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Original Research Article

Assessment of back pain and disability status among automotive industry workers, in Ethiopia

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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, manufacturing sectors in Ethiopia, including automotive manufacturing is growing well but there is poor culture of work place safety. The aim of this study was to assess the prevalence of back pain and disability status at Bishoftu automotive industry workers.
Methods: A cross sectional study was conducted among 412 workers in a period of February to May 2018. Simple random sampling technique was applied to select participants. Data was collected by face-to-face interview using standard Nordic and Oswestry back pain disability index tools. Analysis was done by using SPSS version 24. Bivariate and multivariate logistic regression analyses were used to determine associations.
Results: Prevalence of work related back pain among automotive production factory workers during last 12 months and last seven days were 51.7% and 25% respectively and 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).
Conclusions: High prevalence of back pain among automotive industry workers was seen. 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 need more attention to promote the health and safety of workers.

Keywords: Back pain, Lower back pain, Upper back pain, Disability

INTRODUCTION

Back pain is non-traumatic musculoskeletal disorder that affects the upper and lower back, regardless of its diagnosis, that was not secondary to other disease or injury. In view of occupational health that is one of the disorders which can causes a major public health and socio-economic problems.[1] Worldwide, it is a major cause of disability that reduces worker's performance, well-being, and work absence which can causes an

enormous economic burden on individuals, families, communities, industry and governments. The global prevalence of lower back pain has been estimated to be 9.4% and this can cause more disability than any other health condition (10.7% of total YLDs); ranks 6th in terms of overall disease burden (83 million DALYs).[2-4]

The effects of back pain in the workplace takes up a high percentage of physician's time; it is widespread across many occupations, from heavy industrial to light office work. Occupations such as driving, manual handling and occupations that involve a lot of improper body movements is related to type of Low back pain. In industrial population various factors like postural deviations, core strength, flexibility and psychosocial aspects are responsible for lower back pain.[5,6]

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. About 80% of the adult productive workforces involved in any occupations should have an experience of one-time back pain during their active life period due to nature of their work. Globally more than 80% of the populations were have of experiences of an episode of back pain.[7-11]

In socio-economic perspective, back pain is the leading cause of expenditure followed by disabilities, coronary artery disease, respiratory infections, and diabetes. Furthermore, it is one of the most common of musculoskeletal disorders for which individuals seek medical care estimated between 40% and 85% of people and have been consulting with health care professionals. 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.[12-15]

In developing countries, workers in automotive industry have been working in a poor working condition and environment due to lack of health and safety awareness among employees and employers. There is paucity of information about the magnitude and impacts of back pain among manufacturing workers in developing countries when compared to developed countries.[16,17] In Africa including Ethiopia, there is limited information on the magnitude of back pain, level of disability and associated risk factors among automotive industries.

Even though, automotive industries are growing in Ethiopia, knowledge concerning on occupational health and safety among all stakeholders are minimal. In addition, there is lack of strong functioning health and safety systems in the manufacturing sectors.[18] The poor culture of occupational safety results the back pain tends to affect the social, economic, physical and mental wellbeing of the workers. This study was conducted to assess the prevalence of back pain, level of disability and associated risk factors among automotive industry workers in Ethiopia.

METHODS

Study design and period

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

Source and study population

This was a cross-sectional study conducted among automotive manufacturing workers working in the Bishoftu automotive industry from February to May 2018 at Bishoftu, Ethiopia. According to established selecting criteria a total of 422 study participant were selected.

Data collection tools and procedures

The data were collected through face-to-face interview using standard Nordic and Oswestry back pain disability index.[19] Standard questionnaire was used both in English and local language to make the conversation suitable. The first part of the questionnaire consists of demographic information. The second part of questions which determine data on back pain perceived symptoms as well as history of back pain in relation to the symptoms in the last 12 months. The third part of the questionnaire was used to measure functional disability of workers due to back pain in the last seven days. The fourth part of the questionnaire consists of questions which determine factors associated with back pain.

Sample size determination

The sample size was calculated using single population proportion and double population formula.

Data management and data analysis procedures

Collected data was cleaned, coded and entered to Epi Info version 7. Statistical package for social sciences (SPSS) version 24 was used for data analysis. Descriptive statistics and bivariate logistic regression were used to explore presence of statistical association. The associations were described using odds ratio with 95% confidence interval.

