College of Health Sciences
School of Public Health

Assessment of Back Pain and Disability Status among Automotive Industry Workers, Ethiopia

By: Wondosen Hailu (BSc)

Advisors: Ansha Nega (Msc)
Dr. Yared Mamushet (MD)

A research thesis submitted to Addis Ababa University College of Health Science School of Public Health in partial fulfillment for the requirements of Master degree in Public Health with specialty in Environmental and Occupational Health

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Approved by examining board

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Abbreviations / Acronyms

AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
BP	Back Pain
CI	Confidence Interval
COR	Crude Odds Ratio
DALY	Disability-Adjusted Life Year
HSE	Health and safety executive
ILO	International labor organization
LBP	Low back pain
MSD	Musculoskeletal disorder
NIOSH	National Institute of Occupational Safety and Health
ODI	Oswestry Disability Index
SPSS	Statistical Package for Social Sciences
WHO	World Health organization
YLD	Years Lived with Disability

Abstract

Background: Back pain is a very common public health problem in the manufacturing industry and a major cause of disability that affects work performance and wellbeing. Currently, in Ethiopia manufacturing sectors, including automotive manufacturing, is growing well but there is poor culture of work place health and safety in the manufacturing sectors. In the process of automotive production, certain mechanical tasks like manual handling, lifting, pushing or pulling heavy objects increased back problem. Which is not frequently studied and there is little evidence on this problem in automotive manufacturing industry, especially in Ethiopia there is no study to the author's knowledge. So studying about the impact of back pain among automotive industry workers is one of the key issues in improving worker's health and safety.

Objective: The aim of this study was to assess the prevalence of back pain and disability status in an Ethiopian Automotive Industry workers.

Method: A cross sectional study was conducted among 412 Bishoftu Automotive Industry workers from February 2017 to May 2018. Simple random sampling technique was applied to select participants from each departments of production factories. The data was collected by face-to-face interview using standard Nordic and Oswestry Back Pain Disability Index tools. The analysis was done by using SPSS version 24. Bivariate and multivariate logistic regression analyses were used to determine associations.

Results: The prevalence of work related back pain among automotive production factory workers during the last 12 months and the last seven days were 51.7% and 25% respectively. The prevalence of back pain related disability was 87%. The risk factors of the work related back pain that were identified include; work experience (11-15 years)[AOR: 0.02, 95%CI(0.001−0.46)], tasks that involve bending and twisting [AOR: 2.03, 95%CI(1.19−3.45)] and lifting of heavy loads [AOR: 4.89, 95%CI(2.83−8.47)].

Conclusion and recommendations: This study showed a high prevalence of back pain among automotive industry workers. Furthermore, this study verified workers with back pain and more specifically those working in tasks that involve with the identified associated risk factors were suffer from disability. The problem should have got attention to promote the health and safety of workers to prevent and for early detection and intervention should be planned for those who develop the problem in the automotive manufacturing industry to reduce effects of disability.

Key words: Back pain, lower back pain, upper back pain, disability

1. Introduction

1.1 Background

There is a growing interest in the subject of musculoskeletal disorders (MSDs) related to the workplace, due to the increasing number of workers suffering from these disorders. Back pain is one of the leading musculoskeletal disorders and it is an important public health, economic and social problem. It is any non-traumatic musculoskeletal disorder affecting the upper and lower back regardless of its diagnosis, that was not secondary to another disease or injury (1).

Back pain is a very common health problem and a major cause of disability that affects work performances and well-being worldwide. The global point prevalence of LBP has been estimated to be 9.4% (2). The Global Burden of Disease estimate showed LBP results in more disability than any other condition worldwide (10.7% of total YLDs); ranks 6^{th} in terms of overall disease burden (83 million DALYs); and is the leading cause of disability in both developed and developing countries (3). Low back pain is the leading cause of activity limitation and work absence throughout much of the world, and it causes an enormous economic burden on individuals, families, communities, industry and governments (4).

Back pain in the workplace takes up a high percentage of the occupational physician's time; it is widespread across many occupations, from heavy industrial through to light office work(5). Low back pain prevalence is related to the type of occupations such as driving, manual handling and occupations that involve a lot of improper body movements. In industrial population various factors like postural deviations, core strength, flexibility and psychosocial aspects are responsible for low back pain (6). There has also been a high prevalence of low back pain reported in the automotive industry (7).

The automotive industry is an important sector of the overall economy, particularly in industrialized countries. Back in days Ethiopia had no Automotive Industries that produce or assemble vehicle, it is not far from 11 years. Currently one government enterprise, the Bishoftu Automotive and Locomotive Industry, and five private companies, namely Yangfan Motors Plc., Mesfin Industrial Engineering Plc., Belayab Motors, Betret International and BH Trading and Manufacturing are engaged in the assembly of automobiles.

Bishoftu automotive industry was established in 1999 and it was incorporate in to the metals and Engineering Corporation in 2010, located 45km East of Addis Ababa, in the town of Bishoftu. It occupies a total area of 32.5 hectares, out of which 87000m^2 is covered by various building. It directly contributes to the national economy through the production of various products and services which are essential in public transport, construction, transportation of materials, and military purposes in the country. Some of the vehicles that are assembled in this industry are city buses, tractors, dump trucks, low-bed trucks and high-bed trucks, pick-ups, cross country buses, mid-size buses, sport utility vehicles, overhauling of tanks and armored personnel carriers and many more.

The company has about 3,324 workers. Bishoftu Automotive and Locomotive industry which is a governmental organization is an industry follows different types of operational job flow cycling. It is organized under nine different factories having different purpose. The most common processes in each production factories are welding production, painting, assembly and disassembly line.

In the process of automotive production, certain activities like manual handling of weights, lifting, pushing or pulling weights or heavy objects were highly correlated with back pain(8). About 80% of the adult working population, would experience back pain sometime during their active life due to their nature of work, which requires heavy physical work, awkward posture, or prolong periods in one posture (9). Currently, in Ethiopia automotive industries like that of other industries are growing well that involve many laborious tasks that can lead workers to suffer from back pain unless effective strategies designed to prevent the onset and intervention for back care. The poor culture of workplace safety as well as lack of a functioning occupational health and safety system in the sectors will increase the impact. There is limited information on the magnitude of back pain among automobile industries in Africa, including Ethiopia. This leads a deep gap in what is known about back pain in a large part of the regions. It is hence important to determine the prevalence of back pain and level of disability among automotive industry workers in Ethiopia.

1.2 Statement of the problem

Back pain is a highly prevalent disabling musculoskeletal condition affecting almost everyone at some time (10). Globally, more than 80% of the population will experience an episode of back pain at some time during their lives (11). Back pain is a recognized societal problem from both a disablement and economic perspective, with costs exceeding that of coronary artery disease, respiratory infections, and diabetes (12). It is one of the most common conditions for which individuals seek medical care (12). It is estimated that between 40% and 85% of people with back pain consults health care professionals about their pain (13).

Back pain continue to be the most common musculoskeletal problem in the workplace. It affects many workers, is associated with high costs to industry and the individual, and can negatively influence the quality of life for the workers. These public health problems were not well recognized due to data limitation in the area of work related disease and absence of an effective and continuous monitoring program regarding to occupational health and safety in the world (14).

Despite the large population of workers employed in the automotive industry, the physical nature of the tasks involved expose to work related back pain. Working in prolonged standing, and assembling the components using tools cause musculoskeletal disorder mainly in upper limbs like the neck, back, shoulders, arms, hands, and wrist (15).

In developing countries, workers in automotive industry had poor working condition and environment, lack of awareness among employees and employers regarding the benefits of a proper design of the work environment and appropriate work practices (16). However, there is no previous study conducted on the effect of occupational related back pain and functional disability due to back pain among workers of automotive industry in Ethiopia.

1.3 Significance of the study

Back pain is one of the most important public health problems. These problems are causing long period of disability and may increase high treatment cost. There is less information about the magnitude and impacts of back pain among manufacturing workers in developing countries when compared to developed ones (17).

Currently, in Ethiopia automotive industries like that of other industries are growing but knowledge concerning on occupational health and safety among workers is minimal, as well as there is lack of strong functioning health and safety system in the manufacturing sectors (18). Back pain tends to affect the social, economic, physical and mental wellbeing of the workers. It is hence important to determine the prevalence of back pain and related disability among production workers in the automotive industry.

Therefore, the aim this study is to assess the prevalence of back pain and disability status due to back pain among automotive industry workers. This study will provide information on the magnitude of the problem, the risk factors of back pain, and direct prevention strategies based on the findings. Besides, it can also serve as baseline information to undertake studies on similar settings.

2. Literature review

2.1 Burden of back pain worldwide

Back pain is one of the most common health problems and creates a substantial personal, community, and financial burden globally (19). The Global Burden of Disease Study estimated that all musculoskeletal disorders combined caused 21.3% of the total years lived with disability, globally second to mental and behavioral problems (23.2%). Out of the 291 conditions studied, low back pain ranked first for the disability, and sixth for the overall burden (20).

In industrialized countries, low back pain (LBP) is a major public health problem, a leading cause of disability, and imposes an enormous social and economic burden on the community(21). The lifetime prevalence of non-specific low back pain is estimated at 60–70% in industrialized countries with one year prevalence of 15–45% and 5% per year incidence in adult (22).

Back pain is a major public health problem in the USA, because more than 34 million (17%) adults report low back pain (23). On any given day, an estimated 6.5 million people in the United States are bedridden because of back pain and approximately 1.5 million new cases of back pain are seen by physicians in each month (24). An estimated 2.06 million episodes of low back pain occurred among a population at risk of over 1.48 billion person-years for an incidence rate of 1.39 per 1,000 person-years in the United States. Low back pain accounted for 3.15% of all emergency visits. Injuries sustained at home (65%) accounted for most patients presenting with low back pain (25).

Low back pain is a major health and socioeconomic problem in Europe. Many people will experience one or more episodes of low back pain in their lives. Health and Safety Executive work related back disorders statistics in Great Britain showed that the prevalence rate of LBP was 590 cases per 100,000 people with 194,000 total cases in 2016/17. The working days lost due to work related back disorders was 3.2 million days with an average number of days lost per case of 16.5 days (26).

Study in Asia showed back pain was common, with 30% of cohort members reporting low back pain. The chronic low back pain group was more likely than the never back pain group to report functional limitations (27). The annual prevalence of low back pain among the Chinese working population was more than 50% (28). Study in Taiwan had reported 25.7% low back pain within the past 3 months among adults aged 20 years and older. Factors associated with low back pain

included female gender, low education, and blue-collar work (29). In a baseline assessment of 30 rural villages surrounding Shigatse City, Tibet, showed that the point prevalence of low back pain was 34.1%; the 12-month prevalence was 41.9%. The 20% of the villagers had substantial functional disability associated with low back pain (30).

The global prevalence of general disability is highest in sub-Saharan Africa. Among the leading causes of disability in the region was low back pain which was largely consistent with the leading causes at the global level (31). The mean low back pain point prevalence among the adolescents was 12% and among adults was 32%. The average one year prevalence of low back pain among adolescents was 33% and among adults was 50%. The average lifetime prevalence of low back pain among the adolescents was 36% and among adults was 62% (32).

Study conducted in rural community in South West Nigeria showed that 40% of the population had low back pain in the last 12 months while 33% had low back pain at the time of the study. The prevalence among males was higher than females; 44.7% and 35.6% respectively. The severity and mean duration of low back pain was highest among farmers (33). Another study conducted in urban community of Southwest Nigeria showed that the 12-month prevalence of low back pain was 44%, while the point prevalence was 39%. Back pain was more prevalent among men (49%) than women (39%). The prevalence of back pain was highest among farmers (85%) and lowest among housewives (32%). In this study low back pain did not feature as a main cause of morbidity, accounting for a mean of 3 days off work per person per year (34).

A study among Lesotho mothers showed that 10.12% had severe, 12.82% moderate and 35.54% mild low-back pain. About 78.77% of the mothers with severe low-back pain were poor, illiterate, and from rural communities (35). The prevalence low back pain among outpatients in Uganda showed 62.3% of patients had mechanical or simple back pain with non-specific pain. About 19.1% had nerve root compression due to prolapsed intervertebral discs, 17.2% had serious spinal pathology due to tuberculosis, brucellosis, fractures and degenerative changes (36).

The extent of the chronic pain problem poses a significant economic burden for patients, health services and societies. The economic impact of pain is greater than most other health conditions, due to its effects on rates of absenteeism, reduced levels of productivity and increased risk of leaving the labor market (37). The impact of pain on economies is enormous, with the cost of back

pain alone equivalent to more than a fifth of one country's total health expenditure and 1.5% of its annual gross domestic product, while in another, it represents three-times the total cost of all types of cancer (38).

2.2 The prevalence of back pain in Ethiopia

Even though there is small number of studies on the subject matter in Ethiopia, some studies showed high prevalence of back pain in different occupational categories. The prevalence of back pain among hospital staffs showed the life time prevalence of LBP was found to be 50.6% and the 12 month LBP prevalence was 41.4%(39). Another study in clinical laboratory workers showed that the 12 month prevalence of back pain was 66%(39). The study among pedestrian back loading women indicated that the prevalence of upper back pain and lower back pain were 67.3%, and 60.4% respectively(40). A study among garment workers showed that the prevalence of upper back pain and lower back pain were 6%, and 44% respectively(41).

