



Correlates and Barriers to Effective Prevention of Musculoskeletal Disorders among Plumbers in Rivers State

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ABSTRACT

This study investigates correlates and barriers to effective prevention of Musculoskeletal Disorders in Rivers state. A cross-sectional survey design was employed, involving a sample of 400 plumbers. A validated self-structured questionnaire titled barriers to Musculoskeletal Disorders questionnaire (BMSDQ) with a reliability index of 0.87 was used to collect data. A total of 329 copies of the 400 administered questionnaire was retrieved (82.25%) and used for analysis. Percentage, mean, standard deviation and regression was employed for data analysis using SPSS 25.0 version. Demographic data indicated a dominant youth presence, with 35.6%, 32.6%, 17.6%, and 14.6% falling into age brackets of 16-25, 26-35, 36-43, and above 43 years, respectively. Additionally, 73.3% identified as Christians, 13.4% as traditionalists, 11.2% as Muslims, and 2.1% adhering to other religions, reflecting the Christian-majority context of Rivers State. Regarding working experience, 46.2%, 30.7%, 11.9%, and 11.2% reported 1-5, 6-10, 11+ years, and less than 1 year, respectively. Findings indicated significant correlations between MSD prevalence and physical fitness ($R = 0.678$, $P < 0.05$), job demands ($R = 0.292$, $P < 0.05$), and years of working experience ($R = 0.260$, $P < 0.05$). Notably, inadequate training, time pressures, and lack of employer support were identified barriers to effective MSD prevention. The study underscores the need for tailored interventions, encompassing ergonomic training, improved work conditions, and management commitment to health and safety.

Keywords: Musculoskeletal Disorder, correlates, Barriers, prevention measures, Plumbers

INTRODUCTION

Musculoskeletal injuries and disorders (MSDs) is ranked as the most widespread form of serious occupational injury and disease in numerous countries (International Labour Organisation, 2015; Safe Work Australia, 2015a). Musculoskeletal disorders (MSDs) represent a significant public health concern globally, affecting a wide range of occupations and industries. Among these, plumbers are particularly susceptible to MSDs due to the physically demanding nature of their work, involving tasks that require repetitive movements, awkward postures, heavy lifting, and exposure to vibration. MSDs encompass a variety of conditions affecting muscles, tendons, ligaments, joints, and other musculoskeletal structures, leading to pain, discomfort, reduced productivity, and even long-term disabilities. Understanding the factors that correlate with the occurrence of MSDs and the barriers to their prevention among plumbers in Rivers State is crucial for developing effective intervention strategies to safeguard their health and well-being.

Numerous studies have highlighted the high prevalence of MSDs among plumbers worldwide. The physically demanding nature of plumbing work, which often involves bending, kneeling, squatting, and

working in confined spaces, places significant stress on the musculoskeletal system. A study by Waters et al. (2016) found that plumbers had a higher prevalence of MSDs in comparison to workers in other industries, with back pain and shoulder pain being the most commonly reported issues.

Several factors have been identified as correlates of MSDs among plumbers. One key factor is the ergonomic challenges associated with their work tasks. Prolonged periods of awkward postures and repetitive movements contribute to the accumulation of microtrauma in musculoskeletal tissues. According to a study by Bao et al. (2018), poor ergonomic practices were significantly associated with the development of MSDs among plumbers. Additionally, lack of physical fitness and inadequate warm-up routines before undertaking strenuous tasks can exacerbate the risk of MSDs. This is consistent with findings from a study by Waters et al. (2019), which demonstrated that plumbers with higher levels of physical fitness experienced fewer MSDs.

Despite the known risks and potential consequences of MSDs, there are several barriers that hinder the effective prevention of these disorders among plumbers. One major barrier is the perception of time constraints and work pressures. Plumbers often work in time-sensitive environments, which can lead to neglecting proper ergonomics and safety measures. This is supported by the research of Johnson and Hall (2017), who found that time pressures were cited as a primary reason for disregarding preventive practices among plumbers.

The organizational culture and support within plumbing companies play a pivotal role in shaping the prevention of MSDs. A positive safety culture promotes the adoption of preventive measures, whereas a lack of management commitment to safety can lead to negligence. A study by Smith et al. (2020) emphasized the significance of leadership support, training, and provision of ergonomic tools in reducing the risk of MSDs among plumbers.

Socioeconomic factors also influence the prevention of MSDs among plumbers. Access to appropriate personal protective equipment (PPE) and ergonomic tools can be limited by financial constraints, potentially compromising their safety. A study by Chen et al. (2018) highlighted that the absence of proper PPE was a significant barrier to the prevention of MSDs among plumbers.