Data quality assurance

Standard Nordic and Oswestry back pain disability index questionnaire were used.[19] The questionnaire was pretested among auto repair mechanics in Addis Ababa before a week of actual data collection period. Supervisors and data collectors were trained on the techniques, rules and regulations of data collection and closer supervision was undertaken. Finally,

questionnaires were reviewed and checked for completeness and relevance.

Ethical consideration

Ethical clearance and approval were obtained from the Institutional Review Board of the Addis Ababa University, College of Health Science and School of Public Health. Formal letter and written permission were obtained from Bishoftu automotive industry, and informed consent was taken from each participant. During the survey, the purpose of the study was explained to each participant.

RESULTS

Socio demographic characteristics of the respondents

A total of 422 automotive manufacturing workers were interviewed, of which 10 respondents completed the interview partially. The remaining 412 questionnaires were completed, with 97.6% response rate. The participants were predominantly were males accounts 257 62.4%. Majority 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.

Table 1: Socio-demographic data of the study participants (n=412).

Categories of variable	Frequency	Percentage
Gender		
Male	257	62.4
Female	155	37.6
Age (in years)		
<25	104	25.2
25-29	164	39.8
30-34	76	18.4
35-39	47	11.4
≥40	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

Concerned marital status, 214 (51.9%) were single and 188 (45.6%) 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 1-5 years and 113 (27.4%) had served 6-10 years and the mean service year was 5±3.5 SD with a minimum and maximum of 1 and 30 years of experience (Table 1).

Work-related characteristics of study participants

Based on our analysis, from a total 422 study participants 373 (90.5%) were permanently employed, 366 (88.8%) were working 6 days per week, 403 (97.8%) were working for eight hours per day in their job and 221 (53.6%) of the respondents had no formal workplace, and health and safety training. Regarding the nature of the job 49.0%, 21.1%, 11.2% and 7.3% of the respondents work in assembling, welding, painting and disassembling respectively.

Table 2: Work-related characteristics of study participants (n=412).

Categories of variables	Frequency	Percentage
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 (in days)		
5	29	7.0
6	366	88.8
7	17	4.1
Working hours per day (in hours)		
≤8	403	97.8
>8	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 (>25 kg)		
Yes	202	49.0
No	210	51.0
Using vibrating powered tools		
Yes	224	54.4
No	188	45.6

In general, half of the respondents 224 (54.4%) were exposed to whole body vibration using vibrating powered tools, 291 (70.6%) were involved in bending or twisting of awkward posture, 261 (63.3%) lift heavy loads >25 kg and 202 (49.0%) were pulling or pushing heavy loads >25 kg in their daily work (Table 2).

Individual and psychosocial characteristics of study participants

According to our finding's majority of the respondents 387 (93.9%) had no smoking status, 58 (14.1%) drinks alcohol at least two times per week, and 193 (46.8%) were practicing physical exercise at least two days per week for 30 minutes. Regarding job satisfaction more than half of the respondents 277 (67.2%) had no satisfaction and 313 (76.0%) of the study population had job stress (Table 3).

Table 3: Individual and psychosocial characteristics of study participants (n=412).

Categories of variables	Frequency	Percentage
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

Prevalence of work related back pain among respondents

Based on our study work related back pain among automotive industry workers who had experienced ache, pain, and discomfort in the last 12 month and 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 (Figure 1).

According to the present study among the respondents 46 (11.2%) had received treatment for back pain, 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 during the last 12 months. In addition, the results of our study showed that 12 (2.9%) of the respondents were hospitalized and 23 (5.6%) respondents were absent from work more than four consecutive days and 62 (15.0%) were thought to change their job due to back pain disability (Table 4).

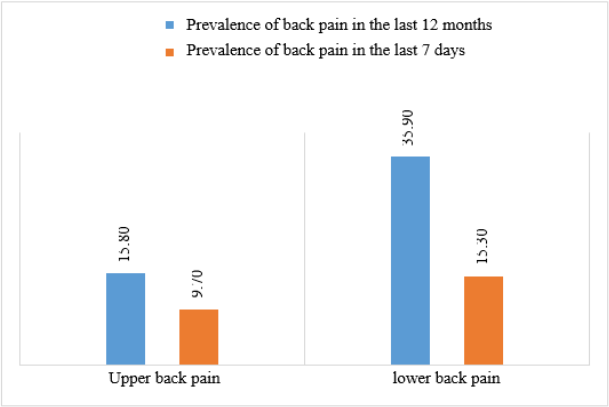

Figure 1: The prevalence of back pain among the respondents.