In Sub-Saharan Africa including Ethiopia, the health systems are still more centered on fighting epidemics such as HIV/AIDS, Tuberculosis and Malaria(42), while in developed countries the focus of health systems is moving from diseases causing high death rates, such as communicable diseases, to chronic conditions (such as back pain) that have lower mortality but higher impacts on the length of life lived with functional limitations (2).

In developing countries, such as Ethiopia, the impact of chronic diseases such as back pain is in addition to the continued need to respond to communicable diseases. Therefore, highlighting of the impact of back pain on the functional activities of the manufacturing workers is critical in understanding the magnitude of the problem not only in Ethiopia but the entire African continent which is focusing on fighting other epidemics than chronic conditions.

2.3 Functional disability due to back pain

Back pain is the single leading cause of disability worldwide and has enormous effects on an individual's functional ability leading to the loss of one's quality of life (3). Functional limitations is defined as activity limitations experienced because of the back pain problems while activity limitation as the level of difficulty that an individual has in executing an activity due to back pain(43). Previous studies reported that back pain had catastrophic effects on an individual's

functional ability and daily activities such as standing, sitting, sleeping, walking, lifting, carrying, travelling to work, socializing and interference with personal care (44).

According to the World Health Organization (WHO) one of the most disabling conditions among the elderly is musculoskeletal disorders, of which back pain is a major contributor (45). Low back pain is the most common cause of early retirement on ground of ill health, sickness absence, job changes and a fall in the work speed among the working population (46). Study indicated that worldwide, more people are disabled from working because of musculoskeletal disorders especially back pain than from any other group of diseases. Occupational related low back pain was estimated to cause 818,000 disability-adjusted life years lost annually worldwide (1). A study reported that most patients with back pain recover quickly and without residual functional loss and that overall, 60-70% recovers by six weeks, 80-90% by 12 weeks and recovery after 12 weeks is slow and uncertain. Fewer than half of those individuals disabled for longer than six months return to work and, after two years of absence from work, the return-to-work rate is close to zero (9).

The prevalence of low back pain in the United States, as well as the disability and financial burden associated with it, continues to increase with treatment costs such as physiotherapy and allied special services consistently rising by at least 7% per year, and they have a total impact in excess of $170 billion annually in health care (47). It remains the leading cause of disability in persons younger than 45 years old and comprises approximately 40% of all compensation claims in the United States (48).

Many people in Nigeria are living with disability due to chronic low back pain (CLBP), with the greatest burden accounted for by people living in rural Nigeria. Psychosocial factors were the most important factors associated with CLBP disability, and accounted for 62.5% and 49.1% of the variance in self-reported and performance-based disability, respectively.

Literature shows the consequent economic, psychosocial and functional challenges experienced by workers, employers and their families following the workers suffering from back pain. Different occupational hazards seem to influence the prevalence of back pain in various occupational settings. Therefore, identifying hazards to occupational-related back pain is crucial to developing appropriate preventative and cost effective measures for low back pain(37).

2.4 Magnitude of work related back pain in automotive industry

A study among automotive assembly line workers in Malaysia revealed that 78.4% of workers reported MSD while the highest percentage of complaints concerned the lower back (50.9%) and the upper back pain accounts (31%)(49). Another study in Malaysia automotive industries workers showed that an increment in the point prevalence of LBP was 57.9%, 49.5%, and 35.1 % for 12 months, one month, and of 7 days respectively (50). The top three highest prevalence of LBP were found at engine section (39.0%), followed by casting section (38.2%) and assembly section (37.5%) (51).

Study in Iranian automotive assembly line workers showed that the prevalence of low back pain was 47.4% which is the most common reason for missing work (17.9%) (52). Among Tehran auto parts manufacturing workshops workers, 27.5% suffered from back pain. A high percentage of young workers suffered from low back pain, it was expected that increased experience had increased the incidence of back pain (53).

A study among automobile service industry in Nigeria showed that 94.4% of the workers who participated in the study suffered from low back pain. The studied mechanic works were characterized with, manual lifting of component parts combined with awkward postures, forceful gripping, hand twisting, and standing for long period of time (54)

2.5 Factors associated with back pain in automotive industry

Epidemiological studies continue to provide insights into the prevalence of back pain and have identified many individual, psychosocial, and occupational risk factors for its onset (55). The risk factors for back pain reported in studies include stress, anxiety, depression, heavy physical load (56), smoking (57), alcohol consumption (58), and obesity (57).

Socio demographic factors

Study in Kosovo power plant workers showed that the prevalence increased with age in both sexes. The severity grade of LBP was significantly higher in older employees than in younger ones(59). Female or older workers were at increased risk of experiencing low back pain(60).

Study in Malaysian automotive assembly line workers indicated that significant risk factors for LBP symptoms were workers aged ≥ 25 years and those workers with equal and more than three

years of work experience (49). A study in Ethiopian aircraft technicians showed the duration of employment was significantly associated with experiencing low back pain. As aircraft technicians with 7 - 9 years working experience were almost eight times more likely to experience LBP than those with 1 - 3 years of experience . The prevalence of back pain increased as the number of working hours spent on repeated strenuous physical activities and the time spent on repeated bending, twisting, or reaching increased(61).

Individual factors

The influence of lifestyle factors on back pain risk is crucial. Since the positive association between smoking and risk of LBP has been confirmed, it was not surprising those current smokers to be at higher risk of LBP compared with non-smokers(57). However, the relationship between environmental tobacco smoke and the risk of frequent LBP remains unclear. A person who consumes alcohol daily had a twice the chance of developing low back pain compared to a person who does not consume alcohol (62).

Back pain correlates with physical inactivity such as time spent on hours watching TV or video. Sports activities such as swimming and soccer were associated with decreased prevalence of back pain (63). Physical exercise has consistent evidence for primary prevention of low back pain compared to no activity (64). A study among Tehran auto parts manufacturing workshops showed that there was a significant relationship between exercise and the prevalence of back pain (53).

The individuals with a college degree or higher levels of education have a lower chance of experiencing LBP than those with only a high school education or are college drop-outs (65). A study conducted to assess the effect of ergonomics training programs on the prevalence of low back pain among workers of an Iranian automobile factory showed the prevalence of LBP experienced during the last year significantly decreased from 42% to 23% in participants took part in the workshop (66).

The history of previous low back pain significantly increased the risk of a new episode of disabling low back pain. Primary care treatment of chronic LBP is associated with modest or no improvement (67). Study conducted in North Carolina households showed that 39% of those with back pain sought medical care; 24% sought care initially from an allopathic physician, 13% from a chiropractor, and 2% from other providers. More prolonged pain, more severe pain, and sciatica

were associated with care-seeking. Younger age, male gender, and non-job-related pain did correlate with the decision to seek care from a chiropractor (68).

Work related factors:

A study among automotive industry workers showed physical activities associated with LBP were lifting weight and climbing stairs, not using any mechanical lifting aid, and postures (extreme bending, pushing and pulling, standing, kneeling, and bending and twisting) (8). A study among automotive assembly line workers in found that awkward posture was significantly associated with MSDs such as low back pain (49)]. Workers experienced back pain in the auto industry was as a result of their ignorance in the correct and ergonomic techniques in materials handling (51).

Study conducted in Ethiopian aircraft technicians a significant associations between the prevalence of LBP and pulling and pushing heavy loads, lifting heavy objects, and carrying heavy loads. Tasks that involve bending, lifting, hard to hold loads, and working with twisted trunks were also significantly associated with LBP (61).

Psychosocial factors

The prevalence rate of self-reported low back pain in previous three months among workers in the U.S. found significant associations between low back pain and a set of psychosocial factors, including work-family imbalance, exposure to hostile work, and job insecurity, while controlling for demographic characteristics and other health related factors (60). Workers with low satisfaction with their work achievements had a higher prevalence of chronic low-back pain(69).

A study among automotive industry workers showed that stress at work was significantly associated with the 12 months prevalence for low back pain. This finding indicates that psychosocial risk factors are associated to the occurrence of low back pain. Employees with high demands, low control, job strain, low job satisfaction and low job appreciation were associated with both LBP prevalence and incidence of disabling LBP(50).

These all associated factors may contribute for the occurrence of back pain and related disability among workers engaged in the automotive production activity. The factors impact on back pain directly or indirectly through the interaction of each other.

2.6 Conceptual frame work

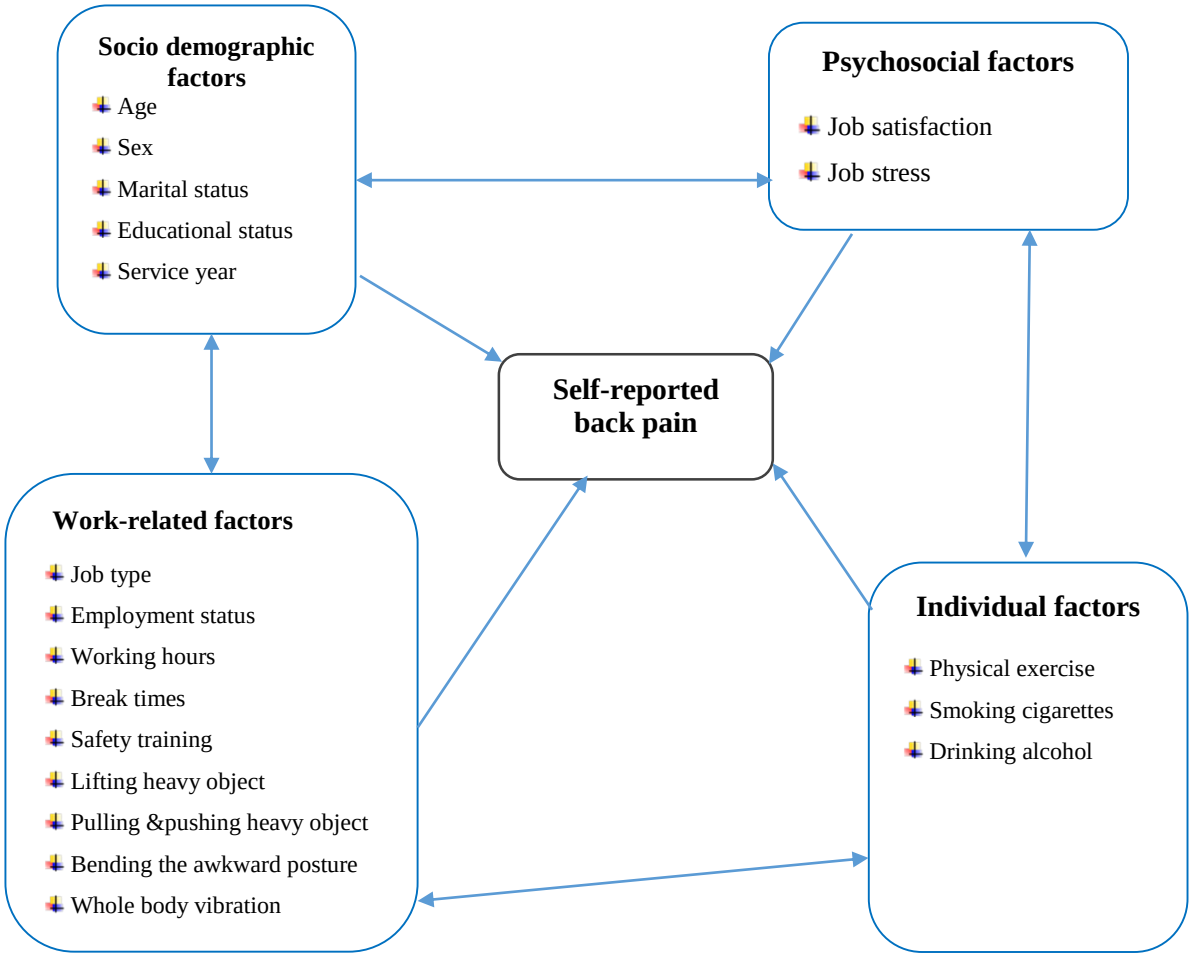

Figure 1: Conceptual framework of back pain and disability status (adapted with some modifications after reviewing different literatures), April, 2018

3. Objectives

3.1 General objective

The main aim of this study is to assess the prevalence of back pain and disability status among automotive industry workers in Ethiopia

3.2 Specific objectives

- To assess the prevalence of back pain among automotive industry workers
- To determine disability status due to back pain among automotive industry workers
- To determine factors associated with back pain among automotive industry workers

4. Methods

4.1 Study area

The study was conducted in Bishoftu Automotive Industry which is located 45 km east of the capital city of Addis Ababa, in the town of Bishoftu. The absolute location of Bishoftu is 8°45′N latitude and 38°59′E longitude. Topographically the city is located in tepid to cool sub-moist mid highland at an altitude of about 1920 meters above sea level with moderate weather condition. The temperature of the area falls within a range of 16°c and 24°c.

