

Musculoskeletal disorders in operator drivers in north-western Namibia – associated factors and awareness

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INTRODUCTION

Musculoskeletal disorders (MSDs) are soft tissue injuries caused by either unexpected or continued exposure to vibration and awkward positioning, and affect tendons, joints, muscles, nerves and/or cartilage.¹ These disorders are of major public health concern due to the resultant temporary or permanent disability, and reduced quality of life.² When induced by work practices and working conditions, they are referred to as work-related musculoskeletal disorders (WMSDs). Production line workers, healthcare workers, construction workers, repairers and labourers, and other worker groups are at risk of developing WMSDs.³

More than 150 diagnosed disorders affect the locomotor systems of 20–33% of people who live in pain.⁴ Globally, the prevalence and impact of musculoskeletal conditions increase with ageing.⁴ Factors associated with WMSDs include poor work posture, repetitive movements, exposure to vibration, and monotonous work.⁵ Consequences of MSDs include psycho-social problems, reduced performance, absenteeism, and high medical costs.⁵ Work-related MSDs also affect organisational performance. Darvishi et al. (2017) reported that MSDs lead to loss of work efficiency and early ill-health retirement among bus and truck drivers.⁶ This was supported by Santos et al. (2017), who added that musculoskeletal complaints result in sick absenteeism, and switching and leaving jobs.⁷

Operator drivers sit for long hours, while engaging in activities such as excavating, dumping, loading, pumping concrete, transporting heavy building materials or rocky ore, etc.^{8,9} The impact of awkward

ABSTRACT

Background: Operator drivers are responsible for driving trackless heavy-duty mining or construction vehicles such as graders, dumpers, loaders, and bulldozers. They have an increased prevalence of musculoskeletal disorders (MSDs) due to the nature of their work. There is a paucity of data on MSDs and associated factors among operator drivers in Namibia.

Objective: We assessed awareness of, and factors associated with, MSDs among operator drivers in the construction and mining industries in Namibia.

Methods: In this cross-sectional study, questionnaires were administered to operator drivers, and managerial staff were interviewed, using a semi-structured interview guide. Data obtained were analysed using chi-square tests and binary logistic regression modelling.

Results: 182 operator drivers completed the questionnaires, and 13 operator drivers' supervisors and managers were interviewed. Factors associated with MSDs were length of service for ≥ 10 years (OR 15.3, 95% CI 6.0–39.0), alcohol consumption (OR 2.8, 95% CI 1.1–6.7), lack of physical fitness activity (OR 8.8, 95% CI 3.8–20.4), and lack of awareness of MSDs (OR 3.1, 95% CI 1.3–7.3). Managerial staff were of the opinion that the operator drivers did not suffer from MSDs.

Conclusion: We found health issues that are associated with MSDs among the operator drivers, impacting their general wellness and productivity. Monitoring of health and wellness of these workers by the companies is recommended. There is need to increase MSD awareness, personal protective equipment usage, ergonomics skills training, and physical fitness exercises for operator drivers. Employers are urged to adopt policies, and to design guidelines and interventions aimed at promoting occupational health and safety in this population.

body positions on the development of WMSDs has been reported in literature.¹⁰ High temperatures¹¹ and the use of outdated equipment¹² can also pre-dispose operator drivers to WMSDs.

A WMSD prevalence of 44.0% was reported in earth movement workers in five construction companies in Nigeria, in 2014.¹³ However, there is a paucity of data on MSDs among operator drivers in Namibia generally, and there are no published studies on Namibian mine workers.

Our objective was to assess the awareness of, and risk factors for, MSDs among operator drivers in the mining and construction industries in Namibia.

METHODS

This was a cross-sectional study conducted in the north-western region of Namibia where 80% of the mines are located. Three large quarries and three large building construction companies provided consent for the study. The study population comprised 335 operator drivers and 21 operator driver supervisors and managers.