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

Categories of variables	Frequency	Percentage
Past history of back pain		
Yes	59	14.3
No	353	85.7
Consecutive day absence from work in the past 12		
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 behaviour towards back pain		
No treatment received	366	88.8
Traditional healer	14	3.4
Prescription of	15	3.6
Physical exercise	6	1.5
Physiotherapy	4	1.0
MRI	7	1.7

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 (Figure 2). Back pain interfered daily lives of workers activity in varies degrees. Lifting was the most affecting activity with a mean difference of 1.95 followed by sitting (1.13) and standing (1.03).

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

Functions	95% confidence interval of the difference					
	t value	df	Sig (2-tailed)	Mean difference	Lower	Upper
Back pain intensity	7.117	102	0.000	0.757	0.55	0.97
Personal care	8.681	102	0.000	0.864	0.67	1.06
Lifting	12.733	102	0.000	1.951	1.65	2.26
Walking	8.102	102	0.000	0.641	0.48	0.80
Sitting	9.575	102	0.000	1.126	0.89	1.36
Standing	10.202	102	0.000	1.029	0.83	1.23
Sleeping	3.691	102	0.000	0.485	0.22	0.75
Social life	8.644	102	0.000	0.874	0.67	1.07
Traveling	9.073	102	0.000	0.893	0.70	1.09
Employment	13.440	102	0.000	0.932	0.79	1.07

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 (in years)					
<25	48 (46.2)	56 (53.8)	1.00	1.00	
25-29	86 (52.4)	78 (47.6)	0.78 (0.48-1.27)	0.92 (0.52-1.62)	0.765
30-34	38 (50)	38 (50)	0.86 (0.47-1.55)	1.34 (0.66-2.72)	0.417
35-39	27 (57.4)	20 (42.6)	0.64 (0.32-1.22)	1.51 (0.60-3.80)	0.379
≥40	14 (66.7)	7 (33.3)	0.43 (0.16-1.15)	0.56 (1.36-2.31)	0.423
Service year					
1-5	126 (45.82)	149 (54.18)	0.79 (0.13-4.79)	0.36 (0.03-4.31)	0.422
6-10	67 (59.29)	46 (40.71)	0.46 (0.0.07-2.85)	0.19 (0.02-2.34)	0.198
11-15	18 (94.74)	1 (5.26)	0.037 (0.003-0.55)	0.02 (0.001-0.46)*	0.015
≥16	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 (>25 kg)					
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 to OLS					
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.

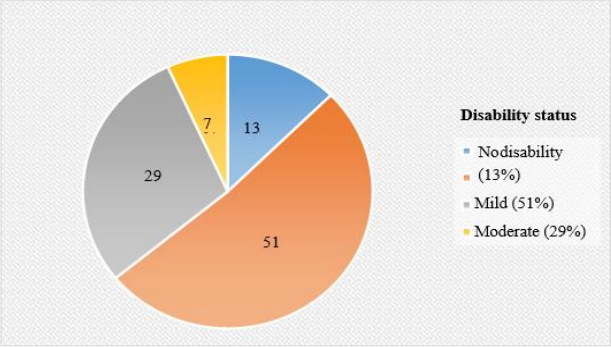

Figure 2: Disability status due to back pain among respondents.

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 scores mean difference of 0.48 which is the least disrupted by back pain among the respondents (Table 5).

Factors associated with back pain

Based on our study 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.

DISCUSSION

According to our findings, the prevalence of work related back pain within the past 12 months were 51.7%, of which 35.9% accounts for lower back and 15.8% for upper back pain. These findings are in concordance with the findings in a study among Malaysian automotive industry workers that reported 50.9%.[23] But, higher observation than in study among car-manufacturing group in Iran 21% and lower prevalence of lower back pain than studies done among professions of nurses which is 44%, higher magnitude of upper back pain than the garment industry workers which was 6%.[21,33,34] This discrepancy could be resulted from the variation in nature of activities, difference in the availability of ergonomics tools, different sample size, study area, workload and assessment tools.

