

# Prevalence of lower back pain among workers in a Bloemfontein welding company

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## ABSTRACT

**Background:** Lower back pain (LBP) is a common health problem that has been identified as one of the most costly occupational disorders worldwide. Workers in welding factories are at high risk of acquiring LBP due to the physical demands of the work they perform.

**Objective:** This study was conducted to determine the prevalence of LBP and associated risk factors among workers in a welding company in South Africa.

**Methods:** A retrospective cross-sectional survey was carried out using a self-administered questionnaire. Of the 124 eligible participants, 88 completed and returned the questionnaires. Participants were assigned to two groups, viz. those with and those without lower back pain.

**Results:** Fifty-three participants (60.2%) had LBP. More males had LBP than females ( $p = 0.003$ ). The prevalence of LBP was significantly higher among welders and fitters than office workers, viz. 69.0% and 43.3%, respectively;  $p = 0.019$ . A statistically significant proportion of participants had LBP and sleep disturbances, or LBP and headache ( $p < 0.05$ ).

**Conclusion:** Most study participants suffered from LBP which was associated with work-related factors and medical disorders. Issues that could be incorporated into a LBP preventive programme include regular exercise, reduced physical workload and provision of medical care for affected workers. There is a need for implementation and monitoring of occupational health and safety interventions in the workplace to prevent LBP.

**Keywords:** lower back pain, sleeping disturbances, welders, fitters, office workers

## INTRODUCTION

Lower back pain (LBP) is a common and costly medical condition that is both an occupational and public health burden.<sup>1</sup> It is one of the most common musculoskeletal disorders faced by the industrialised world and affects a large percentage of the population. LBP strains national health and welfare systems in terms of diagnosis, treatment, absenteeism and early retirement.<sup>1,2</sup> It has been reported that the prevalence of chronic LBP is around 23%, and 11-12% of the population is disabled as a result of LBP.<sup>3</sup> Non-specific LBP is not attributable to a recognisable specific pathology whereas specific LBP is attributable to a known recognisable pathology.<sup>3,4</sup> In 2010, LBP was ranked third among all diseases in terms of disability-adjusted life-years in the United States of America.<sup>5</sup> It has been reported that the lifetime prevalence of LBP is over 70% in Europe, with the most affected individuals being the working population aged 35-55 years.<sup>6</sup>

A 2007 South African study conducted in the steel industry reported a LBP point and lifetime prevalence rate of 35.8% and 63.9%, respectively.<sup>7</sup> Van Vuuren et al., in another study conducted in South Africa, reported a lifetime and point prevalence of LBP among workers in a manganese factory to be 71.6%

and 37.6%, respectively.<sup>8</sup> A study<sup>9</sup> conducted in South Africa among hospital employees indicated a LBP point prevalence rate of 47.5% which was higher than the 35.8% point prevalence reported by Van Vuuren et al. in 2005.<sup>10</sup> In Kosovo, a study conducted among power plant workers reported a LBP prevalence of 83.4% and 61.6% for blue and white collar workers, respectively.<sup>11</sup> The prevalence of LBP among Chinese coal miners over a period of 12 months was reported to be 64.9% in one study,<sup>12</sup> and 62.2% in another.<sup>13</sup> Similar rates were reported among arc and gas welders in Iran (72.2% and 66.7%, respectively).<sup>14</sup>

Research done in occupational settings has indicated that the most frequently reported risk factors associated with LBP include lifting heavy loads, maintaining an awkward posture for sustained periods, and exposure to whole body vibration.<sup>15</sup> A 2008 study conducted among forest industry workers in Finland reported that the effects of physical workload on LBP diminished with age, whereas health behaviour, sleep disturbance and mental distress were predictors of LBP.<sup>15</sup> It has been reported that the risk of LBP is high among food processing workers because they are required to work in awkward positions and lift heavy materials.<sup>16,17</sup>

Several studies have indicated that LBP is associated with a

combination of physical factors. Workplace factors include rapid work pace, repetitive motion patterns, insufficient recovery time, forceful manual exertion, non-neutral body postures of the wrists, elbows or shoulders, concentrations of mechanical pressure, and low temperature.<sup>18</sup> In heavy industry such as welding, lifting of heavy weights and changes in body posture are the main factors associated with LBP.<sup>19</sup>

Advancing age has also been reported as a risk factor. A study by Hagberg et al.<sup>20</sup> indicated that the normal degeneration of tissues with advanced age increases the risk of LBP. Bejja et al.<sup>21</sup> reported other risk factors, such as smoking, increased body mass index and disturbed psychological profile.

Welding is associated with increased risk of musculoskeletal disorders, including LBP.<sup>14</sup> Welders keep their necks bent or shoulders raised for long periods of time and lift heavy equipment, increasing the risk of LBP. In the present study, welders and fitters worked in two similar welding workshops. Their tasks involved (1) welding components in flat, vertical or overhead positions, (2) cutting work pieces using powered saws, (3) positioning work pieces using cranes, (4) grinding off excess weld using portable hammers, (5) preparing all surfaces to be welded and (5) shaping metal pieces with hammers. A study conducted in Iran by Ebrahimi et al.<sup>14</sup> indicated that duration of employment as a welder was associated with increased risk of musculoskeletal disorders of the neck, shoulder and lower back.