Bishoftu Automotive Industry had nine different production factories and over 3,324 workers with 2,342 permanent and 982 temporarily employees. Out of these over 2,546 workers are production staffs while the remaining are under the administrative staffs.

4.2 Study design and period

A cross-sectional study was conducted to assess the prevalence of back pain and disability status among Bishoftu Automotive Industry workers from February to May 2018.

4.3 Source population

All production employees who were working in Bishoftu automotive industry.

4.4 Study population

All sampled production workers in Bishoftu automotive industry

Inclusion criteria

All workers who had worked at least12 months in those production departments was included.

Exclusion criteria

All workers in the factory who are not involved in the manual labour (guards, administrative workers, cafeteria workers, drivers,…etc.) in those sampled production sections was excluded.

4.5 Sample size determination

The sample size for objective one and two was calculated separately using a formula for single population proportion and double population formula for third objective considering different assumptions. Sample size determination considering the absence of previous study in Ethiopia and in other African countries in this specific study area which include only automotive production factory workers the following assumptions was undertaken.

The sample size for the first objective was calculated using the prevalence of low back pain (47.1%) which was reported from the study conducted among aircraft technicians in Ethiopian Airlines(61). Based on the assumption with a precision level 5% and 95% confidence interval and adding 10% to compensate for non-response rate, the actual sample size for the study was computed using the formula for single population proportion as indicated below:

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

Where, n = the maximum sample size, Zα/2 = standard normal distribution curve value for 95% CI which is 1.96 (where, α= 0.05), p = prevalence of low back pain (0.47), and d = the margin error between the sample and the population (0.05).

$$n(lower\ back\ pain) = \frac{(1.96)^2 0.47(1-0.47)}{(0.05)^2} = \frac{(3.8416 \times 0.25)}{0.0025} = 384$$

Adding 10% (38.4) non-response rate, the sample size was 422 workers in automotive production factories. Therefore the sample size for the low back pain was the largest; it is taken as appropriate sample size for the first objective.

Sample size for the third objective was calculated using double population proportion formula based on the following assumptions. The prevalence of low back pain among aircraft technicians in Ethiopian Airlines who do not bend posture in awkward posture was 26% and those bending posture was 74% (61). A type I error of 5%, power to detect the assumed difference 85% and a 10% non-response rate. It was calculated using double proportion formula using Epi info version 7 (n1=86, since n1=n2, n=172) and by adding 10% for non-response resulted 190. Therefore compared with the sample size of first objective, 422 is larger and it was taken as sample size for this study.

$$n1 = \frac{[Z\frac{\alpha}{2}\sqrt{2pq} + Z1-\beta\sqrt{(p1(q1)+p2q2}]^2}{(p1-p2)^2}$$

Where, n_1 = number of workers bending in awkward posture, n_2 = number of workers who don't bend in awkward posture, p_1 = proportion of low back pain among workers not bending in awkward posture, p_2 =proportion of low back pain among workers bending in awkward posture, Zα/2 = critical value at 95% level of significance, $Z_1 - \beta$ = standard normal distribution value corresponding to 80% power to detect the assumed difference =0.84.

4.6 Sampling procedure

Bishoftu automotive industry was intentionally selected in the consideration of time, financial, material, human power constraints to account the whole automotive industries located in different regions of Ethiopia. In Bishoftu automotive industry there were nine production sections which was included in the sample size determination technique. The study sample was distributed in the nine production departments according to their workers` number of proportion. Finally, the study subjects were selected using simple random sampling technique using workers attendance registration as sampling frame from each production sections as indicated below in figure 2.

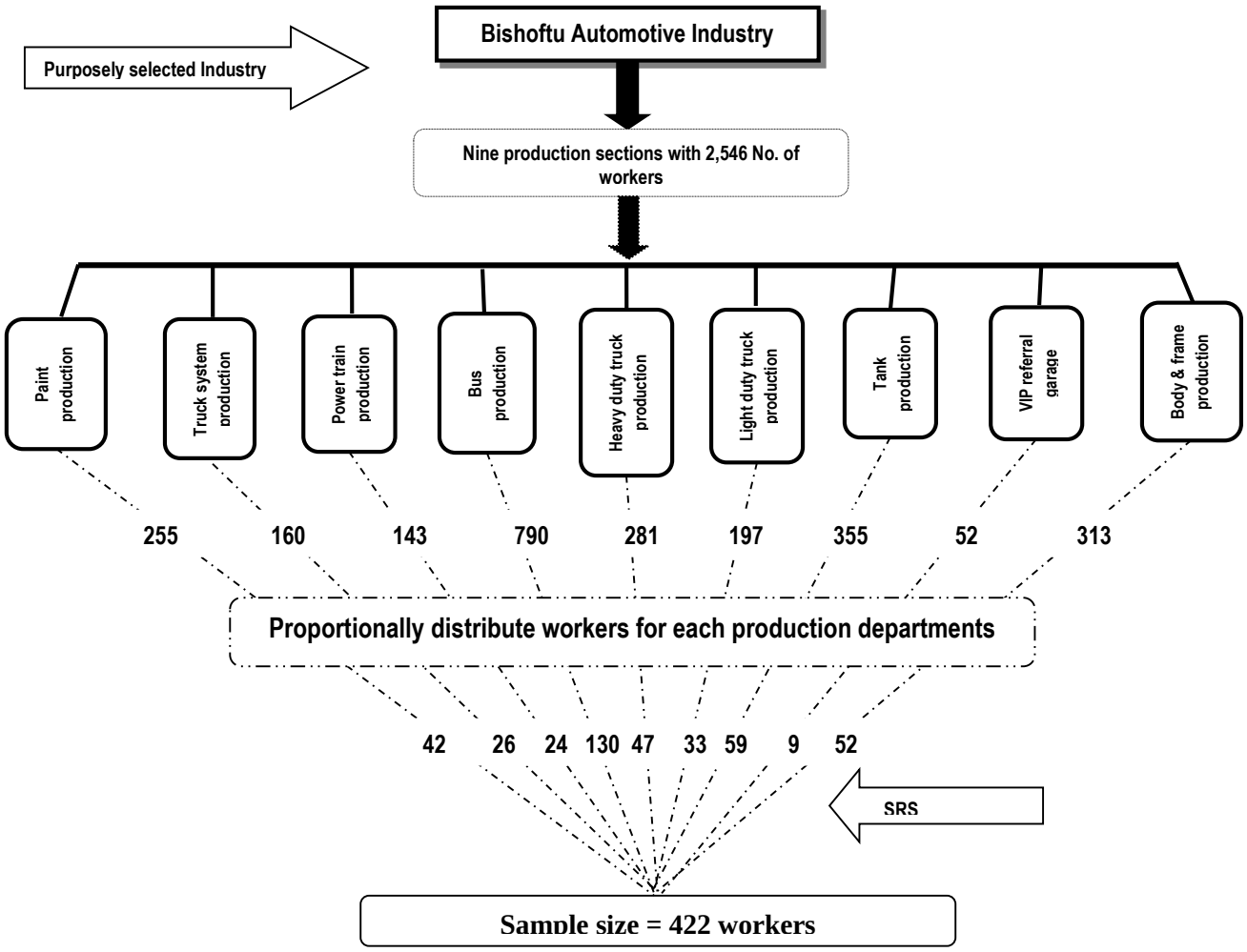

Figure 2: Schematic presentation of sampling procedure for the selection of study unit among Bishoftu automotive industry workers in Ethiopia, April, 2018

4.7 Study variables

Dependent variables:

- Self-reported back pain among the respondents

Independent variable:

- **Socio-demographic variables**: age, sex, marital status, educational status and service year
- **Work related factor**: Lifting heavy object, pulling &pushing heavy object, bending and twisting posture, working hours, break times, health & safety training, employment status, job type and whole body vibration
- **Individual factor**: physical exercise, cigarette smoking and alcohol drinking habits
- **Psychosocial factors**: Job satisfaction and job stress

4.8 Data collection tools and procedures

The data was collected by a face-to-face interview using standard Nordic and Oswestry Back Pain Disability Index. First, the English version of the standard questionnaire was obtained. Then it was translated to Amharic version (local language) to make suitable conversation during an interview and retranslated to English to check if it is consistent with the original questionnaire.

It contains six parts. The first part of the questionnaire consisted of questions comprised of demographic information. The demographic part seek information about gender, age, marital status and educational status. In this part, open-ended and closed ended questions was phrased, with dichotomized answer alternatives "yes" and "no" for closed ended questions.

The second part of the questionnaire consisted of questions which determine data on back pain perceived symptoms as well as the history of back pain in relation to the symptoms in the last 12 months and seven days. Information determining back pain symptoms was derived from the Nordic Musculoskeletal Disorder Questionnaire (70) and supported by picture that shows the upper and lower back parts to easily identify the back pain area during data collections. Closed-ended dichotomized response alternatives was used.

The third part of the questionnaire was used to measure functional disability of workers due to back pain in the last seven days starting from data collection time. It utilized the modified Oswestry Back Pain Disability Index questionnaire (71). The questionnaire consisted of 10 item questions related to the effect that pain has on typical daily activities. The 10 sections of questions consisted

of pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and employment. For each section the total possible score was 5: if the first statement was marked, the section score = 0; if the last statement was marked, the score = 5. The scores were then added and the final score was expressed as % disability. The final score was interpreted as (1.) (0%-20%) minimum disability, when a patient can cope with most living activities; (2.) (21%-40%) moderate disability, when a patient experiences more pain and difficulty with sitting, lifting and standing and they may be disabled from work; (3.) (41%-60%) severe disability, when a pain remains the main problem; (4.) (61%-80%) crippled, when back pain impinges on all aspects of the patient's life; (5.) (81%-100%) which was bed-bounded or exaggerating indicated that the individual was disabled from most of the activities asked on the questionnaire.

The forth part of the questionnaire consists of questions which determine factors associated with back pain. It was used to assess the individual factors, work related factors and psychosocial factors of the participants.

Four data collectors and one supervisor was involved. The questionnaire was distributed to the work sections proportionally as indicated in the sampling technique. Then, the participants invited from each sections for face to face interview.

4.9 Data management

The collected data was cleaned, coded and entered to Epi Info version 7. When the entry of questioner was completed, cleaning was made to avoid missing value, outliers and other inconsistencies by running commands like frequencies and sort on the same software. Cleaned data was exported to the statistical Package for Social Sciences (SPSS) version 24 for analysis.

4.10 Data analysis procedures

After the data was edited, coded, entered, cleaned and exported into SPSS version 24 software program for analysis, odds ratio with 95% confidence interval was used to measure the association between dependent (back pain) variables and the independent (socio demographic, work related, personal and psychological) variables.

For the first and second specific objectives descriptive statistics like frequency and percentage and the findings were presented by frequency tables, graphs, charts, percentage and proportion with 95% C.I.

For the third specific objective to determine the independent factors associated with back pain cross tabulation, bivariate logistic regression was used to explore presence of statistical association between different independent variables and outcome variables using crude odds ratio with 95% C.I. Bivariate logistic regression analysis was performed to see the existence and significance of association between dependent and independent variables.

Independent variables with p-value less than 0.05 under 95% CI was considered as having significant association with dependent variable and was reported using both p-value and crude odds ratio with 95% C.I in the bivariate analysis part. Variables which show association on the bivariate analysis ($p<0.2$) was entered in to multivariate logistic regression analysis to identify their significance/independent effects on the outcome variable. Finally, variables with $p<0.05$ in the multivariate analysis was considered significant and presented by adjusted odds ratio with 95% C.I.

4.11 Data quality assurance

The Standard Nordic and Oswestry Back Pain Disability Index Questionnaire was used. The questionnaire was pretested among Auto Repair Mechanics in Addis Ababa one week before the actual data collection period. The supervisor and data collectors were trained for two days before data collection on the techniques, rules and regulations of data collection and closer supervision was undertaken during data collection in a way that bias could not occur. Additionally, after data collection, questionnaires were reviewed and checked for completeness and relevance by supervisors and principal investigator and the necessary feedback was given to data collectors in the next morning.

4.12 Ethical consideration

Ethical clearance and approval was obtained from the Institutional Review Board of the Addis Ababa University, College of Health Science, School of public health. Formal letter for cooperation was obtained from school of public health, College of Health Sciences, Addis Ababa University and a written permission was obtained from Bishoftu Automotive Industry. Privacy issue was critically maintained. Informed consent was obtained from each participant and the information obtained from them would not disclosed to third person. Confidentiality was assured.

More of participation in this study was entirely voluntary. Participating and not participating on this study was full right for all workers and participants could stop at any time from participation. Participants could skip any question that they didn't want to answer and can ask any question that are not clear. The study has no risk on participant and there is also no direct benefit for being participating on the study.