Current study described prevalence of disability among 87% respondents with back pain occurring within the previous 7 days were ranges from mild 51% to severe disability 7%. This finding is comparable with the results found in the study done among construction workers in India with prevalence ratio of 71.4%, and less than in the research done in Sao Paulo state which showed prevalence of disability among 65% respondents, and occurred moderate to severe disability among 80.7% of them.[35,36] It is also higher than students of Tehran, Iran which showed that 47.8% suffered from back pain related disability.[22]

Our study revealed that, back pain interfered the workers normal work, ability 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.[29]

Lifting is the most disabling activity in our study; this may be due to the spinal loads. Similarly, this finding is consistent with those of previous studies which shows spinal load is greater in patients with LBP compared to asymptomatic participants.[37] Thus, it is important to teach lifting techniques to the workers. In addition, Sitting and standing were the work place activities commonly attributed as a cause back pain in our study. The reason behind may be prolonged sitting and standing with the improper posture that affects a different spinal loading pattern. Similar findings agreed that prolonged sitting and standing is common aggravating factor in individuals with back pain.[29,37]

Various factors socio-demographic, work related factors, personal and psychosocial factors have been shown to be associated with occurrence of back pain. According to our findings, risk of back pain was 1.6 times higher in females than males. Regarding this, similar finding was explained in the research that is female workers have increased risk of experiencing back pain than males.[27] Moreover, our findings showed that about 2.9% workers with back pain were hospitalized for 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. This finding was in 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.[30,38]

In this study, longer duration of work in automotive manufacturing 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). Similar result is obtained in research done in Ethiopian aircraft technicians which showed duration of employment as aircraft technicians

with 7-9 years were almost eight times more to complain low back pain than those with 1-3 years of experience. Work activities that require twisting in awkward way during automotive manufacturing showed a significant association with 2 times higher getting of back pain than workers not bend or twist in awkward posture in our result. Previous studies confirm the effects among automotive manufacturing that says frequent extreme bending showed 15 times higher of getting low back pain than workers no bending.[8,28]

Lifting of heavy weights is found to be the risk factor for back pain in our finding. Respondents who were lifting weight more than 25 kg had 5 times higher of getting back pain. This finding was supported by other studies where jobs requiring frequent lifting of objects weighing 23 kg load increases risk to low back pain 15 times more. Lifting less than 25 kg and greater than 25 kg increases the risk for back pain 2.9 and 3.5 time respectively compared to no lifting conditions.[8,38] The size of the object lifted play a significant role in the pain severity due to the high energy required for larger objects during lifting. Based on our study, there is no association between the development of back pain, and age, pulling and pushing activities, workplace safety and health training, job stress and job satisfaction. In contrast to our result other study revealed that older ages have higher risk than younger age workers.[20,26] This could be when age increase, joint mobility and muscular strength decreases.

However, association exists between job stress and job satisfaction with development of back pain and incidence in disabling back pain is seen in the study done among automotive industry workers, no association exists in the present study.[24,25] According to our result, pulling and pushing activities in automotive manufacturing is not significantly associated with the prevalence of back pain. In contrast to our finding of similar studies among industrial workers showed 3.5 times higher back pain for pushing and pulling weights than no pushing or pulling conditions.[38] This is might be due to the difference in work setting, salaries rate and safety standards availing for the workers.

Strengths

To assure the quality of the data, standardized data collection tool was used and pre-testing was done, appropriate sampling procedure was followed, and large sample size was taken to get more representative data for the source population.

Limitations

As self-reported pain or discomfort, might be over and under estimation of the magnitude of back pain and there might be recall bias.

CONCLUSION

Back pain is highly prevalent among automotive industry workers in Ethiopia. In addition, this study verified automotive production workers with back pain were suffered from disability. Furthermore, the workers who had served for longer years, bending or twisting in awkward posture and lifting heavy weights were more probably to suffer back pain and disability.

Recommendations

The problem should have got attention to promote the health and safety of workers to prevent and for early detection. An ergonomics interventions program in the workplace should focus on eliminating awkward postures, manual handling of heavy loads and designing sitting-standing workstations on the production line.

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