Sampling and data collection

The sample size of 182 operator drivers was calculated using the formula $n = \frac{N}{(1 + Ne^2)}$, where n = sample size, N = study population size, and $e = 0.05$. Stratified random sampling was used to select operator drivers from the six companies. The number of participants required for each company was calculated using the formula $N_x = \frac{n(P)}{N}$ where n = total sample size of the study, P = population size for each stratum,

and N = total population of the study. Table 1 shows the numbers of operator drivers and sample size for each of the six companies.

A questionnaire with closed-ended questions was designed to collect information about demographics, lifestyle, work-related factors, awareness, and occurrence of MSDs. A semi-structured interview guide was used to assess awareness of MSDs, and related risk factors and consequences, among the driver operators' supervisors and managers.

Data analysis

Data were analysed using the SPSS version 25. The data were summarised as frequencies and percentages for categorical data and as means and standard deviations for continuous data. Chi-square tests were used to compare the associations between MSDs covariates. Binary logistic regression modelling was used to identify risk factors for MSDs. The outcome variable (MSDs) and some explanatory variables are defined in Table 2.

Variables that were significant at $p < 0.20$ at the univariate level were included in the binary logistic regression models. Three variables (prolonged sitting, exposure to vibration, and repetitive neck and/or wrist movements) had p values ≥ 0.20 and were excluded from the initial multivariable model. Nine variables (age group, marital status, level of education, years as a driver, smoking, alcohol consumption, physical fitness activities, sitting posture, and MSDs awareness) were entered as covariates in the multivariable logistic regression model, using forward stepwise selection. Five variables with $p > 0.05$ in the multivariable model were excluded from the final model. The Hosmer-Lemeshow test was used to test the goodness of fit of the final model.

Approval for the study was obtained from the Research and Ethics Committee of the Faculty of Health and Applied Sciences at the Namibia University of Science and Technology (FHAS 31/2018). Individual companies provided permission to conduct the study.

Table 1. Numbers and proportions of operator drivers in each mine and construction company

Company	Industry	Population size (n)	Calculated sample size (n)	% of total
A	Construction	37	20	11.0
B	Construction	51	28	15.2
C	Construction	51	28	15.2
D	Mining	44	24	13.1
E	Mining	63	34	18.8
F	Mining	89	48	26.6
All		335	182	

Table 2. Definitions of variables

Variable name	Definition
MSDs	Presence of carpal tunnel syndrome, low back pain, osteoarthritis, other idiopathic pain syndromes which result in numbness, discomfort, pain, tingling, and swelling, leading to physical restriction
Awareness of MSDs	An understanding of MSD risk factors and effects
Physical exercise	Physical workout or training of any extent at time of data collection
Prolonged sitting	Sitting for > 6 hours in a day when at work
Smoking	Inhalation and exhalation of any tobacco substance at the time of data collection
Alcohol consumption	Consumption of any alcoholic beverage at the time of data collection
Vibration exposure	Use of vibrating tools, equipment or machinery for > 6 hours a day when at work

RESULTS

Demographic and lifestyle characteristics of operator drivers

The demographic, lifestyle and work-related characteristics of the 182 participating operator drivers are presented in Table 3. All were male, and most were aged 24–35 years ($n = 73$, 40.1%). Most had primary or secondary school education ($n = 144$, 79.1%). In terms of lifestyle, 40.7% ($n = 74$) reported that they were smokers, 68.1% ($n = 124$) that they consumed alcohol, and 50.5% ($n = 92$) that they were physically active. More than 95% reported that their jobs involved prolonged sitting, exposure to vibrations, and repetitive neck and/or wrist movements. Less than 30% reported work overload, hot working environments, working with old or uncomfortable machines, or repetitive work. About a third ($n = 53$, 29.1%) of the participants were aware of MSDs.

One hundred and thirty-four (73.6%) of the drivers reported that they experienced some form of discomfort related to their work (Table 4).

Effects of MSDs

Among the 53 operator drivers who were aware of MSDs, 41 (77.4%) also knew about the effects on their health. Five (9.4%) mentioned kidney damage, and four mentioned weakness and neck pain ($n = 4$, 7.6%). Only 13 (24.5%) stated that MSDs may affect them in other ways apart from their health. Four of the 13 (30.8%) cited reduction in wages, and 3 (23.1%) said that MSDs may lead to absenteeism.