4.13 Operational definition

- **Back pain**: Self-reported pain, stiffness, soreness, ache or discomfort experienced in their back during the preceding 12 months and seven days (1).
- **Low back pain (LBP)**: pain or discomfort felt in the lower back with or without radiation to the leg below the knee.
- **Upper back pain (LBP)**: any pain occurring throughout the upper back area, including the shoulder blades and the region where the rib cage connects to the upper, mid-back and chest sections of the spine(1).
- **Disability**: Back pain-related disability refers to difficulties to accomplish activities of daily live at home or at work, the disability outcome is defined with the Oswestry Back Pain Disability Index which is expressed as mild (0-20%), moderate (21-40%), severe (41-60%), very severe (61-80%) and extreme (81-100%) disability level(71) .
- **Job satisfaction**: A score measured using the generic job satisfaction scale as "Yes" and "No" (72)
- **Job stress**: A score measured using the workplace stress scale as "yes" and "no" (73).
- **Cigarette Smoking**: It is practice of smoking cigarette by workers for at least one sticks of cigarette per day (74).
- **Alcohol drinking**: it is a consumption of any kind of alcohol by workers at least for two times per week for different purpose (75).
- **Physical exercise**: Performing any kinds of physical exercise at least two times per week for 30 minutes (76).
- **Health and safety training:** A worker who has got any kind of training in one year period through any kind of media about health and safety rule implemented in industries (77).

4.14 Dissemination of results

The study result will be presented to Addis Ababa University, College of Health Science School of public health. The result document will be disseminated and utilized to all responsible bodies. Further efforts will be made to publish the findings on national or international journal to inform the scientific community.

5. Results

5.1 Socio demographic characteristics of the respondents

A total of 422 automotive manufacturing workers were interviewed, of which 10 respondents partially completed the interview. So 412 questionnaires were completed, with 97.6% response rate. More than half of the study subjects, 257 (62.4%) were males. Most of the respondents, 164(39.8%) were in the age group of 25-29 years and the mean age of the study subjects was 28.6 ± 5.7 SD. For marital status, 214 (51.9%) were single and 188(45.6%) were married. Majority of the study participants, 334(81.1%) have attended Diploma or TVET level. Regarding the work experience of the study subjects, 275(66.7%) had served from 1−5 years and 113 (27.4%) had served for 6−10 years and the mean service year was 5 ± 3.5SD with a minimum and maximum of 1 and 30 years respectively (Table1).

Table 1: Socio-Demographic characteristics of the respondents

Categories of variables	Frequency(n=412)	Percent(%)
Sex		
Male	257	62.4
Female	155	37.6
Age in years		
<25 years	104	25.2
25−29 years	164	39.8
30 − 34 years	76	18.4
35−39 years	47	11.4
≥40 years	21	5.1
Marital status		
Single	214	51.9
Married	188	45.6
Divorced	10	2.4
Educational status		
Primary school	2	0.5
Secondary school	4	1.0
Diploma or TVET	334	81.1
Degree and above	72	17.5
Service year		
1−5 years	275	66.7
6–10 years	113	26.8
11−15 years	19	4.5
≥16 years	5	1.2

5.2 Work-related characteristics of study participants

Most of the respondents, 373(90.5%), were permanently employed, 366(88.8%) were workeing 6 days per week and almost all of them 403(97.8%) were working for eight hours per day in their work. Two hundred and twenty one (53.6%) of the respondents had no formal workplace health and safety training. Regarding the nature of the job, it was found that 49.0%, 21.1%, 11.2% and 7.3% of the respondents work as assembling, welding, painting and disassembling respectively. Two hundred and ninety one (70.6%) of the respondents' job involve bending or twisting in awkward posture. Two hundred and sixty one (63.3%) of the respondents lift heavy loads (more than 25 kg) and 202(49.0%) were pulling or pushing heavy loads (more than 25 kg) in their daily work. Almost half of the respondents, 224(54.4%) were exposed to whole body vibration from using vibrating powered tools (Table 2).

Table 2: Work-related characteristics of study participants

Categories of variables	Frequency(n=412)	Percent(%)
Job type		
Welding	87	21.1
Painting	46	11.2
Assembling	202	49.0
Disassembling	30	7.3
Finishing	24	5.8
Others	23	5.6
Employment status		
Temporary	39	9.5
Permanent	373	90.5
Working days per week		
5 days	29	7.0
6 days	366	88.8
7 days	17	4.1
Working hours per day		
≤ 8 hours	403	97.8
>8 hours	9	2.2
Health and safety training		
Yes	191	46.4
No	221	53.6
Bending or twisting in awkward posture		
Yes	291	70.6
No	121	29.4
Lifting of loads more than 25 kg		
Yes	261	63.3
No	151	36.7
Pushing or pulling heavy loads(>25kg)		
Yes	202	49.0
No	210	51.0
Using vibrating powered tools		
Yes	224	54.4
No	188	45.6

5.3 Individual and psychosocial characteristics of study participants

Among the respondents, 193 (46.8%) were practicing physical exercise at least two days per week that last for at least 30 minutes. Most of the respondents, 387 (93.9%), have no smoking behaviors. Regarding alcohol consumption, 58(14.1%) of the respondents drink alcohol at least two times per week for different purpose. On other hand more than half of the respondents, 277 (67.2%), were not satisfied with their job and 313 (76.0%) of them had job stress (Table 3).

Table 3: Individual and psychosocial characteristics of study participants

Categories of variables	Frequency (n=412)	Percent(%)
Habit of doing Physical exercise		
Yes	193	46.8
No	219	53.2
Cigarette smoking behavior		
Yes	25	6.1
No	387	93.9
Alcohol drink behavior		
Yes	58	14.1
No	354	85.9
Job stress		
Yes (16 —32)	313	76.0
No (≤ 15)	99	24.0
Job satisfaction		
Yes (32—50)	135	32.8
No (10—31)	277	67.2

5.4 Prevalence of work related back pain among respondents

The prevalence of work related back pain among automotive production factory workers who had experienced trouble (ache, pain, and discomfort) in the last 12 month period and during the last seven days were 213(51.7%) and 103(25.0%) respectively. The prevalence of lower and upper back pain during the last 12 months were 148(35.9%) and 65(15.8%) respectively; whereas, the prevalence of lower and upper back pain during the last seven days were 63(15.3%) and 40(9.7%) respectively (Fig.3)

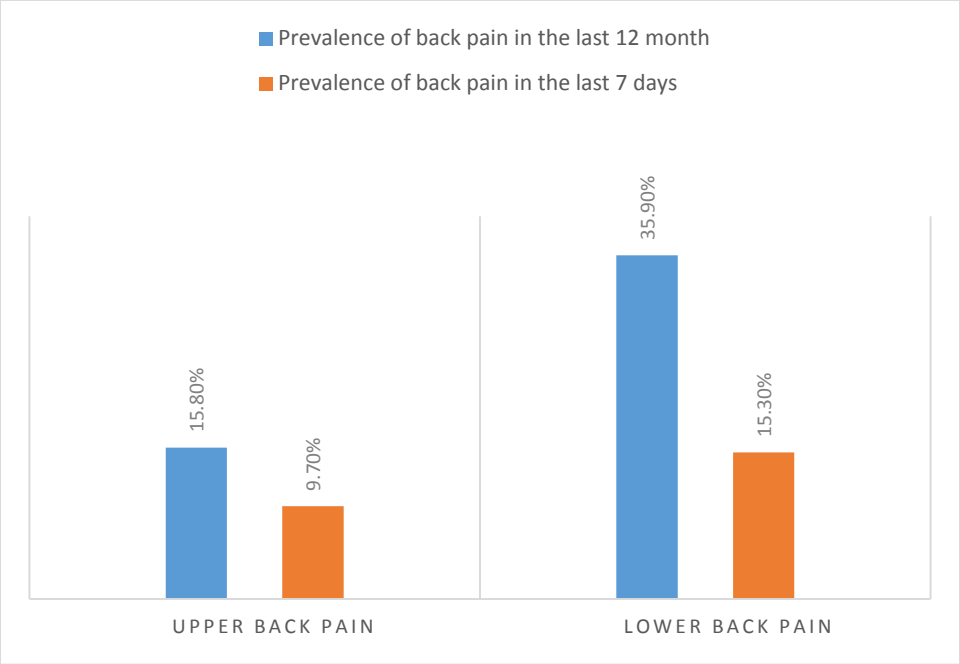

Figure 3: The prevalence of back pain among the respondents

Among the respondents, 12(2.9%) were hospitalized due to back pain during the last 12 months. Forty six (11.2%) workers had received treatment for back pain complains, of which 14(3.4%) preferred traditional remedies, 15(3.6%) used medications, 6(1.5%) used physical exercise, 4(1.0%) physiotherapy and 7(1.7%) had MRI due to their back pain. Twenty three (5.6%) respondents were absent from work for more than four consecutive days and 62(15.0%) were thought to change their job due to back pain disability (Table 4).

Table 4: Back pain related symptoms among respondents, April, 2018

Categories of variables	Frequency(n=412)	Percent(%)
Past history of Back Pain		
Yes	59	14.3
No	353	85.7
Consecutive day absence from work in the past 12 months		
No absence	359	87.1
<4 days	30	7.3
≥4 days	23	5.6
Thought to change work due to back pain		
Yes	62	15.0
No	350	85.0
Hospitalized due to back pain		
Yes	12	2.9
No	400	97.1
Care seeking behavior towards back pain		
No treatment received	366	88.8
Traditional healer	14	3.4
Prescription of medications	15	3.6
Physical exercise	6	1.5
Physiotherapy	4	1.0
MRI	7	1.7

5.5 Disability status due to back pain among the respondents

Among 103 complaints of back pain in the last seven days, 90 (87%) had disability due to back pain, of which 53(51%) had mild disability, 30 (29%) had moderate disability and 7 (7%) had severe disability (Fig.4).

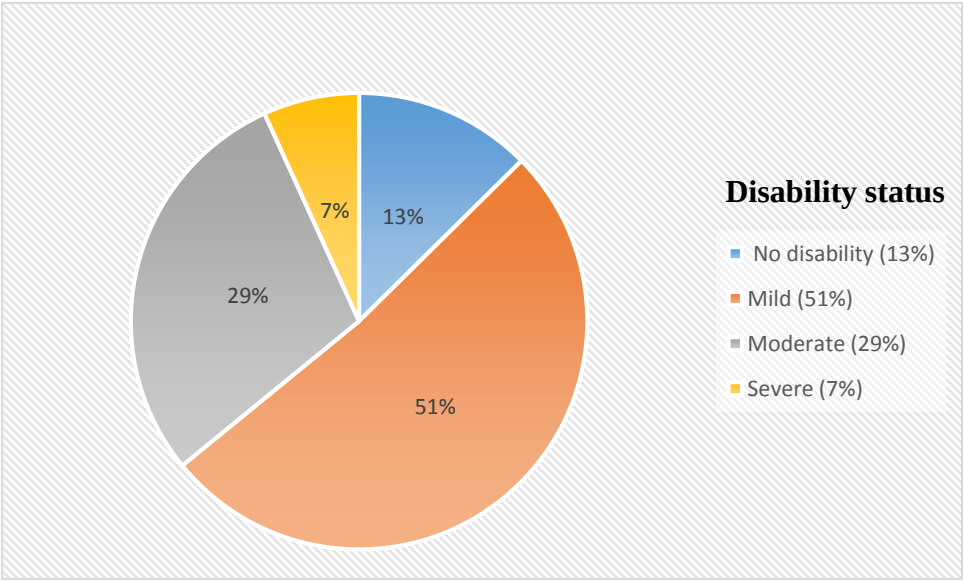

Figure 4: Disability status due to back pain among respondents

Back pain interfered with the workers daily life activities in varies degrees, lifting was the most affected activity with a mean difference of 1.95 followed by sitting (1.13) and standing (1.03). Interference with normal work had a mean difference of 0.93 while travelling, social life, personal care and their pain intensity had a mean difference of 0.89, 0,87, 0.86 and 0.76 respectively. Sleeping mean difference of 0.48 was the least disrupted by back pain among the respondents (Table 5).

Table 5: Functional limitation of the respondents due to back pain

	Test Value = 0					
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
Back Pain Intensity	7.117	102	.000	.757	.55	0.97
Personal Care	8.681	102	.000	.864	.67	1.06
Lifting	12.733	102	.000	1.951	1.65	2.26
Walking	8.102	102	.000	.641	.48	0.80
Sitting	9.575	102	.000	1.126	.89	1.36
Standing	10.202	102	.000	1.029	.83	1.23
Sleeping	3.691	102	.000	.485	.22	0.75
Social life	8.644	102	.000	.874	.67	1.07
Traveling	9.073	102	.000	.893	.70	1.09
Employment	13.440	102	.000	.932	.79	1.07

5.6 Factors associated with back pain

5.6.1 Multivariate analysis

The bivariate logistic regression was done for each variables, to avoid an excessive numbers of variables and unstable estimates, and variables with p-value less than 0.2 in the bivariate analysis were taken in to the multivariate analysis.

The variables that show association in the bivariate analysis ($p<0.2$) that moved to multivariate analysis were sex, age, work experience, tasks that involve bending or twisting back posture, lifting of loads, pushing or pulling heavy weight, using of vibrating tools, job stress and job dissatisfaction.

