal of Humanities and Social Science 2014;4(3).
16. Blader S, Holst U, Danielsson S,Ferhm E, Kalpamaa M, Leijon M, et al. Neck and shoulder complaints among sewing-machine operators . Applied Ergonomics 1991;22(4):251-57.
17. Schneider E, Irastorza X. European Agency for Safety and Health at Work EUROPEAN RISK OBSERVATORY REPORT(EU-OSHA). 2010.
18. Khan AR, Jobair K. Musculoskeletal Symptoms among Female Garmenmts Worker: Working Environment . Journal of Exercise, Sports & Orthopedics. 2018.
19. Bernard BP. A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back . 1998.

20. Wang PC, Rembel D, Hurwitz EL, .Harrisond RJ, Janowitz I , Ritz BR. Self-reported pain and physical signs for musculoskeletal disorders in the upper body region among Los Angeles garment workers. 2008;34:79-87.
21. Vandyck E, Fianu A. The work practices and ergonomic problems experienced by garment workers in Ghana. International Journal of Consumer Studies. 2012;36(4):486-91.
22. Jahan N, Das M, Mondal R, Paul S, Saha T, Akhtar R, et al. Prevalence of Musculoskeletal Disorders among the Bangladeshi Garments Workers . smu medical journal. 2015;2 (1).
23. Bandyopadhyay L, Baur B, Basu G, Haldar A. . Musculoskeletal and Other Health Problems in Workers of Small Scale Garment Industry An Experience from An Urban Slum, Kolkata . Journal of Dental and Medical Sciences 2012;2(6):23-8.
24. Barbara JB, Cohn-S, Nan Lashuay,Leslie I, Robert H. Garment Workers in California,Health Outcomes of the Asian Immigrant Women Workers.: AAOHN JOURNAL; 2004.
25. Hyeonkyeong L, Hyunmi A, Chang GP,Sun J K, Sun HM. Psychosocial Factors and Work-related Musculoskeletal Disorders among Southeastern Asian Female Workers Living in Korea. korea: Safe Health Work; 2011.
26. Wenzhou Yu,Ignatius T.S, Zhimin Li, et.al. Work-related injuries and musculoskeletal disorders among factory workers in a major city of China.: journal homepage; 2012. 457-63 .
27. Thangaraj P, Kanappan S, Chacko T. Occupation-Related Health Status of Women Textile Workers in Tamil Nadu. ADR Journals. 2019;1(4).
28. Dianat I ,Kord M, Yahyazade P, Karimi MA, Stedmon AW. Association of individual and work-related risk factors with musculoskeletal symptoms among Iranian sewing machine operators. Applied Ergonomics. 2015;51:180-8.
29. Rahman A ,Rahaman M. Sickness and Treatment: A Situation Analysis among the Garments Workers . AKMMC. 2013;4(1):10-4.
30. Berberoğlu U, Tokuc B. Work-Related Musculoskeletal Disorders at Two Textile Factories in Edirne, Turkey. BALKAN MEDICAL JOURNAL. 2013;30:23-7.
31. Kaergaard A, Andersen J. Musculoskeletal disorders of the neck and shoulders in female sewing machine operators: prevalence, incidence, and prognosis. Occup Environ Med 2000;57:528-34.
32. Maity P, Sujaya D, Amitava P, Mahata H, Chatterjee M, Dhara P. Identification of a suitable working posture for female workers engaged in golden thread work. . International Journal of Occupational Safety and Health. 2014;4(2):24-33.
33. Chan J, Janowitz I, Lashuay N, Stern A, Fong K, Harrison R. 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 . Applied Occupational and Environmental Hygiene 2002;17(4):247-53.
34. Bukle P. Ergonomics and musculoskeletal disorders: overview. Occupational Medicine 2005;55:164-67.
35. Sealetsa OJ, Thatcher A. Ergonomics issues among sewing machine operators in the textile manufacturing industry in Botswana. 2011;38:279-89.
36. Ozturk N, Esin M. Investigation of musculoskeletal symptoms and ergonomic risk factors among female sewing machine operator in Turkey. International Journal of industrial ergonomics. 2011;41:585-91.
37. Hoe VC, Urquhart D, Kelsall H L, Sim M R. Ergonomic design and training for preventing work-related musculoskeletal disorders of the upper limb and neck in adults. Cochrane Database System Rev. 2012(8):CD008570.
38. Chaiklieng S, Suggaravesiri P, Puntumetakul R. Prevalence and risk factors for work-related shoulder pain among informal garment workers in the northeast of Thailand. Small Enterprise Research 2014;21(2):180-89.

39. Schierhout GH, Meyers J, Bridger RS. Work related musculoskeletal disorders and ergonomic stressors in the South African workforce. cupational and Environmental Medicine 1995;52:46-50.
40. Urban construction and development of galan city. The Federal Democractic Republic Of Ethiopia: Ministry Of Urban Development And Construction 2012.
41. Aghili MM ,Asilian H, Poursafa P. Evaluation of Musculoskeletal Disorders in Sewing Machine Operators of a Shoe Manufacturing Factory in Iran . 2012;62(3).
42. TAFESE A ,Kebede G, SHIBRU A, BENTI T. Work-related Low Back Pain among Garment Industry Workers in Eastern Oromia Region, Ethiopia . INTERNATIONAL JOURNAL OF OCCUPATIONAL HYGIENE. 2018.
43. Punitha Kumary P, Subitha L, Gautam Roy. Pattern of morbidity among female textile workers in Puducherry, South India. International Journal of Medicine and Public Health. 2016;6(3):140-43.
44. Kuorink I, Jonsson B, Kilbom A,Vinterberg H, Biering-Sorensen F, Andersso G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms . Applied Ergonomics. 1987;;Volume 18.3::P 233-37.
45. Brakenridge CL ,Chong Y, Winkler E, Hadgraft N, Fjeldsoe B, Johnston V, et al. Evaluating Short-Term Musculoskeletal Pain Changes in Desk-Based Workers Receiving a Workplace Sitting-Reduction Intervention. International Journal of Environmental Research and Public Health. 2018;15(9):1975.
46. da Costa B, Vieira E. Risk Factors for Work-Related Musculoskeletal Disorders: A Systematic Review of Recent Longitudinal Studies. AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 2010;53:285-323.
47. Richard K, Jose F, Farhana K. Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Injuries amongst Underground Mine Workers in Zambia. South Africa: Journal Occup Health; 2013.
48. Maclntyre p, Scott Macdonand. The Generic Job Satisfaction Scale: Scale Development and Its Correlates. New York: The Haworth Press; 1997.
49. Harris. Attitudes in the American Workplace VII New York: The Marlin Company and the American Institute of Stress.; 2001.
50. Dereje D, Solomon MA, Atalay G. Work-related musculoskeletal disorders and associated factors among bank workers in Addis Ababa, Ethiopia: a cross-sectional study: Bmc Journal; 2020.
51. Lomax RG, Hahs-VD. An introduction to statistical concepts. 4 Edition ed. New York: Routledge; 2012.
52. Teklehaymanot HA ,Asmelash TD, Haimanot G M, Ansha N A,. Predictors of back disorder among Almeda textile factory workers, North Ethiopia: BMC Research Notes; 2018.
53. Sunisa C, Pornnapa S, Sari A. Risk Factors Associated with Work-Related Low Back Pain Among Home-Based Garment Workers. New Zeland2020.
54. Labour Proclamation. The Federal Democratic Republic Of Ethiopia Labour Proclamation 1156/2019. Ethiopia: Federal Negarit Gazette; 2019.
55. Banerjee S, Bandyopadhyay L, Dasgupta A, Paul B, Chattopadhyay O. Work Related Musculoskeletal Morbidity among Tailors: A Cross Sectional Study in a Slum of Kolkata. India: Kathmandu University Medical Journal; 2016.

10 ANNEXES

Annex I: Informed Consent Form (English version)

Hello my name is ----------.I am here on behalf of Mr. Abebaw Belayneh, post graduate student from AAU, School of public health. I am member of research team on assessment of musculoskeletal disorders and associated factors and requesting you to participate in this study which would require your response to an interview on some related issues.