Office workers perform administrative tasks, using computers and other office equipment. Factors that increase the prevalence of LBP among this group include bending the body forward, body distance from the computer, sitting for many hours, and performing repetitive work.<sup>22</sup>

Although personal health factors, such as smoking, lack of physical exercise and being overweight increase the risk of LBP, the scientific evidence to support this is inconsistent.<sup>23</sup> Other factors related to the onset of LBP are gender and type of work.<sup>21,23</sup> A high frequency and severity of LBP is common among workers engaged in more intense physical labour.<sup>24</sup>

There is a dearth of information about the prevalence of LBP in the South African welding industry, and no specific studies have been conducted. The purpose of this study was to investigate the prevalence of LBP among workers in a Bloemfontein welding company.

## METHODS

This was a cross-sectional survey conducted among 124 workers (welders, fitters and office workers) employed in January 2012 by a welding company located in Bloemfontein, Free State province, South Africa. The metal inert welding (MIG) method was used by both welders and fitters working in two similar workshops.

A self-administered questionnaire was developed by the researcher. Information collected included demographic characteristics such as age, gender, marital status and level of education. Work-related information included the number of working hours per week, job category, duration of employment, and safety training. Health-related information provided by the participants

included the type and occurrence of diseases and other health-related disorders. Participants were asked if they had experienced LBP in the 12 months prior to the survey. A screening question was used to identify those who developed LBP from non-work related activities. Participants were classified into two groups: 1) individuals with LBP (LB group), and 2) individuals without LBP (NLBP group).

All data were collected and captured using Microsoft Excel 2010 and analysed using SAS Version 9.2. Chi square tests were used to test differences in proportions. The statistical level of significance level adopted for all the tests was 0,05.

The study was approved by the ethics committee of the University of the Free State (reference number: 170/2011). Permission to conduct the study was obtained from the management at the welding company.

## RESULTS

Of the 124 workers invited to participate in the study, 88 responded (37 welders, 21 fitters and 30 office workers), giving a response rate of 71.0%. None of the workers developed LBP from non-work related activity and so there were no exclusions. The majority of participants were male (83.0%), and younger than 40 years (69.3%). Welders and fitters comprised 42.0% and 23.9% of the participants, respectively; 34.1% were office workers. Of the 15 female participants, nine were office workers; four and two were welders and fitters, respectively. Of the 73 males, 21 were office workers, and 33 and 19 were welders and fitters, respectively. The age group into which the majority of participants fell was the 30-39 year age group (43.2%); the median age was 34 years. Most were married (47.7%), and non-smokers (70.5%). Only 38.6% had completed tertiary education. Most (84.1%) participants had worked for 1-10 years and very few (8.0%) had received safety training in the 12 months prior to the study. The majority (70.5%) worked a 40-hour week. Most of the fitters ( $n = 19$ ; 95.5%), about a third of the welders ( $n = 13$ ; 35.1%), and a quarter of the office workers ( $n = 7$ ; 23.3%), worked more than 40 hours per week. One of the office workers and one of the workers in the fitter/welder group reported having a back injury.

The reports of LBP by socio-demographic, lifestyle and work-related factors are shown in Table 1. Fifty-three participants (60.2%) suffered from LBP. The comparison between the LBP and NLBP groups showed statistically significant differences in relation to gender, employment division and duration of employment ( $p < 0.05$ ). Fifty-eight percent of participants aged 30-39 years had LBP. More male participants (67.1%) than females (26.7%) reported LBP ( $p = 0.003$ ). More study participants who worked in the welding workshops had LBP than those who worked in offices ( $p = 0.019$ ). More workers who had worked for 10 or fewer years reported LBP than those who had worked for more than 10 years ( $p = 0.033$ ).

Table 2 shows the prevalence rates of LBP by disease and other health-related problems. A statistically significant proportion of participants with LBP also had sleep disturbances (43.4%) or headaches (84.9%).

**Table 1. Prevalence of LBP by socio-demographic, lifestyle and work-related factors**

Variable	n	LBP group		NLBP group		P value
		n = 53		n = 35		
		n	%	n	%	
<b>Age (years)</b>						
20-29	23	14	60.9	9	39.1	0.941
30-39	38	22	57.9	16	42.1	0.696
40-49	16	10	62.5	6	37.5	0.837
50-59	10	6	60.0	4	40.0	0.987
60-65	1	1	100	0	-	0.413
<b>Gender</b>						
male	73	49	67.1	24	32.9	0.003*
female	15	4	26.7	11	73.3	
<b>Level of education</b>						
less than secondary	4	3	75.0	1	25.0	0.536
secondary	50	27	54.0	23	46.0	0.170
tertiary	34	23	67.6	11	32.4	0.259
<b>Smoking status</b>						
smoker	26	13	50.0	13	50.0	0.204
non-smoker	62	40	64.5	22	35.5	
<b>Working hours per week</b>						
<40	2	2	100	0	-	0.245
40	62	36	58.1	26	41.9	0.522
>40	24	15	62.5	9	37.5	0.789
<b>Received safety training</b>						
yes	7	5	71.4	2	28.6	0.527
no	81	48	59.3	33	40.7	
<b>Division</b>						
welding workshops	58	40	69.0	18	31.0	0.019*
offices	30	13	43.3	17	56.7	
<b>Duration of employment (years)</b>						
1-10	74	41	55.4	33	44.6	0.033*
>10	14	12	85.7	2	14.3	