The multivariate logistic regression analysis identified that sex(being female), work experience (long years), tasks that involve bending or twisting back posture and lifting of loads had significant association with back pain in the past 12 months period.

Female workers were 1.59 times more likely to develop back pain compared to male workers [AOR=1.59, 95%CI=(1.01−2.54)]. Employees with work experience of (11−15 years) in automotive industry were 0.02 times less likely to develop back pain than employees had long (≥16 years) year of service [AOR= 0.02, 95%CI=(0.001−0.46)]. Bending or twisting the back posture was 2 times more at risk of self-reported back pain [AOR=2.03, 95%CI=(1.19−3.45)]. Workers frequently lifting of loads more than 25 kg were 5 times complain back pain [AOR=4.89, 95%CI=(2.83−8.47)].

Table 6: Multivariate logistic regression analysis of the adjusted effect of factors associated with back pain, April, 2018 (n=412)

Categories of variables	Back pain in the last 12 months		COR (95%CI)	AOR (95%CI)	p-value
	Yes(%)	No(%)			
Sex					
Male	144(56.03)	113(43.97)	1.00	**1.00**	
Female	69(44.52)	86(55.48)	1.58(1.06−2.37)	**1.59(1.01−2.54) ***	**0.048**
Age					
<25 years	48(46.2)	56(53.8)	1.00	1.00	
25-29 years	86(52.4)	78(47.6)	0.78(0.48−1.27)	0.92(0.52−1.62)	0.765
30-34 years	38(50)	38(50)	0.86(0.47−1.55)	1.34(0.66−2.72)	0.417
35-39 years	27(57.4)	20(42.6)	0.64(0.32−1.22)	1.51(0.60−3.80)	0.379
≥40 years	14(66.7)	7(33.3)	0.43(0.16−1.15)	0.56(1.36−2.31)	0.423
Service year					
1-5 years	126(45.82)	149(54.18)	0.79(0.13−4.79)	0.36(0.03−4.31)	0.422
6–10 years	67(59.29)	46(40.71)	0.46(0.0.07−2.85)	0.19(0.02−2.34)	0.198
11–15 years	18(94.74)	1(5.26)	0.037(0.003−0.55)	**0.02(0.001−0.46) ***	**0.015**
≥16 years	2(40)	3(60)	1.00	1.00	
Bending or twisting in awkward posture					
Yes	170(57.05)	128(42.95)	0.27(0.17−0.43)	**2.03(1.19−3.45) ***	**0.009**
No	43(37.72)	71(62.28)	1.00	1.00	
Lifting of load weighing more than 25 kg					
Yes	139(58.40)	99(41.60)	0.18(0.12−0.29)	**4.89(2.83−8.47) ***	**0.000**
No	74(42.53)	100(57.47)	1.00	1.00	
Pushing or pulling heavy loads(>25kg)					
Yes	115(56.93)	87(43.07)	1.00	1.00	
No	98(46.67)	112(53.33)	0.66(0.45−0.98)	0.63(0.37−1.05)	0.072
Using vibrating powered tools					
Yes	131(58.48)	93(41.52)	0.55(0.37−0.81)	1.00	
No	82(43.62)	106(56.38)	1.00	0.83(0.51−1.35)	0.46
Job stress					
Yes (16-32)	173(55.3)	140(44.7)	0.55(0.35−0.87)	1.00	
No (≤ 15)	40(40.4)	59(59.6)	1.00	0.82(0.48−1.39)	0.46
Job satisfaction					
Yes (32—50)	58(43.0)	77(57.0)	0.59(0.39−0.89)	0.61(0.38−0.98)	0.077
No (10—31)	155(56.0)	122(44.0)	1.00	1.00	

*significant association AOR = adjusted odds ratio

6. Discussion

In this study the prevalence of work related back pain within the past 12 months was 51.7%, of which 35.9% accounts for lower back and 15.8% for upper back pain which is comparable with study done in Malaysian automotive industry workers (50.9%) (49). But, it is higher relative to study done in car-manufacturing group in Iran (21%)(78). The disparity in the Iranian study might be due to different sample size, definition, different study area, difference in workload and difference in assessment tools.

The prevalence of work related back pain in this study was further compared with studies done among other professions like nurses and garment industry workers in Ethiopia. The prevalence of low back pain was lower than that of nurses professionals which was 44%(79). But, the magnitude of upper back pain is higher than garment industry workers which was 6%(41). This discrepancy could be resulted from the variation in nature of activities performed at different work sectors and the difference in the availability of ergonomics tools in the working area.

This study showed that 87% of the respondents with back pain in the last seven days had disability due to their back pain which ranges from mild disability (51%) to severe disability (7%). It was comparable to study among construction workers in Brazil with prevalence ratio was 71.4% (80). The study in Sao Paulo State showed that the prevalence of disability among the respondents was 65%, and disability was moderate to severe in 80.7% of them (81). Another study among students of Islamic Azad University, Tehran Iran, showed that 47.8% were suffered from back pain related disability (44). The variation found between the disability prevalence identified in this and other studies can be explained by the different definitions of disability or variation in their jobs.

The present study showed that back pain interfered with the workers‟ normal work, ability to lift or carry objects, walking, traveling, sitting, standing, sleeping, personal care and social-life”. This is in agreement with previous studies which reported that the low back pain had catastrophic effects on an individual’s functional ability and daily activities such as standing, sitting, sleeping, walking, lifting, carrying, travelling to work, socializing and interference with personal care(82).

However, lifting is the most disrupted activity among all as the result showed the highest points given by the respondents. The disability may be due to the spinal loads that increase when the job of lifting is done). Study found out that spinal load is greater in patients with LBP compared with

asymptomatic individuals when performing similar lifting exertions. Not only that, they also found out that spinal loading during lifting also depends on the lifting origin location and the weight of object lifted. Thus, due to the spinal loads, back pain increases and causes lifting to be difficult in individuals with LBP. Another reason is that due to the improper lifting techniques adopted by the respondents increases back pain (64). Thus, it is important to teach lifting techniques to the workers.

Sitting and standing are another two disrupted activities due to back pain. The reason behind it may be prolonged sitting and standing with the improper posture that affects a different spinal loading pattern. Study showed that prolonged sitting and standing is the common aggravating factor in individuals with back pain (64, 82). This shows that sitting and standing posture is important to avoid back pain as well as preventing disability.

This study showed that about 2.9% workers with back pain were hospitalized and 270 days or 5 days per worker absenteeism occurred per year, while 11.2% seek health care treatment and 15% of them thought to change their jobs. The findings of this study are consistent with literature that identifies back pain as a major cause of losing work time and incapacity in the working population and greater use of healthcare resources (e.g. medical consultations) (68, 83).

Studies showed that several factors were related to the occurrence of work related back pain. Socio-demographic, work related factors, personal and psychosocial factors were the possible factors for workers to develop back pain in this study. This study found that the risk of back pain was 1.6 times higher in females than males. The finding of this study is consistent with study that suggested female workers were at increased risk of experiencing back pain than males (60).

Working experience in automotive manufacturing industry had a significant relationship with the risk of getting back pain. Workers with service year of 11-15 were 0.02 times less likely develop back pain than longer year of service (≥16 years). This result is lower than study done in Ethiopian aircraft technicians which showed the duration of employment as aircraft technicians with 7 - 9 years working experience were almost eight times more likely to complain low back pain than those with 1 - 3 years of experience (61).

Work activities that require bending or twisting in awkward way during automotive manufacturing showed a significant association with 2 times higher odds of getting back pain than workers not bend or twist in awkward posture in this study. Study among automotive manufacturing workers found that workers with frequent extreme bending showed 15 times higher odds of getting low back pain (8). The risk of back pain is more likely to occur immediately due to deviation from neutral position. This risk could be attributed to the force given to the spine especially in the lumbar region, and also the energy needed for the muscle to sustain posture during awkward movement.

Lifting of heavy weights is found to be the risk factor for back pain in this study. Respondents who were lifting weight more than 25 kg had 5 times higher odds of getting back pain. This finding was supported by other studies where jobs requiring frequent lifting of objects weighing 23 kg load more than 15 times a day will increase risk to low back pain (8). Lifting < 25 kg and > 25 kg increases the risk for back pain 2.9 and 3.5 time respectively compared to no lifting conditions(84). The size of the object lifted play a significant role in the pain severity due to the high energy required for larger objects. The bigger the size, the larger the energy needed, thus, a huge amount of force will be produced during lifting.

In this study some variables like age, pulling and pushing activities, workplace safety and health training, habit of doing physical exercise, job stress and job satisfaction were not significantly associated with back pain. But, other researchers revealed that older age workers have higher risk than younger age workers (19, 59). This could be when age increase, joint mobility and muscular strength decreases. This leads to increase the pain in different body parts, but in this study the majority of the workers in the automotive factories were younger and the tolerance to report pain could be high among them.

A study showed that proper safety training are important towards reducing the risk of low back pain as automotive manual workers will improve working techniques and use proper body postures (8). The difference in this study may be due to insufficient or improper or not continuous training implemented to remind workers about healthy and proper way of safe lifting techniques.

Studies showed inconsistent findings with the association of physical activities and risk of back pain. However, a study among car manufacturing company was found a significant relationship between the incidence of back pain and sport activities in that workers who had regular exercise

had higher prevalence of low back pain(53). In contrary, there was significant association between physical activities with severity of low back pain in that less activity employees had more severe low back pain than the others (84). Practicing physical exercise may develop good endurance of body muscles and this might decrease the occurrence of muscular pain. Pulling and pushing activities in automotive manufacturing in this stud not significantly associated with the prevalence of back pain. This finding is not similar with a study among industrial workers showed 3.5 times higher odds of back pain for pushing and pulling weights than no pushing or pulling conditions (86).

There was no association exists between job stress and job satisfaction with development of back pain in the present study, but other study among automotive industry workers showed that stress and job satisfaction at work is associated with both the prevalence of back pain and incidence of disabling back pain (50). This is might be due to the difference in work setting, salaries rate and safety standards availing for the workers. Because most of the questions regarding job stress and satisfaction are focus on availability of safety and good facility in the working organization.

7. Strengths and limitations

Strengths:

- Appropriate sampling procedure was followed to include respondents from each production factory to avoid selection bias.
- Large sample size was taken to get more representative data to the source population.
- Day to day supervision was undertaken in a way that bias could not occur during data collection time.
- To assure the quality of the data, standardized data collection tool was used and pre-testing was done.

Limitations:

- As it was self-reported pain or discomfort, there might be over and under estimation of the magnitude of back pain and there might be recall bias.
- Lack of studies with similar methodology and similar topic in local context.

8. Conclusion

The result of this study showed that the prevalence of back pain is higher among Automotive industry workers in Ethiopia. Furthermore, this study verified automotive production workers with back pain were suffered from disability. Moreover, the workers who had served for longer years, bending or twisting in awkward posture and lifting heavy weights were more probably to suffer from back pain and disability.

9. Recommendation

The problem should have got attention to promote the health and safety of workers to prevent and for early detection and intervention should be planned for those who develop the problem in the automotive manufacturing industry to reduce effects of disability. Based on the findings of this study; the following recommendation were forwarded accordingly.

To Bureau of labor and social affairs (BOLSA)

- The regional BOLSA should monitor and evaluate the implementation of health and safety practices at manufacturing industry level.
- Organize a system to monitor, advocate and enhance safe work practice and Ergonomic principles at workplace

To the metal and engineering corporation /industry/

- Should give special attention to prevent and control the problems through proper occupational health and safety policy implementation in the industries.
- Should automate the working process instead of manual material handling operations.
- An ergonomics intervention program in the workplace should focus on eliminating awkward postures and manual handling of heavy loads
- Designing ergonomic training for workers in reducing the prevalence of back pain symptoms among the automotive assembly line workers
- Should create good working environment for workers to be motivated by satisfying their needs, like salaries increment, rewarding good performer.
- Arrange Back Care Services for the affected group to facilitate recovery

To the automotive production factory workers;

- Better to practice self-stretching physical exercise during their break time to improve muscles fatigue.
- Workers should use lifting assistance devices or helping partner to lift heavy objects

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Annex I: English version participant's information sheet

Hello, my name is _____and I am here on behalf of Wondosen Hailu a post graduate student from Addis Ababa University, College of Health Sciences, School of public health. I am here to collect some information about back pain, its related disability and factors associated with back pain from the study participants.

Title of the study: Assessment of back pain and disability status among automotive industry workers in Ethiopia

Benefit of the study: There is no direct benefit for participating in this study. However, the findings of this study will be used to know the magnitude of the problem and important to improve the safety of working condition.

Risk: There is no risk posed to the participants for participating in this study.

Right of participants: Your participation is voluntary and you are not obligate to answer any question you don't wish to answer. If you felt discomfort with the interview, you can with draw any time after you get involved in the study. You can take time to understand and decide on your participation in the study.

Confidentiality: Your name will not be written in this form and will never be used in connection with any information you tell us. All information given by you will be kept strictly confidential.