Title of the study: *prevalence of work related musculoskeletal disorder among female garment workers in Galan city, Oromia, Ethiopia*.

Introduction: The garment sector poses many hazards that can harm to workers in different way. Work related musculoskeletal disorder (WRMSD) has huge impact on the public health problems and economic lost of the society. Occupational injuries of female garment workers were neglected in research study and policy action of under developing countries due to limitation of documentation and they are highly exposed by different work related diseases. Further information about prevalence and factors affecting WRMSD for female garment workers were not known in Ethiopia. Therefore the main aim of this study will be to see the prevalence and associated factors with work related musculoskeletal disorder among female garment workers in *Galan city, Oromia*, Ethiopia.

Objective: The Objective of this study is to assess the prevalence of work related musculoskeletal disorder among female garment workers in *Galan city, Oromia*, Ethiopia 2020/21.

Duration of interview: This interview will take maximum about 20 minutes.

Confidentiality: To establish secured safeguards of the confidentiality of research data, your name will not be written in this form and all information given by you will be kept strictly confidential.

Benefit of the study: The research does not have a short term financial, health care and capacity building benefit to the research participant as an individual or as a group but in the long run it will help the concerned organization and policy makers to have a policy consideration and direction and formulation of strategy and design of occupational health and safety programs based on the recommendations and the findings.

Risk and /discomfort of the study: The study has no any risk for the participants except time consumption.

Right of the participant: Participating and not participating is the full right and participants can stop from participation in the study at any time. This would have no effect at all on your health benefit or other administrative effect and nobody will enforce you to explain the reason of withdrawal. Participant can skip question which the worker doesn't want to respond.

Person to Contact: The participant has the right to ask information that is not clear about the research context and content before and or during the research work. You can contact the principal investigator and his advisor. Moreover, this research undergone ethical reviewed and approved by Addis Ababa university school of public health. The main task of this board is to make sure that the ethical principles are adhered or not the research participants are protected from harm.

Informed Consent Form

Title of the study: ***Prevalence of Musculoskeletal Disorder Among Female Garment Workers in Galan city, Oromia, Ethiopia.***

I have been well aware of that this research undertaking is a post graduate degree partial fulfillment of research thesis which is fully supported and coordinated by AAU School of Public Health and the designate investigator is Abebaw Belayneh. I have been fully informed in the language I understand about the research project objective is to assess the prevalence of work related musculoskeletal disorder and its association factors among female garment workers.

I have been informed that all the information I shall provide to the interviewer will be kept confidential. I understood that the research has no any risk except little time consumption. I also knew that I have the right to withhold information, skip questions to answer or to withdraw from the study any time I have acquainted nobody will impose me to explain the reason of withdrawal. It is also enlighten there would have no effect at all in my health benefit or other administrative effect that I get from the garments.

If you want more information and check about this study, you can contact through the following address.

Investigator: Mr. Abebaw Belayneh Tel: 0921651524(Mobile)

Advisor: Dr. Yifokire Tefera, SPH, AAU; Mobile: 0913754082

Dr. Teferie Abegaz, School of Public Health, Mobile: 0911361607

I have read this form, or it has been read to me in the language I comprehend and understood the condition stated above, therefore, I am willing and confirm my participation by signing the consent.

Agreed to participate in the study: Yes /No (mark one of them for verbal consent)

Signature _____ (if written consent)

Name of witness signature_____ (Data collector, supervisor, any third person)

Signature _____ Date_____.

Annex II- Informed Consent (Amharic version)

በአዲስ አበባ ዩኒቨርስቲ ጤና ሳይንስ ኮሌጅ የህብረተሰብ ጤና ትምህርት ቤት

የጥናቱ መግለጫና የፍቃደኝነት መስጫ ቅፅ

መግቢያ፡- ጤና ይስጥልኝ እንደምን አሉ? እኔ_____. እባላለሁ። እዚህ የመጣሁት ይህንን ጥናት የሚያካሄድ የአዲስ አበባ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ የሕብረተሰብ ጤና ትምህርት ክፍል የድህረ ምረቃ ተማሪ የሆነውን አበባዉ በላይነህን ወክዬ ነው ። በአዲስ አበባ ከተማ በሚገኙ የጨርቃ ጨርቅ ልብስ ስፌት ውስጥ ቁመዉና ተቀምጠዉ በሚሰሩ ሴት ሠራተኞች ላይ በስራ ምክንያት የሚከሰቱ የጡንቻና የመገጣጠሚያ አካላት ህመም መጠንና ተያያዥ መንስኤዎች ለማጥናት ነው። ስለዚህ በጥናቱ ላይ ተሳትፎ ለማድረግ ወይም ላለማድረግ እንዲወስኑ በቅድሚያ የተወሰነ መረጃ እንሰጥዎታለን ።

የጥናቱ ርዕስ፡ በአዲስ አበባ ከተማ በሚገኙ የጨርቃ ጨርቅ ልብስ ስፌትውስጥ ቁመዉና ተቀምጠዉ በሚሰሩ ሴት ሠራተኞች ላይ በስራ ምክንያት የሚከሰቱ የጡንቻና የመገጣጠሚያ አካላት ህመም መጠንና ተያያዥ መንስኤዎች ለማጥናት ነው።

የጥናቱ ጥቅም: ይህ ጥናት ለተሳታፊው ተሳታፊ በመሆናቸው በቀጥታ የሚያገኙት የገንዘብ፣የጤና እንክብካቤም ሆነ ሌሎች ጥቅሞች የሉትም። ነገር ግን በሂደት የጥናቱ ውጤት ለሚመለከተው አካልና እንደ ግብዓትነት ያገለግላል። በተለይ በመስኩ እንደ መነሻ መረጃ ሆኖ ያገለግላል።

የጥናቱ ጉዳት፡ የቃለ መጠይቁ ተሳታፊ በጥናቱ መሰረት የሚደርስባቸው ምንም ዓይነት ጉዳት የለም ጥቂት ሰዓት ከመሻማት በስተቀር ማለት ነዉ።

ሚስጥራዊነት ፡ተሳታፉዎች ስማቸውን እንዲጠቅሱ አይጠበቅም ።ማንኛውንም ተሳታፊዎች የሚሰጡትን መረጃ በሙሉ ሚስጥራዊነቱ እንዲጠበቅ የጥናቱ ስነ-ምግባር ያስገድዳል። በመሆኑም ተሳታፊው የሚሰጠው መረጃ ሚስጥራዊነት ስለሚኖረው ተሳታፊው ከአስተዳደራዊ ጫና ነፃ ነው።

የተሳታፉዎች መብት፡- ተሳታፊው በዚህ ጥናት ላይ የመሳተፍ ወይም አለመሳተፍ መብቱ የተጠበቀ ነው። በመሳተፍ ላይ እያሉ ካልፈለጉ በማንኛውም ሰዓት ማቋረጥ ወይም ከጥያቄዎቹ ውስጥ ለመመለስ የማይፈልጉትን ጥያቄ አለመመለስ ይቻላል። ቃለ-መጠይቁ በአማካይ 15-20 ደቂቃ ይወስዳል ። በቃለ መጠይቁ ወቅት ግልጽ ያልሆነን ነገር መጠየቅ ይቻላል።

መገናኘት የሚፈልጉ ከሆነ፡- የጥናቱ ተሳታፊ ስለጥናቱ ሁኔታ እና ይዘት ግልፅ ካልሆነልዎት በማንኛውም ሰዓት መረጃ የመጠየቅ መብት አለው። ለዚህም የዋናው አጥኚው ስም አበባዉ በላይነህ 0921651524 እና የጥናቱ አማካሪ ስም አቶ ይፎክር ተፈራ 0913754082 እና ዶ.ር ተፈሪ አበጋዝ 0911361607 ማግኘት ይችለላሉ። በዚህ ሰዓት ስለ ቃለ መጠይቁን ዓላማ ወይም ይዘት የሚጠይቁኝ ነገር አለ ? በጥናቱ ለመሳተፍ ፍቃደኛ ነዎት?