Factors associated with MSDs

One hundred and five (57.7%) of the operator drivers reported having MSD symptoms. Significantly higher proportions ($p < 0.05$) of MSDs were reported among participants who were ≥ 40 years old, married, had only a primary school education, were smokers, were alcohol drinkers, and were physically inactive (Table 5). Significantly higher proportions of MSDs were also reported by those who had worked as operator drivers for 10 or more years, sat for prolonged periods, were exposed to vibration, or experienced repetitive neck and/or wrist movements.

Table 6 shows the factors associated with MSDs. The odds of reporting MSDs were 15.3 times greater for operators who had been working for 10 years than those who had been working for shorter periods ($p = 0.00$); 2.8 times greater for those who consumed alcohol compared to those who did not ($p = 0.02$); 8.8 times greater for those who were physically active compared to those who were not ($p = 0.00$); and 3.1 times greater for those who were not aware of MSDs compared to those who were aware ($p = 0.01$).

Table 3. Demographic, lifestyle, and work-related characteristics of operator drivers (N = 182)

Category	Value	n	%
Demographic characteristic			
Sex	Male	182	100
Age (years)	24–35	73	40.1
	36–45	55	30.2
	46–55	46	25.3
	> 55	8	4.4
	Education	No formal education	16
	Primary	69	37.9
	Secondary	75	41.2
	Tertiary	22	12.1
Marital status	Single	92	50.5
	Married	90	49.5
Lifestyle characteristic			
Smoking	Yes	74	40.7
	No	108	59.3
Alcohol consumption	Yes	124	68.1
	No	58	31.9
Physical exercise	Yes	92	50.5
	No	90	49.5
Work-related characteristic			
Work experience (years)	1–10	114	62.6
	11–20	44	24.2
	21–30	24	13.2
Prolonged sitting	Yes	176	96.7
	No	6	3.3
Exposure to vibration	Yes	174	95.6
	No	8	4.4
Sitting with rounded back or shoulders slumped	Yes	107	58.8
	No	75	41.2
Repetitive neck and/or wrist movements	Yes	178	97.8
	No	4	2.2
Prolonged body strain	Yes	92	51.4
	No	87	48.6
Working in a confined space	Yes	141	77.5
	No	41	22.5
Work-related practice			
Work overload	Yes	50	27.5
	No	132	72.5
Working in hot environment	Yes	43	23.6
	No	139	76.4
Working with old/uncomfortable machines	Yes	31	17.0
	No	151	83.0
Repetitive work	Yes	11	18.0
	No	50	82.0
Awareness of MSDs	Yes	53	29.1
	No	129	70.9

Table 4. Discomfort experienced by operator drivers (N = 182)

Nature of discomfort	n	%
Tiredness	40	22.0
Back pain	27	14.8
Upper body pain (neck, shoulder, and headache)	26	14.3
General body pain	22	12.1
Eye pain/discomfort	19	10.4
None	48	26.4

Perceptions about MSDs in operator drivers

Thirteen operator drivers' supervisors and managers were interviewed about their perceptions about MSDs and how they affected the operator drivers. Although they appeared to know what MSDs were, they were of the opinion that workers were not affected.

"I know MSDs exist, but I cannot remember receiving any complaint from my operators. I am not saying we have zero cases of MSDs amongst them because we have people who do not like anyone to pick up that they are suffering from a certain illness." (Participant 1)

"There are a lot of disorders out there. But not so familiar with this one or maybe we are not on the same page. And no one said they were suffering from it." (Participant 2)

"Yes (we are aware), but not so much or to the highest degree. Mostly operators complain about slight back pain, which does not even stop them from working." (Participant 3)

"I know what it is, by definition, but haven't picked up a case within our people. Generally, the possibility of it being present in our company is very high though, due to the nature of work that the operators do." (Participant 4)

The general attitude was also that as long as the operators did not alert anyone that they experienced discomfort, the companies would not take it upon themselves to investigate the prevalence of MSDs. Some participants who were interviewed dismissed the idea that workers suffered from MSDs, and suggested that complaints from employees were frivolous and not worth worrying about. It was also implied that MSDs were being dismissed as everyday discomforts that did not warrant any special attention.