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

Contact address: If you have any question which is not clear to you can contact the investigator or Research and Ethical Committee of Addis Ababa University.

Investigator: Wondosen Hailu
Mob +251-910 3838 95
Email wondatirh@gmail.com
Addis Ababa University, college of health science, school of public health

Annex II: Informed consent form

I have read this form or it has been read to me in the language I understand, all conditions sated above. Therefore;

1. I agree to participate 2. I do not agree

Date of interview ----------Time started ---------- Time completed----------

Result of interview

1. Completed 2. Respondent not available 3. Refused 4. Partially completed

If no, skip to the next participant by writing reasons for his/her refusal.

Data collector name ----------Signature ----------Date----------

Checked by

Supervisor name ----------Signature ----------Date----------

Annex III: Questionnaire English version

A questionnaire designed to assess the prevalence of back pain and disability status among automotive industry workers in Ethiopia.

100. Production factory code ----------

101. ID number of participants----------

Part 1: Socio demographic characteristics			
No	**Questions**	**Possible response**	**Skip**
102	Gender	1. Male 2. Female	
103	How old are you?	.....years	
104	What is your marital status?	1. Married 2. Single 3. Divorced 4. Widowed	
105	What is your educational level?	1. Primary school (Grade1-8) 2. Secondary school (Grade 9-12) 3. Diploma or TVET 4. Degree or above	
106	How long have you worked here?	.....years	

Part 2: Back pain related symptoms

The diagram below shows the approximate position of the body parts referred to in the questionnaire.

No	Question	Response	Skip
201	Did you ever suffer from back pain before working here?	1. Yes 2. No	
202	Have you ever had back pain in the last 12 months?	1. Yes 2. No	If "NO" → 401
203	If your answer for Q. 202 is "YES", which part of your back is affected as shown in the picture above?	0. No pane 1. Upper back 2. Lower back 3. Both upper &lower	
204	Have you ever had back pain during the last 7 days?	1. Yes 2. No	If "NO" → Q.206
205	If your answer for Q. 204 is "YES", which part of your back is affected as shown in the picture above?	0. No pane 1. Upper back 2. Lower back 3. Both upper &lower	
206	Have you ever absent from work because of the back pain in the past 12 months?	1. Yes 2. No	If "NO" → Q. 208
207	If your answer for Q. No. 206 is "YES", how long do you absent from work due to back pain?	----------days	
208	Have you ever thought to change your job because of back pain?	1. Yes 2. No	
209	Have you ever been hospitalized because of back pain in the last 12 months?	1. Yes 2. No	
210	Have you ever tried treatment to manage your back pain in the past 12 months?	1. Yes 2. No	If "NO" → Q. 301
211	If your answer for Q. No. 210 is "YES", what treatment you tried to manage your back pain?	Specify (----------)	

Part 3: Oswestry Back Pain Disability Index: The Oswestry disability index is used in the pain management of spinal disorders to evaluate the impact of back pain on ability to perform every daily life activities. The index takes less than 5 minutes to complete and consists of 10 items, each with 6 answer choices on a scale from 0 to 5. The overall score ranges between 0 and 50. Please answer every question by placing a mark in the one box that best describes your back pain condition during the 7 days.

301 – Back Pain Intensity

- ☐ I can tolerate the pain I have without having to use pain medication.
- ☐ The pain is bad but I manage without having to take pain medication.
- ☐ Pain medication provides me complete relief from pain.
- ☐ Pain medication provides me moderate relief from pain.
- ☐ Pain medication provides me little relief from pain.
- ☐ Pain medication has no effect on the pain.

302 – Personal Care (Washing, Dressing, etc.)

- ☐ I can take care of myself normally without causing increased pain.
- ☐ I can take care of myself normally but it increases my pain.
- ☐ It is painful to take care of myself and I am slow and careful.
- ☐ I need help but I am able to manage most of my personal care.
- ☐ I need help every day in most aspects of my care.
- ☐ I do not get dressed, wash with difficulty and stay in bed.

303 – Lifting

- ☐ I can lift heavy weights without increased pain.
- ☐ I can lift heavy weights but it causes increased pain.
- ☐ Pain prevents me from lifting heavy weights off the floor, but I can manage if weights are conveniently positioned, e.g. on a table.
- ☐ Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.
- ☐ I can lift only very light weights.
- ☐ I cannot lift or carry anything at all.

304 - Walking

- ☐ Pain does not prevent me walking any distance.
- ☐ Pain prevents me walking more than 1 mile.
- ☐ Pain prevents me walking more than ½ mile
- ☐ Pain prevents me walking more than ¼ mile
- ☐ I can only walk using crutches or a cane.
- ☐ I am in bed most of the time and have to crawl to the toilet.

305 - Sitting

- ☐ I can sit in any chair as long as I like.
- ☐ I can only sit in my favorite chair as long as I like.
- ☐ Pain prevents me sitting more than 1 hour.
- ☐ Pain prevents me from sitting more than ½ hour.
- ☐ Pain prevents me from sitting more than 10 minutes.
- ☐ Pain prevents me from sitting at all.

306 – Standing

- ☐ I can stand as long as I want without increased pain.
- ☐ I can stand as long as I want but increase my pain.
- ☐ Pain prevents me from standing for more than 1 hour.
- ☐ Pain prevents me from standing for more than ½ hour.
- ☐ Pain prevents me from standing for more than 10 minutes.
- ☐ Pain prevents me from standing at all.

307 – Sleeping

- ☐ Pain does not prevent me from sleeping well.
- ☐ I can sleep well only by using pain medication.
- ☐ Even when I take pain medication, I sleep less than 6 hours.
- ☐ Even when I take pain medication, I sleep less than 4 hours.
- ☐ Even when I take pain medication, I sleep less than 2 hours.
- ☐ Pain prevents me from sleeping at all

308 – Social Life

- ☐ My social life is normal and does not increase my pain.
- ☐ My social life is normal, but it increases my level of pain.
- ☐ Pain prevents me from participating in more energetic activities (ex sports, dancing, etc.)
- ☐ Pain prevents me from going out very often.
- ☐ Pain has restricted my social life to my home.
- ☐ I have hardly any social life because of my pain.

309 – Traveling

- ☐ I can travel anywhere without increased pain.
- ☐ I can travel anywhere but it increases my pain.
- ☐ Pain restricts travel over 2 hours.
- ☐ Pain restricts travel over 1 hour.
- ☐ Pain restricts my travel to short necessary journeys under ½ hour.
- ☐ Pain prevents all travel except for visits to the doctor/therapist or hospital.

310 – Employment

- ☐ My normal job activities do not cause pain.
- ☐ My normal job activities increase my pain, but I can still perform all that is required of me.
- ☐ I can perform most of my job duties, but pain prevents me from performing more physically stressful activities (ex. Lifting).
- ☐ Pain prevents me from doing anything but light duties.
- ☐ Pain prevents me from doing even light duties.
- ☐ Pain prevents me from performing any job.

311. Total Score: _____/50

% Disability: _____

312. Oswestry Back Pain Disability Index Score Interpretation

0. No disability
1. Minimal disability (0 – 20%)
2. Moderate disability (21– 40%)
3. Severe disability (41 – 100%)

Only for investigator use

Part 4: Work related factors associated with back pain			
No	**Question**	**Possible response**	**Skip**
401	What is the type of your job?	1. Welding 2. Panting 3. Assembling 4.Disassembling 5. Finishing 6. Others	
402	What is your current employment status?	1. Temporary 2. Permanent	
403	How many days do you work per week?	.....days	
404	How many hours do you work per day?	.....hours	
405	Do you take breaks during your job per day excluding lunch time?	1. Yes 2. No	If "NO' → Q. 407
406	If your answer for Q. 405 is "YES", how long do you take a break per day excluding lunch time?	.....in minutes	
407	Have you ever get a formal training on the issue of work place health and safety?	1. Yes 2. No	
408	Does your job involve bending or twisting in awkward posture?	1. Yes 2. No	
409	Do you lift heavy loads (more than 25 kg)?	1. Yes 2. No	
410	Do you pull or push heavy loads (more than 25 kg)?	1. Yes 2. No	
411	Do you often hold vibrating or work with tools or machines in your work?	1. Yes 2. No	
Part 5: Individual factors associated with back pain			
501	Do you have habit of cigarette smoking at least one stick per day?	1. Yes 2. No	
502	Do you drink alcohol at least two times per week?	1. Yes 2. No	
503	Do you practice physical exercise that last for at least 30 minutes and two times per week?	1.Yes 2. No	

Part 6: Psychosocial factors associated with back pain					
S.N	**Questions from 601 to 608 are to measure your job stress.** *The scale consists of 8 items, each with 4 answer choices on a scale from 1 to 4. The overall score ranges between 0 and 32. So please tell me how you feel about each of the following questions.*	**Job stress score**			
		Never	**Rarely**	**Some times**	**Often**
601	Do you feel your working conditions are unpleasant or sometimes even unsafe?	1	2	3	4
602	Do you feel that your job is negatively affecting your physical or emotional wellbeing?	1	2	3	4
603	Do you have high loaded work to complete and or too many unreasonable deadlines?	1	2	3	4
604	Do you find difficult to express your opinion or feelings about your job conditions to your supervisor?	1	2	3	4
605	Do you feel that the job pressure interfere with your family or personal life?	1	2	3	4
606	Do you have adequate control over your work duties?	1	2	3	4
607	Do you receive appropriate recognition or rewards for good performance?	1	2	3	4
608	Are you able or allowed to utilize your skills and talents to the fullest extent at work?	1	2	3	4
609	**Total job stress score**	_____		***Only for investigator use***	
610	**Job stress score interpretation**	**1. Yes (16 —32)** **2. No (≤ 15)**			

S.N	**Questions from 701 to 710 are to measure your job satisfaction.** *The score consists of 10 items, each with 5 answer choices on a scale from 1 to 5. The overall score ranges between 0 and 50. So please tell me how you feel about each of the following questions.*	**Job satisfaction score**				
		Strongly disagree	**Disagree**	**I don't know**	**Agree**	**Strongly agree**
701	Do you receive recognition for a job well done?	1	2	3	4	5
702	Do you feel close to the people at work?	1	2	3	4	5
703	Do you feel good about working at this company?	1	2	3	4	5
704	Do you feel secure about your job?	1	2	3	4	5
705	Do you believe management is concerned about you?	1	2	3	4	5
706	On the whole, do you believe work is good for your physical health?	1	2	3	4	5
707	Do you feel your wages are good?	1	2	3	4	5
708	Do you think all your talents and skills are used at work?	1	2	3	4	5
709	Do you usually get along with your supervisors?	1	2	3	4	5
710	How do you feel about the goodness of your job?	1	2	3	4	5
711	**Total job satisfaction score**	_____			***Only for investigator use***	
712	**Job satisfaction score interpretation**	**1. Yes (32—50)** **2. No (10—31)**				

Thank you very much for your Cooperation!

Annex IV: Amharic Version Participant's Information Sheet

የተሳታፊዎች መረጃ ቅፅ፡

ጤና ይስጥልኝ!

ስሜ----------**እባላለሁ፡፡ እዚህ የመጣሁት በአዲስ አበባ ዩኒቨርስቲ ጤና ሳይንስ ኮሌጅ የህብረተሰብ ጤና ትምህርት ቤት የድህረ ምረቃ ተማሪ የሆኑትን ወንደሰን ኃይሉን ወክዬ ነው፡፡ የመጣሁበት አላማም የድህረ-መረቃ ተማሪው የመመረቂያ ጥናታቸውን በጀርባ ህመም እና ተያያዥ ጉዳዮች በአቶሞቲቭ ኢንደስትሪ ሠራተኞች ላይ ሲለሚያጠኑ መረጃ ለመሰብሰብ ነው፡፡ ስለጥናቱ የሚከተሉትን ነጥቦች ከተገነዘቡ በኋላ ፈቃደኛ ከሆኑ በቃ-ለመጠየቁ እንዲሳተፉ በትህትና እጠይቀዎታለሁ፡፡**

የጥናቱ ዕርስ: **የጀርባ ህመምና የአካል ጉዳተኝነት ሁኔታን በአውቶሞቲቭ ኢንዱስትሪ ሰራተኞች መካካል ዳሰሳ ማከናወን ነው፡፡**

የጥናቱ ጥቅም: **ይህ ጥናት በቀጥታ ለተሳታፊወች የሚሰጠው ጥቅም የለም፡፡ ይሁን እንጂ የዚህ ጥናት ግኝት የችግሩን ስፋት ለማወቅና የሥራ ላይ ደህንነት ሁኔታን ለማሻሻል ጥቅም ላይ ይውላል፡፡**

ጉዳት፡ እዚህ ጥናት ላይ በመሳተፍ ተሳታፊዎች ላይ ምንም አይነት ጉዳት አይደርስባቸውም፡፡

የተሳታፊዎቹ መብት: **በዚህ መጠይቅ ተሳትፎ በእርሶ በፈቃደኝነት ላይ የተመሰረተ ነው፡፡ የማይፈልጉትን ማንኛውም ጥያቄ ለመመለስ ግዴታ የለብዎትም፡፡ በቃለ-መጠይቁ ላይ ጥሩ ስሜት ካልተሰማዎት በየትኛውም ጊዜ ማቋረጥ ይችላሉ፡፡ በጥናቱ ውስጥ ተሳትፎዎን ለመረዳትና ውሳኔ ለማድረግ ጊዜ መውሰድ ይችላሉ፡፡**

ሚስጥራዊነት፡ ተሳታፊወች ስማቸውን እንዲጠቅሱ አይጠበቅም፡፡ ማንኛውንም ተሰታፊ የሚሰጠውን መረጃ በሙሉ ሚስጥራዊነቱ እንዲጠበቅ የጥናቱ ስነምግባር ያስገድዳል፡፡ በመሆኑም ተሳታፊዎች የሚሰጡት መረጃ ሚስጥራዊነቱ ይጠበቃል፡፡

የቃለ መጠይቁ ርዝመት፡ ይህ ቃለመጠይቅ 20 ደቂቃ ያህል ይወስዳል.