የፍቃደኝነት መግለጫ ቅፅ

ከዚህ በላይ ስለጥናቱ የተጻፈውን መግለጫ በሚገባኝ ቋንቋ አንብቤ ወይም ተነቦልኝ ተረድቻለሁ። በማንኛውም ሰዓት ከጥናቱ ያለምንም ቅጣት ማቋረጥ እንደምችል ተረድቻለሁ። በመሆኑም በዚህ

1. እስማማለሁ 2. አልስማማም (መልሱ እስማማለሁ ከሆነ ወደሚቀጥለው ገፅ ይሻገሩ። መልሱ አልስማማም ከሆነ አመሰግናለሁ ብለው ወደሚቀጥለው ሠራተኛ ይሂዱ። ለጥናቱ ፈቃደኛ ያልሆኑበትን ምክንያት በመጠየቅና በማስታወሻ ላይ በመያዝ ለጥናቱ ተቆጣጣሪ ሪፖርት ያድርጉ።

የተጀመረበት ሰዓት፡_____ ያለቀበት ሰዓት_____.

የቃለ መጠይቅ አድራጊዉ፡-ስም_____ መለያ ኮድ ቁጥር_____.

ቃለ መጠይቁን ያረጋገጠዉ ሱፐርቫይዘር ስም_____ ፊርማ_____

አጥኝ ፊርማ 1 ፡-_____ ቀን_____.

Annex III- Informed Consent (Afaan Oromoo version)

Yunniversitii Finfinnee Koollejji Saayinsii Eeguumsa Fayyaa Kutaa Barumsa Fayyaa Hawaasaa

Ibsa Qo'annoo fi guca feedhii qabessummaa kan ittin guutamuu

Seensa: -

Akkam jirtuu? Ani Obboo/Addee----------jedhamaa. Kan asiin dhuufeef qo'annaa kana kan gaggessuu Yunniversitii Finfinnee Koollejji Saayinsii Fayyaa kutaa barumsaa fayyaa hawaasaa irraa barataa digirii lammaffaa kan ta'ee Obbo Ababaaw Balaayinah bakka bu'ee tii. Magaala Finfinnee keessatti kan argaman warshaaleen huccuu hoodhan keessaa dubartoonii dhaabbataniifi taa'anii kan hojjetan irraa hojii isaanitin walqabatee dhibbaa dhukuuba maashaalee fi wirtulee qaamaa fi sababootaa walqabatan qo'achuu dhaa. Kanaafuu qo'aannoo irrattii hirmaachuu dhaaf fedhii qabaachuu fi akka hin qabaannee muurtteesitan ibsa gabaabduu isiiniif goonaa.

Mata Duree Qo'annoo
Magaala Finfinnee keessatti kan argaman warshaaleen huccuu hoodhan keessaa dubartoonii dhaabbataniifi taa'anii kan hojjetan irraa hojii isaanitin walqabatee dhibbaa dhukuuba maashaalee fi wirtulee qaamaa fi sababootaa walqabatan qo'achuu dhaa.

Faayidaan Qo'aannoo: Faayidan qo'aannoo kanaa hirmaatootaaf kallittidhaan maallaqaan, tajaajila wal'ansa fayyaa fi kan biroon kan fayyaduu osoo hintaanee bu'aa qo'aannoo isaa irraa ka'uudhaan qaama dhimmi ilaallatuuf akka galteetti fayyadaa. Keessatuu qo'aannowwan kan akkana fuula duraaf godhamaniif akka odeefannoo ka'umsaattii fayyadaa.

Miidhaan Qo'aannoo: Hirmaatootta gaafiif deebii irratti hirmaataniif haal qo'aannootiin dhibbaan isaan irratti qaqabuu hin jiru yeroo gabaabduu isaan irraa fudhachuu malee.

Icciitidahaan qabuu: Hirmaatoonni maqaa isaani akka ibsan hin eegamuu. Hirmaatoonni kamiyyuu oddeefannoo keennan guutumaan guututti icciitidhaan akka qabamuu seerii qo'aannoon nii dirqamsiisaa. Kanaafuu yaada hirmaataan keennu iccitidhaan waan eeggamuuf dhiibbaa bulchinsaa irraa bilisaa.
Mirga Hirmaattootaa: Hirmaataan qo'aannoo kana irrattii hirmaachuu ykn hirmaachuu dhisuun mirga dha.Gaafiif deebii irratti hirmaachaa osoo jirtuu yoo hinbarbaannee ta'ee yeroo kamiyyuu addaan kutuu/dhaabuu denddeessuu ykn gaafiilee dhihaatan keessaa deebisuu kan hin barbaannee dhisuu danddessuu. Gaafiif deebiin daqiiqaa 15-20 fudhataa. Yeroo gaafiif deebii irrattii yaada ifaa hin taanee yoo jiratee gaafachuun nidanda'amaa.

Ragaalee kamiyyuuf qaamoolee argachuu barbaaddan yoo jiraatee: -Hirmaattottni qo"aannichaa haala qo'aannoo fi qabiyyee irratti ifaa yoo siinif hintaanee yeroo kamiyyuu gafachuun mirga. Kanuumaaf abbuummaa dhaan maqaan qo"aannoo kan gaggessuu Obbo Ababaaw Balaayinah lakk moobaayilaa 0921651524 fi gorsaa qo"aannoo Obbo Yiifookir Tafarraa lakk moobaayilaa 0913754082 fi

Dr. Tafarii Abagaazi lakk moobaayilaa 0911361607 tiin argachuu danddessuu. Yeroo amaan kanaa waa”ee gaafiif deebii kaayyoo fi qabiyyee irrattii waan nagaafattan jiraa?

Guca hirmaattonni gaaffif debii irratti hirmachuun dura fedhii qabaachuu isaanii kan ittin ibsamuu

Armaan oliittii waa”ee qo”aannoo ibsa afaan naaf galuun duubisee ykn naaf dubbifamee naaf galee jiraa. Yeroo kamiyyuu qo”aannoo irraa adabbii malee dhaabuu akka danda’uu huubadheen jiraa. Kanaafuu qo”aannoo irratti hirmaachuuf fedhii qabduu?

1. Eyyeen ----------(gara gaafitti galuu)
2. Hinqabuu----------(gara hojjetaa ittii anuuttii demaa).Qo'aannoof sababa feedhii hinqabannee gaafachuudhaan yaadannoo qabachuun to’ataa qo’aannichaaf gabaasa godhii.

Yeroon jalqabamee---------- Yeroon xumuramee---------

Maqaan gaafii dhi’eesaa---------- Lakk koodii ----------

Maqaan To’ataa gaafiif deebii mirkaneessee ----------

Qo’aataa Mallattoo 1: - ----------guyyaa ----------

Annex IV- Questionnaire (English version)

Part 1: Socio demographic characteristics for the study subjects.

Code._____. Working department A. sewing section B. cutting section

S. No	**Questions /variables**	**Coding category /possible response**	**Skip to**
101	How old are you	Age in years _____	
102	Sex of worker	1. male 2. female	
103	What is your current marital status?	1. Married 2. Single 3. Divorced 4. Widowed	
104	Educational level	1. Unable to read and write 2. Write & read only 3. Primary school completed (1-8) 4. secondary school complete(9-12) 5. Certificate/ diploma 6. Degree and above	
105	Monthly salary	---------- birr	
106	Overall, how-many- years have you been worked in garment	---------- years	

Part 2: individual and work related factors associated with WRMSDs among female garment workers

S. No	**Questions /variables**	**Coding category /possible response**	**Skip to**
201	Height in meter	_____meter	
202	Weight in kg	_____ kg	
203	BMI (body mass index in kg/m2)	1.Underweight (<18.5 kg/m²) 2.Healthy (18.5–24.9 kg/m²) 3.Overweight (25–29.9 kg/m²) 4.Obese (≥30 kg/m²)	
204	Do you have Habit of doing physical exercise at least twice per week for 30 minutes?	1.Yes 2.No →	Q.206
205	If yes for Q204 how often?	1.Two times per week 2.≥Three times per week	
206	What types work do you practice after leaving in these compound	1.Not at all 2.The same types of work	