Rivers State, Nigeria, is home to a thriving construction and plumbing industry, contributing significantly to the state's economy. However, there is a paucity of research specifically addressing MSDs among plumbers in this region. Understanding the unique challenges faced by plumbers in Rivers State is essential for tailoring intervention strategies that align with the local context and needs. Hence, this study investigate correlates and barriers to effective prevention of Musculoskeletal Disorders in Rivers state.

Aim and Objectives

This study investigated correlates and barriers to effective prevention of Musculoskeletal Disorders among plumbers in Rivers state. Two specific objectives were explored:

1. Identify the correlates of MSD among plumbers in Rivers State
2. Identify the barriers to effective prevention of MSD among plumbers in Rivers State

Research questions and hypothesis

1. What are the correlates of MSD among plumbers in Rivers State
2. What are the barriers to effective prevention of MSD among plumbers in Rivers State
3. Explore

Hypothesis 1: physical fitness levels, job demands and work experience do not significantly correlate with the prevalence of MSD among plumbers in Rivers State.

Critical Literature review and gap in literature

According to Leka and Cox (2018), ergonomic hazards in the workplace refer to many elements of work design and administration, as well as the social and organisational contexts, which possess the capacity to result in psychological or bodily injury. These hazards are significant contributors to the aforementioned risks. The impact of ergonomic risks on mental health disorder (MHD) risk has been extensively reported in the literature, as evidenced by studies conducted by Nieuwenhuijsen et al. (2010) and Way (2012). It is

well acknowledged that psychological hazards can exert a substantial influence on the risk of musculoskeletal disorders (MSDs), in addition to the effects of physical "manual handling" hazards. This assertion is supported by various studies, including those conducted by Eatough et al. (2012), Gerr et al. (2014), Lang et al. (2012), Marras et al. (2019), and the National Research Council (NRC) and Institute of Medicine (2011).

In order to enhance the mitigation of musculoskeletal disorders (MSD), it is crucial that occupational health and safety (OHS) protocols implemented within the workplace effectively target ergonomic hazards associated with work-related factors. The process of risk management in the workplace involves three main components: hazard identification, risk assessment, and the implementation of risk control measures (Safe Work Australia, 2018). Despite the scarcity of research on the subject matter, a number of studies (Leka et al., 2015; Macdonald and Evans, 2006; Macdonald and Oakman, 2013, 2015; Oakman et al., 2018; Whysall et al., 2014) have yielded findings indicating that the implementation of risk management strategies in occupational settings is largely ineffective in adequately recognising, evaluating, and mitigating risks associated with ergonomic hazards in the workplace. In the study conducted by Oakman et al. (2018), the researchers discovered that when it comes to addressing ergonomic factors related musculoskeletal disorders (MSDs), policies and practises tend to prioritise individual factors such as bullying, harassment, and stress management. However, the study highlights that managers have a clear responsibility for addressing work and organisational factors, which are often overlooked in these policies and practises.

Although there are various resources available (British Standards Institute, 2011; Canadian Standards Association, 2013; Comcare, 2008; Health and Safety Executive, 2012; International Labour Organisation, 2012; Leka and Cox, 2018), the underlying factors contributing to this condition remain ambiguous. There is a potential lack of awareness among workplace occupational health and safety (OHS) risk management authorities regarding the imperative to address the potential risks associated with psychological hazards in the workplace. The results obtained from the Australian residential aged care sector corroborated this assertion (Oakman & Bartram, 2017). Furthermore, an examination of European policies pertaining to ergonomic factors impacting occupational health in 2015 revealed that workplace hazards are predominantly perceived as being of a physical nature, even within the realm of mental health disorders. In their study, Whysall et al. (2014) examined the involvement of ergonomics consultants in the management of musculoskeletal disorder (MSD) hazards. The researchers discovered that the primary focus of ergonomists on fulfilling "clients' needs and expectations" hindered the implementation of safer workplace practises. Macdonald and Oakman (2015) conducted study indicating that individuals responsible for overseeing the management of musculoskeletal disorders (MSDs) in occupational settings might be neglecting to consider the potential consequences of psychological hazards.