አድራሻ: **ያልገባዎት ማንኛውም ጥያቄ ቢኖር የጥናቱን ባለቤት ወይም አዲስ አበባ ዩኒቨርሲቲ የምርምርና የሥነ ምግባር ኮሚቴውን ማነጋገር ይችላሉ፡፡**

የጥናቱ ባለቤት: ወንዶሰን ኃይሉ

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የፈቃደኝነት መግለጫ ቅፅ፡

ከዚህ በላይ ስለጥናቱ የተጻፈውን መግለጫ በሚገባኝ ቋንቋ አንብቤ ወይም ተነቦልኝ ተረድቻለሁ፡፡ በመሆኑም በዚህ፣

1. እስማማለሁ 2. አልስማማም

መልሱ አልስማማም ከሆነ አመስግነው መጠይቁን ያቋርጡ፡፡ ለጥናቱ ፈቃደኛ ያልሆኑበትን ምክንያት በመጠየቅና በማስታወሻላይ በመያዝ ለጥናቱ ተቆጣጣሪ ሪፖርት ያድርጉ፡፡

የቃለመጠይቁ ቀን ----------የተጀመረበት ጊዜ ---------- የተጠናቀቀበት ጊዜ----------

የቃለ መጠይቁ ውጤት

1. ተጠናቋል 2. መልስ ሰጪው አልተገኘም 3. ፍቃደኛ አልነበሩም 4. በከፊል ተጠናቅቋል

የመረጃ ሰብሳቢው ስም ----------ፊርማ ----------ቀን----------

ያረጋገጠው፡

የተቆጣጣሪው ስም ---------- ፊርማ ----------ቀን ----------

Annex V: Questionnaire Amharic Version

የጀርባ ህመምና የአካል ጉዳተኝነት ሁኔታን ለማጥናት የተዘጋጀ መጠይቅ፡

ይህ መጠይቅ የተዘጋጀው በቢሾፍቱ አውቶሞቲቭ ኢንደስተሪ ውስጥ የሚገኙ ሰራተኞች በስራ ምክንያት ያጋጠሙ የጀርባ ህመምና በጅርባ ህመም ምክንያት የሚከሰት የአካል ጉዳተኝነት ሁኔታ፣ መጠንና ተያያዥ መንስኤዎችን ለማጥናት ነው።።

100. የፋብሪካው ኮድ ----------

101. የተሳታፊ መለያያ ኮድ ----------

ክፍል 1 - የማህበራዊና ስነህዝባዊ ጥያቄዎች			
ተ.ቁ	ጥያቄዎች	ምላሽ	ይለፉ
102	ፆታ	1. ወንድ 2. ሴት	
103	እድሜዎ ስንት ነው?	.....ዓመት	
104	የጋብቻ ሁኔታዎ ምንድነው?	1. ያገባ/ች 3. የፈታ/ች 2. ያላገባ/ች 4. የሞተባት/በት	
105	የትምህርት ደረጃዎ ምንድነው?	1. የመጀመሪያ ደረጃ ት/ ቤት (ከ1-8 ኛ) 2. የሁለተኛ ደረጃ ት/ቤት (ከ 9-12 ኛ) 3. ዲፕሎማ ወይም የቴክኒክና ሙያ ትምህርትና ሥልጠና 4. ዲግሪ ወይም ከዚያ በላይ	
106	በዚህ ስራ ላይ ምን ያህል ቆይተዋል?	.....ዓመት	

ክፍል 2: የጀርባ ህመምን የተመለከቱ ጥያቄዎች፡- ከታች የተመለከተው ስዕል በመጠይቁ ውስጥ የተጠቀሱትን የሰውነት ክፍሎች ግምታዊ አቀማመጥ ያሳያል።

ተ.ቁ	ጥያቄዎች	ምላሽ	ይለፉ
201	እዚህ ሥራ ከመጀመርዎ በፊት የጀርባ ህመም ተሰምቶት ያውቅ ነበር?	2. አዎ 2. አይ	
202	ባለፉት 12 ወራት ውስጥ የጀርባ ህመም ተሰምቶት ያውቃል?	1. አዎ 2. አይ	"አይ" ከሆነ → 401
203	ለጥያቄ ቁ. 202 መልስዎ <አዎ> ከሆነ፣ ከላይ በስዕሉ ላይ እንደተመለከተው የትኛው የጀርባዎ ክፍል ላይ ህመም ተሰማዎት?	1. የላይኛው የጀርባ ክፍል 2. የታችኛው የጀርባ ክፍል	
204	ባለፉት 7 ቀናት ውስጥ የጀርባ ህመም አጋጥሞዎት ያውቃል?	1. አዎ 2. አይ	'አይ"ከሆነ → ተ.ቀ 206
205	ለጥያቄ ቁ. 204 መልስዎ <አዎ> ከሆነ፣ ከላይ በስዕሉ ላይ እንደተመለከተው የትኛው የጀርባዎ ክፍል ላይ ህመም ተሰማዎት?	1. የላይኛው የጀርባ ክፍል 2. የታችኛው የጀርባ ክፍል	
206	ባለፉት 12 ወራት ውስጥ በጀርባ ህመም ምክንያት ከሥራ የቀሩበት ጊዜ አለ?	1. አዎ 2. አይ	"አይ' ከሆነ → ተ.ቁ 208
207	ለጥያቄ ቁ.206 መልስዎ "አዎ" ከሆነ በጀርባ ህመም ምክንያት ከስራ ምክንያት ለምን ያህል ጊዜ ቀሩ?	----------ቀን	
208	በጀርባ ህመም የተነሳ ስራዎን ለመቀየር አስበው ያውቃሉ?	1. አዎ 2. አይ	
209	ባለፉት 12 ወራት ውስጥ በጀርባ ህመም ምክንያት ሆስፒታል ተኝተው ያውቃሉ?	1. አዎ 2. አይ	
210	ባለፉት 12 ወራት ውስጥ የጀርባዎን ህመም ለማከም ህክምና ሞክረው ያውቃሉን?	1. አዎ 2. አይ	"አይ' ከሆነ' → ተ.ቁ. 301
211	ለጥያቄ ቁ. 210 መልስዎ "አዎ" ከሆነ, የጀርባዎን ህመም ለማከም ምን ዓይነት ህክምና አድርገው ነበር?	ይጥቀሱ (----------)	

ክፍል 3: የOswestry Back Pain የአካል ጉዳተኝነት መለኪያ

ይህ መጠይቅ ባለፉት 7 ቀናት ውስጥ የጀርባ ህመምዎ በዕለት ተዕለት ኑሮዎ ላይ ተጽዕኖ ስለሚያሳድርብዎት መንገድን ይዳስሳል:: ለእያንዳንዱ ለተጠቀሱት ተግባራት ከ 0 እስከ 5 አማራጮች አሉ:: ከተዘረዘሪት አማራጮች መካካል በለፉት 7 ቀናት ውስጥ የጀርባዎ ህመም በዕለት ተዕለት ኑሮዎ ላይ ያደረሰቦት ተጽዕኖ ካለ ያካፍሉን::

301 – የህመሙ ክብደት
- ☐ የህመም ማስታገሻ መድሃኒት ሳያስፈልገኝ፣ ሕመሙን መታገስ እችላለሁ.
- ☐ ሕመሙ መጥፎ ነው፣ ነገር ግን የሕመም መድኃኒት ሳልወስድ መቆጣጠር እችላለሁ
- ☐ መድሃኒቱ ህመሜ ላይ በቂ እፎይታ ያስገኝልኛል
- ☐ መድሃኒቱ ከህመም ስሜት መጠነኛ እፎይታ ይሰጠኛል
- ☐ መድሃኒቱ ከህመም ስሜት ትንሽ እፎይታ ይሰጠኛል
- ☐ መድሃኒቱ በህመሜ ላይ ምንም ለውጥ የለውም

302 – የግል እንክብካቤ (ለምሳሌ፣ መታጠብ፣ ልብስ መልበስ)
- ☐ ህመሙ ሳይጠናብኝ፣ እራሴን መጠበቅ እችላለው
- ☐ ህመሙ ቢጠናብኝም እራሴን መንከባከብ እችላለው
- ☐ እራሴን መንከባከብ ከባድ ስለሆነ ዝግተኛ እና ጥንቁቅ ነኝ
- ☐ እገዛ እፈልጋለሁ፣ ነገር ግን አብዛኛውን የግል እንክብካቤዬን ማከናወን እችያለሁ
- ☐ በአብዛኞቹ የእንክብካቤ አገልግሎቴ በየቀኑ እርዳታ እፈልጋለሁ
- ☐ መልበስ አልቻልኩም፣ ማጠብ አስቸጋሪ ሆኖብኛል እና አልጋ ላይ ነኝ

303 – ማንሳት
- ☐ ያለምንም ህመም፣ ክብደት ማንሳት እችላለሁ
- ☐ ከባድ ክብደት ማንሳት እችላለሁ ነገር ግን የበለጠ ህመም ያስከትላል
- ☐ ህመሙ ከባድ ክብደት ከወለል ላይ እንዳላነሳ ይከለክለኛል፤ ነገር ግን ክብደቱ በተገቢ ሁኔታ እንዲቀመጥ ከተደረገ ማንሳት እችላለው
- ☐ ህመሙ ከባድ ክብደት ከማንሳት ይከለክለኛል፤ ነገር ግን በተገቢ ሁኔታ እንዲቀመጥ ከተደረገ ከቀላል እስከ መካከለኛ ክብደት ማንሳት እችላለሁ
- ☐ በጣም ቀላል ክብደትን ብቻ ማንሳት እችላለሁ
- ☐ ማንኛውንም ነገር ማንሳት ወይም መሸከም አልችልም

304 - መራመድ
- ☐ ህመሙ ማንኛውንም እርቀት ከማራመድ አላገደኝም
- ☐ ህመሙ ከ ነ ማይል በላይ (ነ ማይል = ነ.6 ኪ.ሜ) እንዳልራመድ አግዶኛል
- ☐ ህመሙ ከ ½ ማይል በላይ ለመራመድ ይከለክለኛል
- ☐ ህመሙ ከ¼ ማይል በላይ እንዳልራመድ ይከለክለኛል
- ☐ በክራንች ወይም በከዘራ ብቻ መጓዝ እችላለሁ
- ☐ አብዛኛውን ጊዜ አልጋ ላይ እተኛለሁ፤ ወደ መፀዳጃ ቤት ለመሄድ መዳኽ አለብኝ

305 -መቀመጥ
- ☐ በማንኛው መቀመጫ ላይ እስከፈለኩኝ ድረስ መቀመጥ እችላለው
- ☐ የምወደው ወንበር ላይ እስከፈለኩኝ ድረስ መቀመጥ እችላለሁ
- ☐ ህመሙ ከአንድ ሰዓት በላይ መቀመጥ ይከለክለኛል
- ☐ ህመሙ ከግማሽ ሰዓት በላይ መቀመጥ ይከለክለኛል
- ☐ ህመሙ ከነ0 ደቂቃዎች በላይ መቀመጥ ይከለክለኛል
- ☐ ህመሙ በጭራሽ እንዳልቀመጥ ይከለክለኛል

306 – መቆም
- ☐ ያለምንም ህመም የፈለኩትን ያህል መቆም እችላለሁ
- ☐ እስከፈለኩኝ ድረስ መቆም እችላለሁ ነገር ግን ህመሜን ይጨምራል
- ☐ ህመሙ ከአንድ ሰዓት በላይ ቆሞ ለመቆየት ይከለክለኛል
- ☐ ህመሙ ከግማሽ ሰዓት በላይ ቆሞ ለመቆየት ይከለክለኛል
- ☐ ህመሙ ከነ0 ደቂቃዎች በላይ ቆሞ ለመቆየት ይከለክለኛል
- ☐ ህመሙ በጭራሽ ቆሞ ለመቆየት ይከለክለኛል