		3.Others specify _____	
207	How you pass your recreation time?	1.Watching movies 2. Reading books 3.Others specify _____	
208	Do you Smoke cigarette?	1.Yes 2.No	Q210
209	If your answer is yes for question number **208.**How many cigarettes do you smoking per day?	1.----------sticks 2.----------packet	
210	Do you consume any kind of alcohol at least twice per week?	1.Yes 2.No	
211	Do you have any symptom related to WRMSDs before engaged in this work?	1.Yes 2.No	Q213
212	Which hand you use dominantly?	1. Right 2. Lift	
213	Repetitive work within <30 seconds	1.Never 2.Sometimes 3.Always	
214	Do you take breaks during your job per day excluding lunch time?	1. Yes 2. No	Q216
215	If yes Q214,total working breaks excluding lunch break	1. ≤15 minutes 2. above 15 minutes	
216	Doing high loaded work?	1.Never 2.Sometimes 3.Always	
217	Did you attend formal training of health safety from organization?	1. Yes 2. No	
218	Payment method of salary?	1.Hourly payment 2.Fixed monthly payment 3.Per production payment	
219	Availability of sufficient light?	1.Yes 2.No	

Part 3: Working posture factors associated with WRMS Disorders among female garment workers.

No	**Questions /variables**	**Possible answer**	**Skip to**
301	How much Time spent in standing to make your task per day?	----------hour	Fill only for standing work posture workers
302	How many days you work in standing position per week?	----------day	
303	Does your job involve Bending or twisting in an awkward way?	1. Yes 2. No	**Q 305**
304	Do you work in the same position for 2 hours in bend over?	1. Yes 2. No	

305	How much Time spent in sitting to make your task?	----------hour	
306	Types of setting chair?	1.Fixed 2.Adjustable	Only fill for sitting work posture workers
307	Fitness of the working machine with setting chair?	1.Comfortable 2.Non comfortable	
308	How many days you work in sitting position per week?	----------day	

Part 4: Psychosocial factors associated with WRMS Disorders among female garment workers.

Questions to measure job stress (Q 401-408)						
S. No	**Questions /variables**	**Job stress score**				
		Never	Rarely	Some times	Often	Very often
401	Conditions at work are unpleasant or sometimes even unsafe.	1	2	3	4	5
402	I feel that my job is negatively affecting my physical or emotional wellbeing	1	2	3	4	5
403	I have high loaded work to do and/or too many unreasonable deadlines.	1	2	3	4	5
404	I find it difficult to express my opinion or feelings about my job conditions to my superiors.	1	2	3	4	5
405	I feel that job pressures interfere with my family or personal life.	1	2	3	4	5
406	I have adequate control or input over my work duties.	5	4	3	2	1
407	I receive appropriate recognition or rewards for good performance.	5	4	3	2	1
408	I am able to utilize my skills and talents to the fullest extent at work	5	4	3	2	1
	Final score					

Questions to measure job satisfaction (Q 409-418)						
No	**Questions /variables**	**Job satisfaction score**				
		Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied
409	I receive recognition for a job well done.	1	2	3	4	5
410	I feel close to the people at work.	1	2	3	4	5
411	I feel good about working at this company.	1	2	3	4	5
412	I feel secure about my job.	1	2	3	4	5

413	I believe management is concerned about me.	1	2	3	4	5
414	On the whole, I believe work is good for my physical health	1	2	3	4	5
415	My wages are good.	1	2	3	4	5
416	All my talents and skills are used at work.	1	2	3	4	5
417	I get along with my supervisors.	1	2	3	4	5
418	I feel good about my job	1	2	3	4	5
	Final score					

Part 5: Prevalence of WRMSDs among female garment workers by Nordic Musculoskeletal Questionnaire

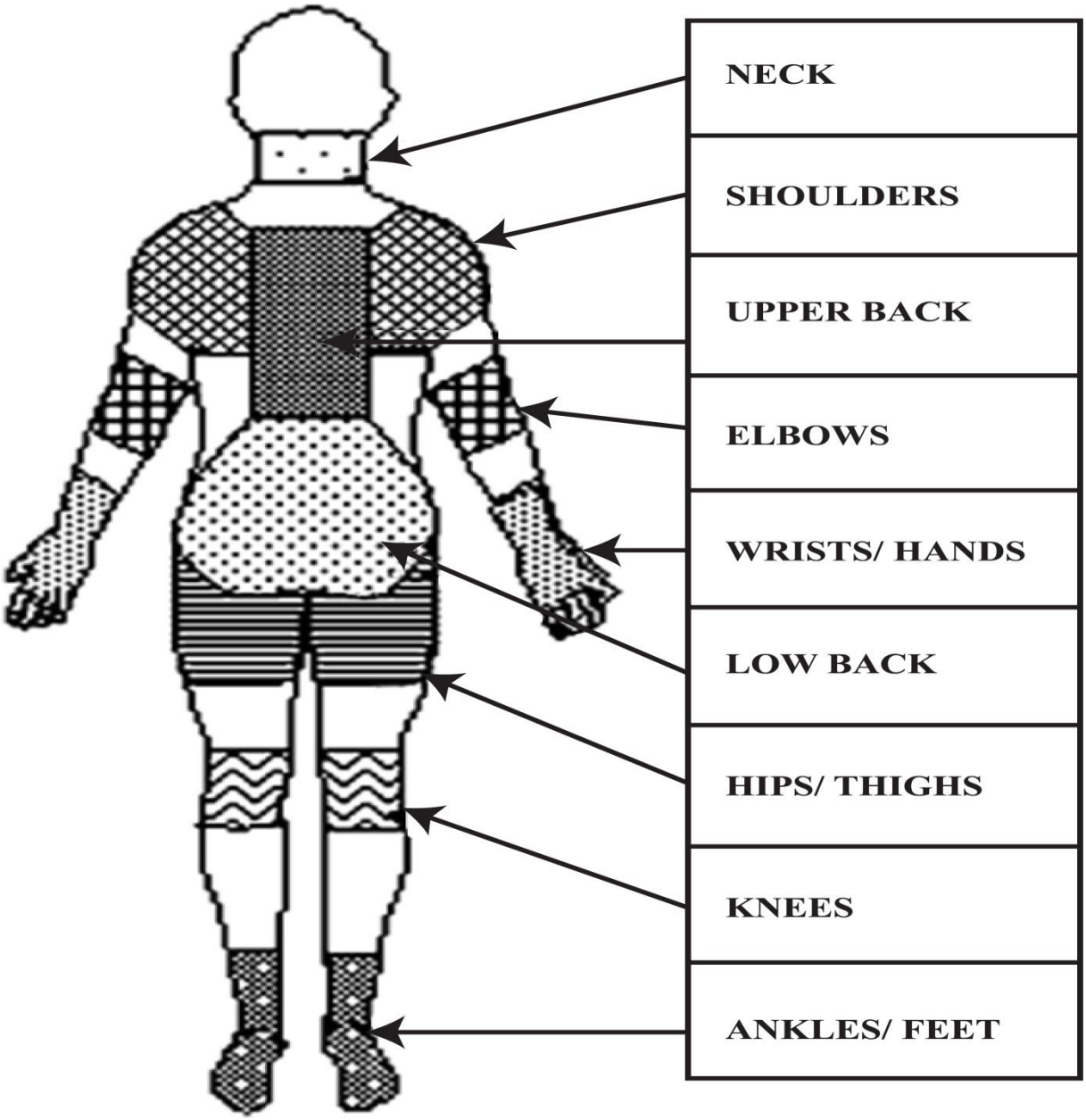
Please answer by using the tick boxes ☑
– *one tick for each question*

Please note that this part of the questionnaire should be answered, even if you have never had trouble in any parts of your body.