\*Statistically significant

## DISCUSSION

This study investigated LBP among workers in a welding company. The findings were consistent with previous studies that reported LBP prevalence between 60% and 85% in working populations.<sup>23,25</sup> The LBP prevalence among welders and fitters was significantly higher than among office workers ( $p < 0.05$ ), supporting findings from a previous study<sup>24</sup> where a high prevalence of LBP was reported among workers engaged in intense physical labour.

Welders and fitters are susceptible to LBP due to the nature of the work they perform. Most of their tasks include lifting, pushing and pulling heavy loads as well as bending their trunks. This results in more strain exerted on the muscles of the back, increasing the risk of LBP. The prevalence rates of LBP among Iranian welders in a study<sup>14</sup> conducted in 2011 were similar to those reported in the present study, but higher than those reported

in a 2008 study conducted among welders in a Canadian steel company (life time and point prevalence rates of LBP of 55% and 27%, respectively).<sup>26</sup>

In this study, the LBP prevalence of office workers was higher (43.3%) than that reported in a previous study<sup>22</sup> among Greek public office workers (33%). In the present study, more office workers worked for 40 hours per week, on average. Maintaining poor body posture and sitting for long hours might be some of the reasons associated with LBP in this group.

Participants aged 30-39 years reported the most LBP, in line with a previous study<sup>27</sup> that reported that participants younger than 45 years were mostly affected by LBP. Although few participants were smokers, smoking was less prevalent among participants with LBP, but there was no association with LBP. Other studies<sup>16,23,28</sup> have reported an association between smoking and increased risk of LBP.

Significantly more workers who worked from 1-10 years reported LBP than those who worked more than 10 years. This is similar to the findings of a previous study that reported a significant association between duration of employment as a welder and the prevalence of LBP,<sup>14</sup> and might be due to the healthy worker effect. Although the length of the working week was not significantly associated with LBP, a previous study indicated that back pain was associated with the number of hours spent on repeated activities of work.<sup>29</sup>

Males had a higher prevalence of LBP than females (67.1% and 26.7%, respectively), contrary to a previous study that reported a higher prevalence of LBP among females (27%) than males (20%).<sup>30</sup> However, this finding might be explained by the type of work conducted: the majority of females were employed as office workers, while the majority of males were employed as welders and fitters.

An association between LBP and sleep disturbances, and LBP and headaches, was found. The latter association was also reported in a more recent study,<sup>31</sup> while a 2008 Finnish study revealed that mental stress and sleep disturbances were significant predictors of LBP among industrial workers in their 40s.<sup>15</sup>

## LIMITATIONS

As this was a cross-sectional study, causes of LBP could not be explored. Study participants were asked to report LBP in the past 12 months, thus the results might have been subject to recall bias. The study was conducted in one welding company and the results cannot be generalised to all workers in welding companies across the country. A small sample size is another limiting factor of this study.

## RECOMMENDATIONS

A risk assessment should be conducted in the welding company to establish the working conditions that might increase the risk of LBP in workers. Occupational health and safety interventions should be identified and implemented to reduce the incidence of LBP among workers in the welding company, and those with LBP should be treated. Consideration should be given to the nature

**Table 2. Prevalence of LBP in participants with additional diseases and other health-related disorders**

Disease/ disorder	Reported LBP				P value
	Yes (n = 53)		No (n = 35)		
	n	%	n	%	
Hypertension	8	15.1	1	2.9	0.063
Stress	20	37.7	7	20.0	0.774
Sleep disturbance	23	43.4	5	14.3	0.004*
Headache	45	84.9	11	31.4	<0.001*
Diabetes	2	3.8	0	-	0.245
Asthma	2	3.8	0	-	0.245
Arthritis	1	1.9	0	-	0.413

\*Statistically significant

of work performed in various divisions during the implementation of any interventions. Training and education programmes about the causes, risk factors, preventive measures, and effective management strategies of LBP should be conducted.

## CONCLUSION

The prevalence of reported LBP was high in the welding company and poses a major challenge as it could increase absenteeism rates and affect production. A risk assessment would identify work-related causes of LBP in the company.

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## DECLARATION

The author declares no conflicts of interest.

## LESSONS LEARNED

1. Welders and fitters have a high risk of LBP and special attention should be paid to them to reduce the prevalence
2. LBP might be associated with sleeping disturbances and headaches

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