307 – መተኛት
- ☐ እንቅልፌ በህመሙ ምክንያት በጭራሽ አይረበሽም
- ☐ መተኛት የምችለው የሕመም ማስታገሻ መድሃኒትን ከወሰድኩኝ ብቻ ነው
- ☐ መድሃኒት በምወስድበትም ጊዜ እንኳ ከ 6 ሰዓታት ያነሰ ነው የምተኛው
- ☐ መድሃኒት በምወስድበትም ጊዜ እንኳ ከ 4 ሰዓት ያነሰ ነው የምተኛው
- ☐ መድሃኒት በምወስድበትም ጊዜ እንኳ ከ 2 ሰዓት ያነሰ ነው የምተኛው
- ☐ ህመሙ በጭራሽ እንዳልተኛ ይከለክለኛል

308 – ማህበራዊ ህይወት
- ☐ ማኅበራዊ ኑሮዬ ጤናማ ነው እናም ህመሜን አይጨምርም
- ☐ ማኅበራዊ ኑሮዬ ጤናማ ነው ነገር ግን የሕመም ደረጃውን ይጨምራል
- ☐ ህመሙ ኃይል የሚጠይቁ ተግባራት ላይ እንዳልሳተፍ ይከለክለኛል (ለምሳሌ፣ ስፖርት፣ ጭፈራ)
- ☐ ህመሙ ሁሌ ከ ቤት እንዳልወጣ ይከለክለኛል
- ☐ ህመሜ ማህበራዊ ሕይወቴን በቤቴ ውስጥ ገድቦታል
- ☐ በህመሜ ምክንያት ማናቸውም ማኅበራዊ ኑሮ የለኝም

309 – መጓዝ
- ☐ ያለምንም ህመም በማንኛውም ቦታ መጓዝ እችላለሁ
- ☐ በማንኛውም ቦታ መጓዝ እችላለሁ ነገር ግን ህመሜን ይጨምራል
- ☐ ሕመሜ ከ2 ሰዓት በላይ እንዳልጓዝ ይገድባል
- ☐ ሕመሜዬ ከ ነ ሰዓት በላይ እንዳልጓዝ ይገድባል
- ☐ ሕመሜ ከ ½ ሰዓት በታች ላሉ አጭር አስፈላጊ ጉዞዬን ይገድባል
- ☐ ሕመሜ ወደ ሐኪም / ቴራፒስት ወይም ሆስፒታል ከመሄድ በስተቀር ሁሉንም ጉዞ ይገድባል

310 – የሥራ ሁኔታ
- ☐ መደበኛ ሥራዬ ህመም አያስከትልም
- ☐ የሥራዬ እንቅስቃሴ ህመምዬን ይጨምራል፤ ነገር ግን የሚያስፈልገውን ሁሉ መሥራት እችላለሁ
- ☐ አብዛኛዎቹን የሥራ ዲርሻዎቼን ማከናወን እችላለሁ፤ ነገር ግን ህመሜ ከባድ አካላዊ፣ የሚያስጨንቁ ተግባራትን ከማከናወን ያግደኛል (ለምሳሌ፣ ማንሳት፣ ማውረድ)
- ☐ ህመሜ ቀላል ነገርን ከመስራት በስተቀር ምንም ነገር ከማድረግ ይከለክለኛል
- ☐ ህመሜ ቀላል ስራዎችን እንኳ እንዳልሰራ ይከለክለኛል
- ☐ ህመሜ ማንኛውንም ስራ እንዳላከናውን ያግደኛል

311. ጠቅላላ ውጤት : _____/50	**% አካል ጉዳተኝነት : _____**	
312. Oswestry Back Pain የአካል ጉዳተኝነት መለኪያ ውጤት ትርጓሜ	**1. አነስተኛ የአካል ጉዳት (0 - 20%)** **2. መካከለኛ የአካል ጉዳትን (21- 40%)** **3. ከባድ የአካል ጉዳት (41 - 100%)**	

ክፍል 4: ከጀርባ ህመም ጋር ተያያዥነት ያላቸው ሁኔታዎች			
ተ.ቁ	**ጥያቄዎች**	**ምላሽ**	**ይለፉ**
401	የስራዎ አይነት ምንድ ነው?	1. ብየዳ 2. ቀለም መቀባት 3. መገጣጠም 4. ዲስአሰምብለንግ 5. ፊኒሽንግ 6. ሌላ	
402	የሥራዎ ቅጥር ሁኔታ ምንድነው?	1. ጊዜያዊ 2. ቋሚ	
403	በሳምንት ምን ያህል ቀን ይሰራሉ?	.....ቀናት	
404	በቀን ምን ያህል ሰዓት ይሰራሉ?	.....ሰዓት	
405	የምሳውን ሰዓት እረፍት ሳይጨምር በስራዎ ላይ እረፍት ይሰጣሉ?	3. አዎ 2. አይ	'አይ' ከሆነ → ተ.ቁ 407
406	ለጥያቄ ተ.ቁ 405 መልስዎ "አዎ" ከሆነ የምሳ ሰዓቶን እረፍት ሳይጨምር በቀን ለምን ያህል ጊዜ እረፍት ይወስዳሉ?	.....ደቂቃ	
407	በሥራ ቦታ ጤንነት እና ደህንነት ዙሪያ መደበኛ ስልጠና አግኝተው ያውቃሉ?	1. አዎ 2. አይ	
408	ስራዎ ምቹ ባለሆነ ሁኔታ ታጥፈው ወይም ተጠማዘው እንዲሰሩ አድረጎዎታል?	1. አዎ 2. አይ	
409	በሥራ ቦታ ከባድ ክብደት (ከ 25 ኪሎ ግራም በላይ) ያነሳሉ?	1. አዎ 2. አይ	
410	በሥራ ቦታ ከባድ ክብደት (ከ 25 ኪሎ ግራም በላይ) ይጎትታሉ ወይም ይገፋሉ?	1. አዎ 2. አይ	
411	በሥራዎ ወቅት የሚነዝሩ መሳሪያዎችን ወይም ማሺኖችን ይጠቀማሉ?	1. አዎ 2. አይ	
ክፍል 5፡ የግለሰብ ሁኔታን የተመለከቱ ጥያቄዎች			
501	ሲጋራ ያጨሳሉ (በቀን ቢያንስ አንድ ፍሬ)?	1. አዎ 2. አይ	
502	አልኮል መጠጥ አዘውትረው ይጠጣሉ(በሳምንት ቢያንስ ሁለት ጊዜ)?	1. አዎ 2. አይ	
503	የአካል ብቃት እንቅስቃሴ በሳምንት ቢያንስ ሁለት ቀናት ለ30 ደቂቃ ያደርጋሉ?	1. አዎ 2. አይ	

ክፍለ 6፡ ከስራ ቦታና ስነልቦና ጋር ተያያዥነት ያላቸው ጥያቄዎች					
ተ.ቁ	**ከተራ ቁ. 601-608 የስራ ጭንቀትን የተመለከቱ ጥያቄዎች፡** ይህ የሥራ ጭንቀት መለኪያው 8 ይነት ጥያቄዎችን ሲይዝ እያንዳንዳቸው ከ1-4 ነጥብ ይሚይዙ 4 አማራጮች አላቸው፡፡ አጠቃላይ የመለኪያዎቹ ውጤት ድምር ከ 0 እሰከ 32 ይሆናል፡፡	**የሥራ ላይ ጭንቀት መለኪያዎች**			
		በጭራሽ	**አልፎ አልፎ**	**አንዳንድ ጊዜ**	**ሁል ጊዜ**
601	የሥራ ሁኔታዎ እንደማያስደስት ወይም አንዳንድ ጊዜ አስተማማኝ እንዳልሆነ ይሰማዎታል?	1	2	3	4
602	ሥራዎ አካላዊም ሆነ ስነ-ልቦናዊ ደህንነቶ ላይ አሉታዊ ተጽዕኖ እንደሚያመጣ ይሰማዎታል?	1	2	3	4
603	ብዙ የስራ ጫና አለብዎት ወይም ስራዎን በተቀመጠለት ግዜ ገደብ ለማጠናቀቅ ይቸገራሉን?	1	2	3	4
604	ስለ የሥራዎ ሁኔታ አስተያየት ወይም ስሜትዎን ለሥራ ተቆጣጣሪዎ ለመግለጽ አስቸጋሪ ነውን?	1	2	3	4
605	የሥራዎ ጫና በቤተሰብዎ ወይም በግል ሕይወትዎ ላይ ተጽዕኖ እንደሚያሳድር ይሰማዎታል?	1	2	3	4
606	የሥራዎትን ተግባራት በበቂ ሁኔታ መቆጣጠር ይችላሉን?	1	2	3	4
607	በጥሩ ሁኔታ ለሰሩት ስራ እውቅና ወይም ሽልማት ተሰጥቶዎታል?	1	2	3	4
608	በስራ ቦታ ችሎታዎትንና ክህሎትዎን ሙሉ በሙሉ መጠቀም ይችላሉ?	1	2	3	4
609	**ጠቅላላ የሥራ ጭንቀት ውጤት**	_____			
610	**የሥራ ጭንቀት የውጤት ትርጉም**	**3. አዎ (16 to 32)** **4. አይ (≤15)**			

ተ.ቁ	**ከ 701 እስከ 710 ያሉት ጥያቄዎች የስራ እርካታዎትን መለካት ነው** ይህ የሥራ እርካታ መለኪያው 10 አይነት ጥያቄዎችን ሲይዝ እያንዳንዳቸው ከ1-5 ነጥብ ይሚይዙ 5 አማራጮች አላቸው፡፡ አጠቃላይ የመለኪያ ጥያቄዎቹ ውጤት ድምር ከ 0 እሰከ 50 ይሆናል፡፡	**የስራ እርካታ መለኪያ**				
		በእጅጉ አልስማም	**አልስማማም**	**አላውቅ ም**	**እስማማ ለው**	**በእጅጉ እስማማለው**
701	ለሰሩት መልካም ስራ እውቅና አግኝተው ያውቃሉን?	1	2	3	4	5
702	በሥራ ቦታዎ ላሉት ሰዎች ቅርብ እንደሆኑ ይሰማዎታል?	1	2	3	4	5
703	በዚህ ኩባንያ በመስራትዎ ጥሩ ስሜት ይሰማዎታል?	1	2	3	4	5
704	ስለ ስራዎ ዋስትና ይሰማዎታል?	1	2	3	4	5
705	አስተዳደሩ ስለእርስዎ ያስብዎታል ብለው ያምናሉ?	1	2	3	4	5
706	በአጠቃላይ ሥራ ለጤንነትዎ ጥሩ ነው ብለው ያምናሉ?	1	2	3	4	5
707	ደሞዝዎ ጥሩ እንደሆነ ይሰማዎታል?	1	2	3	4	5
708	ችሎታዎና ክህሎትዎ ሙሉ በሙሉ ስራ ላይ የሚያውሉ ይመስልዎታል?	1	2	3	4	5
709	ከሥራ ተቆጣጣሪዎች ጋር ጥሩ መግባባት አለኝ ብለው ያምናሉ?	1	2	3	4	5
710	ስለ ሥራዎ ጥሩነት ምን ይሰማዎታል?	1	2	3	4	5
711	**አጠቃላይ ውጤት**	_____				
712	**የሥራ እርካታ ውጤት ትርጓሜ**	**1. አዎ (32-50)** **2. አይ(10-31)**				

ስለትብብርዎ በጣም እናመሰግናለን!

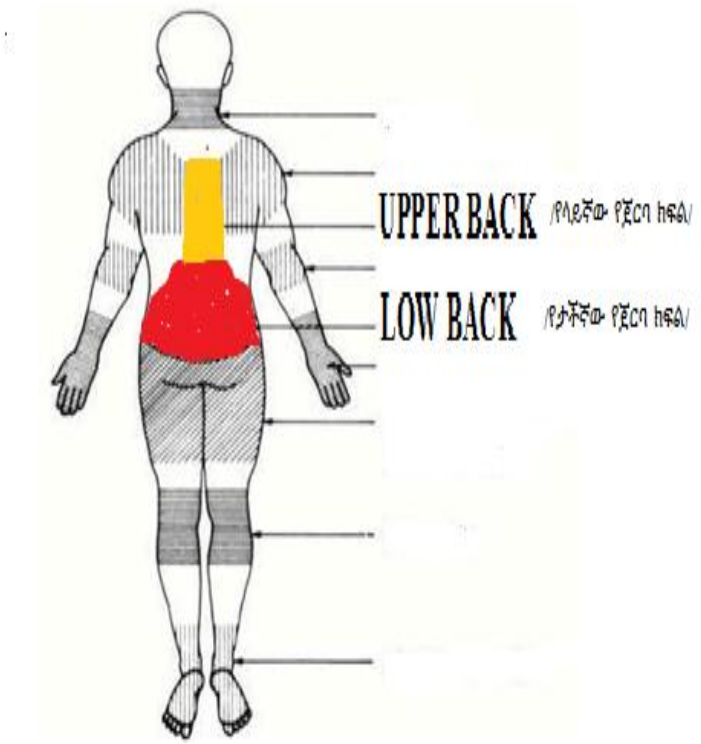

Figure 5: Parts of body that was referred in the questionnaire