Have you at any time during the **last 12 months** had **trouble (such as ache, pain, discomfort, numbness)** in:	Have you had **trouble** during the **last 7 days:**	During the **last 12 months** have you been **prevented** from carrying out normal activities (eg. job, housework, hobbies) because of this trouble:
1 ***Neck*** No 1☐ Yes 2☐	2 ***Neck*** No 1☐ Yes 2☐	3 ***Neck*** No 1☐ Yes 2☐
4 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	5 ***Shoulders*** No 1☐ Yes 2☐ in the right shoulder 3☐ in the left shoulder 4☐ in both shoulders	6 ***Shoulders (both/either)*** No 1☐ Yes 2☐
7 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	8 ***Elbows*** No 1☐ Yes 2☐ in the right elbow 3☐ in the left elbow 4☐ in both elbows	9 ***Elbows (both/either)*** No 1☐ Yes 2☐
10 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	11 ***Wrists/hands*** No 1☐ Yes 2☐ in the right wrist/hand 3☐ in the left wrist/hand 4☐ in both wrists/hands	12 ***Wrists/hands (both/either)*** No 1☐ Yes 2☐
13 ***Upper back*** No 1☐ Yes 2☐	14 ***Upper back*** No 1☐ Yes 2☐	15 ***Upper back*** No 1☐ Yes 2☐
16 ***Lower back (small of the back)*** No 1☐ Yes 2☐	17 ***Lower back*** No 1☐ Yes 2☐	18 ***Lower back*** No 1☐ Yes 2☐
19 ***One or both hips/thighs/buttocks*** No 1☐ Yes 2☐	20 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐	21 ***Hips/thighs/buttocks*** No 1☐ Yes 2☐
22 ***One or both knees*** No 1☐ Yes 2☐	23 ***Knees*** No 1☐ Yes 2☐	24 ***Knees*** No 1☐ Yes 2☐
25 ***One or both ankles/feet*** No 1☐ Yes 2☐	26 ***Ankles/feet*** No 1☐ Yes 2☐	27 ***Ankles/feet*** No 1☐ Yes 2☐

Figure 2 Musculoskeletal questionnaire

Human Body Segments



Annex V- Questionnaire (Amharic version)

እያንዳንዱን መጠይቅ በጥንቃቄ በማስተዋል በሚጠይቀዉ መሰረት በማክበብ ወይም በመፃፍ ይሙሉ።።

ክፍል 1: ማህበራዊ መረጃዎችን በተመለከተ የሚዳስስ መጠይቆች

ኮድ:_____የስራ ክፍል ሀ. የልብስ ስፌት ክፍል ለ. የመቄረጫ ክፍል ሐ. ሌላ ካለ ይፃፉ_____.

ተ.ቁ	የሚጠየቀዉ ጥያቄና ማጣሪያ	የመልስ አማራጭ	ወደ ተመለከተዉ ቁጥር ይዘለል
101	እድሜዎ ስንት ነዉ?	እድሜ በዓመት ----------	
102	ፆታዎ ?	1. ወንድ 2. ሴት	
103	የጋብቻዎ ሁኔታ	1.ያገባች 2.ያላገባች 3.የፈታች 4.የሞተባት	
104	የትምህርት ደረጃዎ ምን ያህል ነዉ?	1. ማንበብና መፃፍ የማትችል 2. ማንበብና መፃፍ ብቻ 3. አንደኛ ደረጃ የጨረሱ (1-8ኛ) 4. ሁለተኛ ደረጃ የጨረሱ(9-12) 5. ቴክኒክና ሙያ ወይም ዲግሪና ከዚያ በላይ	
105	የወር ገቢዎ ምን ያህል ነው?	---------- ብር	
106	በዚህ ስራ ላይ ምን ያህል የስራ ልምድ አለዎት ?	---------- አመት	

ክፍል 2: በስራ ምክንያት የሚከሰቱ የጡንቻና የመገጣጠሚያ አካላት ህመም መጠንና ከግለሰባዊ ባህሪይ ጋር ተያይዞ ያሉ መንስኤዎችን የሚዳስስ መጠይቅ

ተ.ቁ	የሚጠየቀዉ ጥያቄና ማጣሪያ	የመልስ አማራጭ	ወደ ተመለከተዉ ቁጥር ይዘለል
201	የሰውነት ቁመት በሜትር	---------- ሜትር	
202	የሰውነት ክብደት በኪ.ግ	---------- ኪ.ግ	
203	የሰውነት ክብደት ከቁመት ጋር ሲነፃፀር (BMI)	1. ዝቅተኛ ክብደት (<18.5 ኪ.ግ/ሜ²) 2. ጤናማ ክብደት (18.5–24.9 ኪ.ግ/ሜ²) 3. ከፍተኛ ክብደት (25–29.9 ኪ.ግ/ሜ²) 4. ከመጠን በላይ ውፍረት(≥30 ኪ.ግ/ሜ²)	
204	የአካል ብቃት እንቅስቃሴ በሳምንት ቢያንስ 2 ቀን ለ30 ደቂቃ የመስራት ልምድ አለዎት ?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ ጥያቄ ቁጥር 206 ይሂዱ
205	የጥያቄ ቁጥር 204 መልስዎ አዎ ከሆነ ምን ያህል ጊዜ ይሰራሉ ?	1. በሳምንት ሁለት ቀን 2. በሳምንት ሶስት ቀንና ከዚያ በላይ	
206	ከስራ ውጭ በኋላ ምን አይነት ስራ ትሰሪያለሽ ?	1. ምንም 2. ተመሳሳይ ስራ 3. ሌላ ካለ ይገለፅ _____.	

207	የትርፍ ጊዜሽን እንዴት ታሳልፊያለሽ?	1. መዝናኛ ፊልም በማየት 2. መፅሐፍት በማንበብ 3. ሌላ ካለ ይገለፅ_____.	
208	ሲጃራ ታጨሻለሽ ?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ ጥያቄ ቁጥር 210 ይሄዱ
209	የጥያቄ ቁጥር 208 መልሱ አዎ ከሆነ ምን ያህል መጠን ያጨሳሉ?	1.----------ፍሬ/በቀን 2.----------ፓክ/በቀን	
210	በሳምንት ቢያንስ ሁለት ጊዜ ማንኛውንም አልኮል መጠጥ ይጠጣሉ ?	1. አዎ 2. የለም	
211	አጠቃላይ የጤና ችግር መኖሩን ከጡንቻና ነርቭ ህመም ጋር በተያያዘ ከዚህ ከመግባትዎ በፊት አጋጥመዎት ያዉቃል?	1. አዎ 2. የለም	
212	ለስራ በአብዛኛዉ የሚጠቀሙበት እጅዎ የትኛዉ ነዉ?	1. ቀኝ እጅን 2. ግራ እጅን	
213	በመደበኛ ስራዎ ቦታ ላይ ድግግሞሽ የበዛበት ስራ (በየ30 ሴኮንድ የሚደጋገም ድግግሞሽ ስራ) ይገጥሞታል?	1. በፍፁም 2. አንዳንዴ 3. ሁልጊዜ	
214	በመደበኛ ስራዎ ላይ ከፍተኛ የስራ ጫና አጋጥሞት ያውቃል ?	1. በፍፁም 2. አንዳንዴ 3. ሁልጊዜ	
215	በመደበኛ የስራ ክፍሎች ላይ በቂ የሆነ ብርሃን አለ?	1. አዎ 2. የለም	
216	በቀን ዉስጥ ከምሳ ሰዓት ዉጭ ዕረፍት ያደረጋሉ?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ ጥያቄ ቁጥር 218
217	ጥያቄ ቁጥር 216 መልስዎ አዎ ከሆነ በቀን ከምሳ ሰዓት ውጭ ለምን ያህል ደቂቃ እረፍት ያገኛሉ ?	1. ≤ 15 ደቂቃ 2. > 15 ደቂቃ	
218	ከሙያ ደህንነት ጋር በተያያዘ በዚህ 12 ወራት ዉስጥ የተሰጠ ስልጠና ስለመኖሩ?	1. አለ 2. የለም	
219	የደመወዝ ክፍያ ሁኔታ ?	1. በሰዓት 2. በቋሚ ደሞወዝ 3. በምርት ልክ	