"MSDs is not really a big problem with us just like I said at the beginning. It's just the slight back pains which even those experiencing them are not reporting." (Participant 2)

"Our operators do not experience any MSDs we know of..." (Participant 3)

"You may, however, see them (operators) stretching their backs but that does not mean anything. Even I stretch every time I stand up from my seat, but it does not mean I have back problems." (Participant 5)

Table 5. Numbers and proportions of operator drivers with MSDs by demographic, lifestyle and workplace characteristics (N = 182)

Characteristic	Value	No. reporting MSDs	Category total	%	p value
Age group (years)	< 40	37	96	38.5	0.00
	≥ 40	68	86	79.1	
Marital status	Single	44	92	47.8	0.01
	Married	61	90	67.8	
Education	< secondary*	61	85	71.8	0.00
	≥ Secondary	44	97	45.4	
Years worked as an operator driver	< 10	40	102	39.2	0.00
	≥ 10	65	80	81.3	
Smoking	Yes	59	84	70.2	0.00
	No	46	98	46.9	
Alcohol consumption	Yes	76	121	62.8	0.04
	No	29	61	47.5	
Physical exercise	Yes	37	95	38.9	0.00
	No	68	87	78.2	
Work experience (years)	< 10	40	102	39.2	0.00
	≥ 10	65	80	81.3	
Prolonged sitting	Yes	105	176	59.7	0.01
	No	0	6	-	
Exposure to vibration	Yes	103	174	59.2	0.00
	No	2	8	25.0	
Sitting with rounded back/shoulders slumped	Yes	69	107	64.5	0.01
	No	36	75	48.0	
Repetitive neck/wrist movements	Yes	105	178	59.0	0.02
	No	0	4	-	
Prolonged body strain	Yes	56	97	57.7	0.63
	No	49	85	57.4	
Working in confined space	Yes	25	41	61.0	0.63
	No	80	141	56.7	
Working hours	8	60	109	55.0	0.38
	> 8	45	73	61.6	
Time to rest within working hours	Yes	87	159	54.7	0.09
	No	18	23	78.3	

* Excludes those with no formal education

Table 6. Odd ratios for factors associated with reported MSDs in operator drivers

Characteristic	Unadjusted			Adjusted		
	OR	95% CI	p value	AOR	95% CI	p value
Work experience (years)						
< 10	reference			reference		
≥ 10	6.7	3.4–13.4	0.00	15.3	6.0–39.0	0.00
Alcohol consumption						
No	reference			reference		
Yes	1.9	1.0–3.5	0.05	2.8	1.1–6.7	0.02
Physical exercise						
Yes	reference			reference		
No	5.6	2.9–10.8	0.00	8.8	3.8–20.4	0.00
Awareness of MSDs						
Yes	reference			reference		
No	2.2	1.1–4.1	0.02	3.1	1.3–7.3	0.01

The companies did not directly provide their employees with information specifically related to MSDs, and there was a view that alerting the operators about health and safety in a general way was enough.

"Every time we tell them to put their health first and practise safety and that also includes MSDs." (Participant 2)

"No, we don't give them such information." (Participant 4)

"No, we don't provide them with any specific information to MSDs per se, but we always tell them to always use their protective gears such as kidney belts." (Participant 1)

Reporting of MSDs

In addition to not having MSD awareness training in the workplace, there were no well-defined reporting platforms. Although most responses indicated that employees were encouraged to report any matters to management, there were no dedicated channels for reporting health-related matters.

"The platform is for reporting anything not to say only MSDs. We always tell them to report to us anything." (Participant 1)

"They are always free to tell us anything that affects them anytime they want or experience it. But our people sometimes are just not free, they will tell you all is okay while it's not the case." (Participant 3)

There was a sentiment that, even if channels for reporting were in place, these would not help much due to a general employee culture of keeping things to themselves.

"Sometimes, especially during lunch, you may see them talking where one can tell they are talking about something important but the moment you go closer to them then they keep quiet or change the topic completely." (Participant 4)

The absence of incidence reporting makes it difficult to establish the possible risk factors.