ክፍል 3፡ ስራዉን በሚሰሩበት የአሰራር ሁኔታ ጋር ተያይዞ ያሉ መንስኤዎችን የሚዳስስ መጠይቅ

ተ.ቁ	የሚጠየቀዉ ጥያቄና ማጣሪያ	የመልስ አማራጭ	ወደ ተመለከተዉ ቁጥር ይዘለል
301	ምን ያህል ሰዓት ቆመው ስራዎትን በመስራት ያሳልፋሉ?	----------ሰዓት	ቁመዉ ለሚሰሩ ብቻ የሚጠየቅ
302	በሳምንት ለምን ያህል ቀን ስራዎትን ቁመዉ ይሰራሉ?	----------ቀን	
303	ስራዎ ምቹ ባልሆነ ሁኔታ ታጥፈው ወይም ተጠማዘው እንዲሰሩ ያደርገዎታል?	1. አዎ 2. የለም →	ጥያቄ ቁጥር 303 የለም ከሆነ ወደ ጥያቄ ቁጥር 305 ይህዱ
304	አንድን ስራ በተመሳሳይ ሁኔታ ለ2 ሰዓታት ታጥፈዉ ወይም ጎንበስ ብለው ይሰራሉ?	1. አዎ 2. አልሰራም	
305	በዚህ ስራ በቀን ውስጥ ምንያህል ሰዓት ቁጭ ብለዉ ይሰራሉ?	----------ሰዓት	ቁጭ ብለዉ ለሚሰሩ ብቻ
306	በሳምንት ውስጥ ምን ያህል ቀን ቁጭ ብለዉ ይሰራሉ?	----------ቀን	

307	ለስራ በመደበኛነት የመቀመጫ ወንበር ሁኔታ ምን ይመስላል?	1. ቋሚ (ከፍ ዝቅ ማለት የማይችል) 2. ተንቀሳቃሽ(ከፍ ዝቅ ማለት የሚችል)	የሚጠየቅ
308	የመቀመጫ ወንበርዎ ከመስሪያ ጠረጴዛ ወይም ማሽን ጋር ያለው ምቹነት?	1. ምቹ ነው 2. ምቹ አይደለም	

ከፍል 4፡ከስራ ስነልቦና ጋር ተያያዥነት ያላቸው የጡንቻና የመገጣጠሚያ አካላት ህመም መጠን የሚዳስስ መጠይቆች

የስራ ድብርት የተመለከቱ መጠይቆች(ከጥያቄ ቁ.401-408)						
ተ.ቁ	ጥያቄ	የስራድብርትመለኪያዎች				
		በፍፁም	አልፎአልፎ	አንዳንዴ	ብዙጊዜ	ሁልጊዜ
401	የስራ ቦታ ሁኔታዎች ደስ የማይሉና አንዳንዴ ደህንነቱ ያልተጠበቀ ነው ?	1	2	3	4	5
402	ስራዬ አካላዊና ስነ-ልቦናዊ ጉዳት እያደረሰብኝ ነው ብለው ያስባሉ?	1	2	3	4	5
403	ብዙ የስራ ጫና አለብኝ ብለው ያስባሉ?	1	2	3	4	5
404	ስለ ስራ ሁኔታዎ ለአለቆቹ ለመናገር ይከብደኛል ብለው ያስባሉ?	1	2	3	4	5
405	የስራ ጫናው ከግልና ከቤተሰብ ህይወቴ ጋር ይጋጫል ብለው ያምናሉ?	1	2	3	4	5
406	የስራ ድርሻዬን በአግባቡ ማከናወንና መቆጣጠር እችላለሁ ብለው ያምናሉ?	5	4	3	2	1
407	ጥሩ ለሰራሁት ስራ እውቅና/ሽልማት ይሰጠኛል ብለዉ ያምናሉ ?	5	4	3	2	1
408	በችሎታዬና በክህሎቴ በስራዬ ላይ በደንብ እጠቀማለሁ ብለው ያምናሉ ?	5	4	3	2	1
የስራ እርካታን የተመለከቱ መጠይቆች (ከጥያቄ ቁ. 409-418)						
ተ.ቁ		የስራ እርካታ መለኪያ				
		በጣም ደስተኛ አይደለሁም	ደስተኛ አይደለሁም	መካከለኛ	ደስተኛ	በጣም ደስተኛ
409	ጥሩ ለሰራሁት ስራ እውቅና ይሰጠኛል ብለው ያምናሉ?	1	2	3	4	5
410	ከስራ ባልደረቦቼ ቅርበት እንዳለኝ ይሰማኛል ብለው ያስባሉ ?	1	2	3	4	5
411	እዚህ ጨርቃጨርቅ ቤት ዉስጥ በመስራትዎ ደስታ ይሰማዎታል ?	1	2	3	4	5
412	በስራዬ ደህንነት ይሰማኛል ብለው ያስባሉ?	1	2	3	4	5
413	የስራ አመራሩ ስለኔ ጥሩ ያስባል ብለው ያስባሉ?	1	2	3	4	5
414	በአጠቃላይ ስራው ለአካላዊ ጤንነቴ ጥሩ ነው ብለው ያምናሉ ?	1	2	3	4	5
415	የሚከፈለኝ ደመወዝ ጥሩ ነው ብለው ያስባሉ?	1	2	3	4	5
416	ችሎታዬና ክህሎቴ በስራዬ እጠቀማለሁ ብለው ያስባሉ ?	1	2	3	4	5
417	ከተቆጣጣሪዎቼ/አለቆቼ እስማማለሁ ብለው ያስባሉ ?	1	2	3	4	5
418	በስራዬ ምን ያህል ደስተኛ ነኝ ብለው ያስባሉ ?	1	2	3	4	5

ክፍል 5:ባለፉት 12 ወራት ውስጥ በስራ ምክንያት የሚከሰቱ የጡንቻና የመገጣጠሚያ አካላት ላይ የህመም መጠን ለማወቅ የተዘጋጀ መጠይቅ በኖርዲክ ስታንዳርድ መሰረት

ባለፈው 12 ወራት ውስጥ በጡንቻና የመገጣጠሚያ አካላት ላይ አስቸጋሪ የሆነ የህመም ስሜት አጋጥሞት ያዉቃል?		በዚህ 7 ቀን(አንድ ሳምንት) ውስጥ አስቸጋሪ የሆነ የህመም ስሜት አጋጥሞት ያውቃል?		ባለፈው 12 ወራት ውስጥ በጡንቻዎ ላይ በተከሰተው መደበኛ ስራዎ እንዳይሰሩ ከልክሎት ያውቃል?	
1	አንገት ሀ. የለም ለ. አዎ	2	አንገት ሀ. የለም ለ. አዎ	3	አንገት ሀ. የለም ለ. አዎ
4	ትከሻ ሀ. የለም ለ. አዎ ከሆነ በቀኝ ትከሻ በግራ ትክሻ በሁለቱም ትክሻ	5	ትከሻ ሀ. የለም ለ. አዎ ከሆነ በቀኝ ትከሻ በግራ ትክሻ በሁለቱም ትክሻ	6	ትከሻ (በሁለቱም ወይም በአንዱ ከታየ ሀ. የለም ለ. አዎ
7	ክርን ሀ. የለም ለ. አዎ ከሆነ በቀኝ ክርን በግራ ክርን በሁለቱም ክርን	8	ክርን ሀ. የለም ለ. አዎ ከሆነ በቀኝ ክርን በግራ ክርን በሁለቱም ክርን	9	ክርን (በሁለቱም ወይም በአንዱ ከታየ ሀ. የለም ለ. አዎ
10	የእጅና አንጓው ሀ. የለም ለ. አዎ ከሆነ በቀኝ እጅና አንጓው በግራ እጅና አንጓው በሁለቱም እጅና አንጓው	11	የእጅና አንጓው ሀ. የለም ለ. አዎ ከሆነ በቀኝ እጅና አንጓው በግራ እጅና አንጓው በሁለቱም እጅና አንጓው	12	የእጅና አንጓው (በሁለቱም ወይም በአንዱ ከታየ ሀ. የለም ለ. አዎ
13	የላይኛው ወገብ/ ጀርባ ሀ. የለም ለ. አዎ	14	የላይኛው ወገብ/ ጀርባ ሀ. የለም ለ. አዎ	15	የላይኛው ወገብ/ ጀርባ (በሁለቱም ወይም በአንዱ ከታየ ሀ. የለም ለ. አዎ
16	የታችኛው ወገብ/ ጀርባ ሀ. የለም ለ. አዎ	17	የታችኛው ወገብ/ ጀርባ ሀ. የለም ለ. አዎ	18	የታችኛው ወገብ/ ጀርባ ሀ. የለም ለ. አዎ
19	ዳሌና መቀመጫ አካባቢ ሁለቱም ሀ. የለም ለ. አዎ	20	ዳሌና መቀመጫ አካባቢ ሀ. የለም ለ. አዎ	21	ዳሌ፣ታፋ(መቀመጫ አካባቢ) ሀ. አዎ ለ. የለም
22	ጉልበት ሁለቱም ሀ. የለም ለ. አዎ	23	ጉልበት ሁለቱም ሀ. የለም ለ. አዎ	24	ጉልበት (በሁለቱም ሀ. አዎ ለ. የለም
25	እግር/አልቦ ሁለቱም ሀ. የለም ለ. አዎ	26	እግር/አልቦ ሁለቱም ሀ. የለም ለ. አዎ	27	እግር/አልቦ (በሁለቱም ወይም በአንዱ ከታየ ሀ. የለም ለ. አዎ

ስለ ቀና ትብብርዎ አመሰግናለሁ!!

Annex VI- Questionnaire (Afaan Oromoo version)

Gaafannoo tokkoon tokkoon isaa offeegannoo huubachuudhaan haala gaafatuun itti marsuu ykn barreessuun guutaa

Kutaa 1ffaa:- Odeefannoowwan hawaasummaan walqabatee gaafannoowwan dhihaatan

Koodii----------Kutaa hojii A. Kutaa huuccuu hoodhaa B. kutaa ittin muran C. kan biro yoo jiratee ibsaa----------

T. Lakk	Gaafilee	Deebii filannoo	Gara lakkoofisaa agarsifameetti darbii
101	Umriin meqaa?	Umrii Waggaa----------	
102	Saala	1. Dhi	
		2. Dha	
103	Haala Heerumaa	1. Heerumttee	
		2. Hin heerumnnee	
		3. Addan baatee/Hikattee	
		4. Kan iraa dhu'ee	
104	Sadarkaa barumsaa	1. Dubisuufi Barreesuu kan hindandeennee	
		2. Dubisuufi Barreesuu kan dandeessuu	
		3. Sadarkaa tokkoofaa kan xumuuran kutaa (1-8) ffaa kan barattee	
		4. Sadarkaa lammaffaa kan xumuuran kutaa (9-12) ffaa kan barattee	
		5. Oguummaa Teekinikaaa ykn Diigirii fi isaa oli	
105	Haama Galii Ji'an	Qarshii ----------	
106	Hojii kana irratti muuxannoo haagam qabduu?	Waggaa----------	

Kutaa 2ffaa: Gaafannoo hoojii isaanitin walqabatee dhibbaa dhukuuba maashaalee fi wirtulee qaamaasababootaa amala dhunfaan walqabatan irratti kan dhiyaatuu.

T. Lakk	Gaafilee	Deebii filannoo	Gara lakkoofisaa agarsifameetti darbii
201	Dheerina qaamaa meetiridhaan	----------meetirii	

202	Ulfaatina qaamaa k.g dhaan	----------K.g	
203	Ulfaatina qaamaa dheerinna walin yoo wal madaalamuu (BMI)	1. Ulfaatina gadi'anaa (<18.5 k.g/m^2) 2. Ulfaatina fayyaa qabeessaa(18.5–24.9 k.g/m^2) 3. Ulfaatina ol'aanaa (25–29.9 k.g/m^2) 4. Ulfaatina garmalee (≥30 k.g/m^2)	
204	Soochii qaamaa torbaanittii yoo xiqqaatee si'aa 2 daqiqaa 30f hojjeetaa jirtuu?	1. Eeyyeen 2. Hin jiruu	Deebin keessan yoo hin jiruu ta"ee gar gaafii lakk 206 demaa
205	Gaafii lakk 204 deebin keessan Eyyeen yoo ta"ee yeroo hagamiif hojjeettuu?	1. Toorbaanitti yeroo lamaa 2. Toorbaanitti yeroo sadii fi isaa oli	
206	Hojiin alaa hojii maal faa hojjeettuu?	1. hoomaa 2. hojii wal fakaatuu 3. kan biroo yoo jiratee ibsi _____	
207	Yeroo boqonnaa kee akkamitti dabarsitaa	1. Filmii laaluun 2. kitaaba dubbissuun 3. kan biroo yoo jiratee ibsi_____	
208	Tamboo xuuxxaa ?	1. Eeyyeen 2. Hin jiruu	Deebin keessan yoo hin jiruu ta"ee gar gaafii lakk 210 demaa
209	Gaafii lakk 208 deebin keessan Eyyeen yoo ta"ee haammam xuuxxuu?	1.----------firii/guyyaan 2.----------paakkoo/guyyaan	
210	Toorbaanitti yoo xiqaatee yeroo lamaaf alkoolii gosa kamiyyuu dhugduu?	1. Eeyyeen 2. Hin jiruu	
211	Walumaa galatti osoo asi hin galiin duraa rakkoo fayyaa maashaa fi narvii isiin muudatee jiraa?	1. Eeyyeen 2. Hin jiruu	
212	Yeroo baayeef hojiidhaaf harka fayyadamtuu kamipi?	1. Haarka mirgaa 2. Haarka bitaa	
213	Iddoo hojii idilee kee irraa daddeebii hojii kan baayyatee (seekoondii 30 keessaatti hojii irraa deeddebi'uu)qabaa?	1. Mitii 2. Darbee darbee 3. Yeroo baayyee	
214	Hojii idilee kee irratti dhibbaa hojii isii mudatee beekaa?	1. Mitii 2. Darbee darbee 3. Yeroo baayyee	

215	Kutaa hojii idilee keessatti ifaa gahaa jiraa?	1. Eeyyeen 2. Hin jiruu	
216	Guyyaa keessaa yeroo laaqanaan alaa boqonnaa gotuu?	1. Eeyyeen 2. Hin jiruu	Deebin keessan yoo hin jiruu ta”ee gar gaafii lakk 218 demaa
217	Gaafii lakk 216 deebin keessan Eyyeen yoo ta”ee guyyaatti sa’a laaqanaan alaa daqiqaa hagamiif boqonnaa argattuu?	1. ≤ 15 daqiqaa 2. > 15 daqiqaa	
218	Leejjin Oguummaa fi nagummaan waliin walqabatee ji’oota 12 asitti keennamee jiraa?	1. Eeyyeen 2. Hin jiruu	
219	Haala kafalttii mindaa?	1. Sa’atii dhaan 2. Mindaa dhabbataa 3. Haamma omishaatiin	

Kutaa 3 ffaa፡Sababootaa haala hojiimaataawaliin walqabateedhibbaa dhukuuba maashaalee fi wirtulee qaamaa irratti gaafiin dhiyaatuu

T. Lakk	**Gaafilee**	**Deebii filannoo**	**Gara lakkoofisaa agarsifameetti darbii**
301	Sa’aatii meqaaf dhaabbattee hojii kee iraatti dabarsitaa?	----------sa’atii	Dhaabbatanii kan hojjeetan qofaaf kan gaafatamuu
302	Toorbaanitti guyyaa haagamiif hojii kee dhaabbbatte hojjeettaa?	----------guyyaa	
303	Hojiin kee haala rakkisaatin maramtee ykn micciramtee akka hojjeettuu sii taasisaa?	1. Eeyyeen 2. Hin jiruu →	Gaaffii lakk 303f deebin keessan yoo hin jiruu ta”ee gar gaafii lakk 305demaa
304	Hojii tokkoo haala walfakkaatuun sa’atii lamaaf maramtee ykn gad jattee hojjeettaa?	1. Eeyyeen 2. Hin jiruu	
305	Hojii kanaa guyyaa keessaa sa’atii meqaaf teessee hojjeettaa?	---------- sa’atii	Ta’anii hojjeetanii qofaaf kan gaafatamuu
306	Hojii kanaa toorbaan keessaa sa’atii meqaaf teessee hojjeettaa?	----------guyyaa	
307	Hojiif dhaabbidhaan haalli teessoon maal fakaataa?	1. Dhaabbi (olif gadii kan hin jeennee) 2. kan olif gadii socha’uu	