Participants could not comment on the effects of MSDs in the operator drivers and whether it affected performance. Some of the supervisors and managers were also reluctant to associate any poor organisational performance with MSDs or other health problems.

"It's difficult for me to answer because we have not experienced MSDs yet. So, it's not easy for me to link the two." (Participant 1)

"Performance? The only enemy of performance is people, especially those that don't want to work, lots of sick leave here and there! And the economic downfall that the country is facing now is also another problem." (Participant 2)

"Performance has been good. The only thing that may affect performance at work is when people are being absent from work due to false medical reasons which are purely lack of commitment, otherwise no problem." (Participant 3)

"Performance is good because we made sure that their performance and the hours worked to determine their monthly payments. If you don't work hard then no money for you." (Participant 4)

DISCUSSION

Operator drivers who participated in this study reported that they experienced discomfort such as tiredness, general body pain, headache, and back, neck and shoulder pain. Almost 60% reported that they had MSDs, despite their supervisors and managers being unaware about this. High prevalences of MSDs among operator drivers have been reported in many countries, e.g. in the construction industries in Ethiopia¹⁴ and Iran,¹⁵ and in the mining industry in India.¹⁶

In our study, all the drivers were male and most were younger than 45 years. This age group includes those who have the physical capacity to carry out the required energy-demanding duties, and might not be expected to suffer from MSDs. In the univariate analysis, the proportion of operator drivers in the ≥ 40 -year age group, who reported MSDs (79.1%), was significantly greater than that in those younger than 40 years (38.5%). However, age was not a significant risk factor for MSDs in the multivariable model. This may also be due to the healthy worker effect where those who have pain may choose to change their occupations to reduce the risk of MSDs.¹⁷

Lack of physical activity and alcohol consumption significantly increased the likelihood of reporting MSDs. Physical exercise improves health generally and reduces pain related to MSDs.¹⁸ In this study, lack of physical exercise increased the likelihood of having MSDs almost nine-fold. The odds of operators who consumed alcohol reporting MSDs were 2.8 times higher than in those who did not drink alcohol. Alcohol has been associated with MSDs in several studies,^{19,20} highlighting that lifestyle factors should be considered when developing interventions to reduce MSDs.

A significant association was found between the increased length of service and the occurrence of MSDs. Similar findings of drivers with more than 10 years' experience suffering from lower back pain, due to cumulative workload exposure and ageing, have been reported.²¹

There was an overall lack of awareness about MSDs among both the operator drivers and their supervisors and managers. Some of the managers were aware of health conditions being experienced by operator drivers, but could not link them to WMSDs.

The establishment of occupational safety and health management committees in the companies in collaboration with occupational health practitioners, would facilitate improved awareness of WMSDs, identification of specific risks, improved reporting, and appropriate treatment. There should be adherence to local legislation related to occupational health and safety.

CONCLUSION

Almost 60% of the operator drivers reported having MSDs. Lack of physical exercise, alcohol consumption, longer work experience, and lack of awareness of MSDs were significantly associated with self-reported MSDs. These findings can be used to inform strategies to address and, potentially, prevent MSDs in operator drivers in the mining and construction industries. Interventions include MSD and lifestyle awareness campaigns, training on the use of personal protective equipment, and ergonomics skills training. Medical surveillance for the early detection and treatment of MSDs is also recommended. Employers should also adopt policies and design guidelines aimed at reducing the incidence of MSDs.

KEY MESSAGES

1. Longer length of service, lack of physical activity, lack of awareness of MSDs, and alcohol consumption are associated with MSDs among operator drivers.
2. There is a low level of awareness of MSDs among operator drivers and their managers in the construction and mining industries in Namibia.

DECLARATION

The authors declare that this is their own work; all the sources used in this paper have been duly acknowledged and there are no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conception and design of the study: TNN, OA, RM

Data acquisition: TNN

Data analysis: TNN

Interpretation of the data: TNN

Drafting of the paper: TNN, OA, RM

Critical revision of the paper: TNN, OA, RM

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