308	Teessoon xarabeezaa ittin hojjeettuu ykn machinii irraa hojjeettuu waliin wal siimachuu?	1. walin siimaa 2. wal hin simuu	

Kutaa 4 ffaa: Xiinsammuu hojiin waliin walqabateedhibbaa dhukuuba maashaalee fi wirtulee qaamaa irratti gaafiin dhiyaatuu

Hojii nuufisiisaa ilaalchisee gaafiin dhiyaatuu (T. Lakk 401-408)						
T. Lakk	**Gaafilee**	Hojii nuufisiisaa kan madaalamuu				
		Goonkumaa	Darbee darbee	Yeroo tokko tokko	Yeroo baay'ee	Yeroo hundaa
401	Haalli iddoo hojii kan hingamachisnnee fi nageenyii isaanii kan hin eegamnnee dha?	1	2	3	4	5
402	Hojiin kiyyaa dhibbaa qaamaa fi xinsammuu natti geessisaa jeettee yaadduu?	1	2	3	4	5
403	Dhibbaa hojii baay'ee nan qabaa jeettee yaadduu?	1	2	3	4	5
404	Haala hojii keetii anga'ootaaf duubachuudhaaf natti ulfaataa jeettee amanttuu?	1	2	3	4	5
405	Dhibbaan hojii jireenya dhunfaa koo fi matii waliin waliitti bu'aa jeettee amanttuu?	1	2	3	4	5
406	Qooda hojii koo haala gaarittin raawwachuu fi to'aachuu nan danda'aa jeettee amanttuu?	5	4	3	2	1
407	Hojii haala gaariitiin hojjeedheen beekkamttii/badhaasa naaf keennamaa jeettee amanttuu?	5	4	3	2	1
408	Danddeetti fi muuxannoo koo hojii irratti haala gaaritiin fayyadamaajeettee amanttuu?	5	4	3	2	1

Haala hojii gammachisaa ilaalchisee gaafiin dhiyaatuu(T.Lakk 409-418)						
T. Lakk	**Gaafilee**	Hojii gammachisuu kan madaalamuu				
		Baayye	Hin	Jidduu	Nan	Baayyeen

		e gamma daa mitii	gamma duu	galees saa	gamm adaa	gammada a
409	Hojii haala gaariitiin hojjeedheen beekkamttii naaf keennamaa jeettee amanttuu?	1	2	3	4	5
410	Hirriiyyoota waliin walittii dhufeenyaa akka qabduu siif dhagahaamaa?	1	2	3	4	5
411	Warshaa huuccuu kana keessatti hojjeechuu keetif gammachuun isiif dhagahaamaa?	1	2	3	4	5
412	Hojjii keetiin nageenyuummaa natti dhagahaammaa jeettee yaadduu?	1	2	3	4	5
413	Anga'oonnnii waa'ee koo waan gaarii yaaduu jeettee yaadduu?	1	2	3	4	5
414	Walumaagalatti hojiin fayyaa qaamaaf gaarii dhaa jeettee yaadduu?	1	2	3	4	5
415	Mindaan naaf kafalamuu garii dhaa jeettee yaadduu	1	2	3	4	5
416	Danddeetti fi muuxannoo koo hojii irratti haala gaaritiin fayyadamaa jeettee yaadduu	1	2	3	4	5
417	Too'attootaa koo waliin waligaltee qabaa jeettee yaadduu?	1	2	3	4	5
418	Hojii kootiin hagam takkaa gamachuu qabaa jeettee yaadduu?	1	2	3	4	5

Kutaa 5ffaa: Ji'ootaa 12 darban keessaadhibbaa dhukuuba maashaalee fi wirtulee qaamaa beekuufhaala istaandarddii Nordiikin gaafiin dhiyaatee.

Ji'ootaa 12 darban keessaa dhibbaa dhukuuba maashaalee fi wirtulee qaamaa irratti miira dhukkubaa rakkisaa kan ta'ee isiin muudatee beekaa?		**Guyyoota 7 (torbaan tokkoo) darban keessaa miira dhukkubaa rakkisaa kan ta'ee isiin muudatee beekaa?**		**Ji'ootaa 12 darban keessaa dhukuuba maashaalee irratti qaqqabeen hojii kee idilee akka hin hojjeennee dhorgee beekaa?**	
1	Mormaa A. Hin jiruu B. Eeyyeen	2	Mormaa A. Hin jiruu B. Eeyyeen	3	Mormaa A. Hin jiruu B. Eeyyeen
4	Gateetti A. Hin jiruu B. Eeyyeen yoota'ee Gateetti Mirgaan Gateetti Bitaan Kara lamaanuu	5	Gateetti A. Hin jiruu B. Eeyyeen yoo ta'ee Gateetti Mirgaan Gateetti Bitaan	6	Gateetti (Karaa lamaanuu ykn karaa tokkoon yoo mul'atee) A. Hin jiruu B. Eeyyeen

			Kara lamaanuu		
7	Ciiqilee A. Hin jiruu B. Eeyyeen yoo ta'ee Ciiqilee Mirgaan CiiqileeBitaan Ciiqilee lamaanuu	8	Ciiqilee A. Hin jiruu B. Eeyyeen yoo ta'ee Ciiqilee Mirgaan CiiqileeBitaan Ciiqilee lamaanuu	9	Ciiqilee (Karaa lamaanuu ykn karaa tokkoon yoo mul'atee) A. Hin jiruu B. Eeyyeen
10	Harkaa fi dame A. Hin jiruu B. Eeyyeen yoo ta'ee Harkaa fi damee mirgaan Harkaa fi dame bitaan Harkaa fi dame lamaanuu	11	Harkaa fi dame A. Hin jiruu B. Eeyyeen yoo ta'ee Harkaa fi damee mirgaan Harkaa fi dame bitaan Harkaa fi dame lamaanuu	12	Harkaa fi damee (Karaa lamaanuu ykn karaa tokkoon yoo mul'atee) A. Hin jiruu B. Eeyyeen
13	Duugda olaantuu A. Hin jiruu B. Eeyyeen	14	Duugda olaantuu A. Hin jiruu B. Eeyyeen	15	Duugda olaantuu (Karaa lamaanuu ykn karaa tokkoon yoo mul'atee) A. Hin jiruu B. Eeyyeen
16	Duugda gadaantuu A. Hin jiruu B. Eeyyeen	17	Duugda gadaantuu A. Hin jiruu B. Eeyyeen	18	Duugda gadaantuu A. Hin jiruu B. Eeyyeen
19	Mo'oofi naannoo teessumaa lamaanuu A. Hin jiruu B. Eeyyeen	20	Mo'oofi naannoo teessumaa A. Hin jiruu B. Eeyyeen	21	Mo'oofi naannoo teessumaa A. Hin jiruu B. Eeyyeen
22	Jilba lamaanuu A. Hin jiruu B. Eeyyeen	23	Jilba lamaanuu A. Hin jiruu B. Eeyyeen	24	Jilba lamaanuu A. Hin jiruu B. Eeyyeen
25	Milaa/kooranciisaa lamaanuu A. Hin jiruu B. Eeyyeen	26	Milaa/kooranciisaa lamaanuu A. Hin jiruu B. Eeyyeen	27	Milaa (Karaa lamaanuu ykn karaa tokkoon yoo mul'atee) A. Hin jiruu B. Eeyyeen

Hirmaannaa keessaniif isiin galateffannaa!!