The initial recognition of the necessity for implementing a certain behavioural or organisational modification is a pivotal initial phase within the Stages of Change framework (Prochaska and DiClemente, 1982; Whysall et al., 2017). According to Oakman et al. (2016), the lack of acknowledgement on the significance of managing ergonomic hazards within the workplace poses a significant obstacle to enhancing risk management. The perspectives of individuals who hold direct accountability for occupational health and safety (OHS) risk management within the workplace remain mostly undisclosed. The study conducted by Langenhan et al. (2013) examined the viewpoints of 14 European individuals regarding the significant challenges associated with integrating 'ergonomic risks' into the strategic decision-making processes of businesses. The participants included representatives from employer organisations, policy makers, trade unionists, and experts. Nevertheless, there is a dearth of existing research documenting the perspectives and opinions of typical office employees regarding the necessity of managing musculoskeletal disorder (MSD) and mental health disorder (MHD) risks, as well as the barriers hindering the improvement of such management practises.

The absence of established protocols for evaluating and mitigating ergonomic hazards in the realm of managing musculoskeletal disorder (MSD) risks has been identified as a hindrance to enhancing

workplace practises (Macdonald and Oakman, 2015; Whysall et al., 2004). Furthermore, there is a potential lack of awareness among workplace managers regarding the significance of effectively managing risks associated with ergonomic hazards in the workplace. A toolbox for managing the risk of musculoskeletal disorders (MSDs) has been created (Macdonald, 2012a; Macdonald et al., 2017; Macdonald and Oakman, 2013) and subsequently field-tested (Oakman, 2014) to fulfil the need for a standardised process in this area.

Nevertheless, it is imperative to incorporate substantial input from employees in order to effectively control the risks associated with ergonomic hazards. This can be achieved through several means such as conducting surveys or engaging workers in other activities that necessitate their active participation. Hence, it is imperative for line managers and occupational health and safety (OHS) specialists to collaborate in order to develop effective protocols for mitigating psychological risks, including the specific hazard mentioned earlier and the associated toolbox. The lack of authority among technical experts sometimes hinders their ability to successfully address such matters, hence emphasising the significance of line managers' activities. According to Macdonald and Oakman (2015), the actions and choices made by supervisors and managers in the workplace are responsible for several risks, with a special emphasis on ergonomic hazards. Insufficient resources have been identified as a significant obstacle to achieving more efficient risk management of psychological risks. Consequently, the support and endorsement of senior managers are crucial in addressing this issue (Langenhan et al., 2013).

Presently, it is widely acknowledged that there exist unfavourable obstacles "between safety and operations" (International Network of Safety and Health Practitioner Organisations (INSHPO), 2017). Consequently, a substantial overhaul will be required in most workplaces to foster greater engagement of line managers in occupational health and safety (OHS) risk control protocols. Based on the aforementioned, it is apparent that thorough planning is important prior to the implementation of strategies aimed at mitigating occupational health and safety (OHS) risks stemming from ergonomic hazards. The aforementioned study was undertaken in preparation for the utilisation of the MSDs risk management toolbox.

The present study primarily examines the barriers that impede the effectiveness of prevention strategies for musculoskeletal disorders (MSD). Through the act of sharing their viewpoints, stakeholders provide insights into their level of awareness of the necessity of effectively managing risks associated with ergonomic hazards within the workplace. Additionally, they throw light on any other potential obstacles that may hinder the process of bringing about desired transformations.

METHODOLOGY

Design: The study adopted a cross-sectional survey research design to achieve its objectives. A cross-sectional approach allows for the collection of data at a single point in time, providing a snapshot of the relationships between variables (Elendu, 2010; Kothari & Garg, 2014; Nwogu, 2015). This design is suitable for exploring the correlates of musculoskeletal disorders (MSDs) and the barriers to their prevention among plumbers in Rivers State.

Population: The population of interest for this study comprised plumbers working in Rivers State, Nigeria. The inclusion criteria encompassed plumbers engaged in various types of plumbing work, including residential, commercial, and industrial projects.

Sample and Sampling: The sample for the study was 400 plumbers in Rivers State. A stratified random sampling technique employed to select participants. Stratification based on the different types of plumbing work (residential, commercial, industrial) to ensure representation from each category. From each stratum, a proportional number of plumbers will be selected randomly. The sample size will be determined using a formula for estimating proportions within finite populations, considering factors such as confidence level and margin of error.

Instrument: The primary data collection instrument was a structured questionnaire titled Barriers to Musculoskeletal Disorder Prevention Questionnaire (BMSDPQ). The questionnaire was developed based

on established ergonomic assessment tools, validated survey items from previous studies, and relevant literature on occupational health and safety. The questionnaire will consist of sections related to demographics, work-related factors, ergonomic practices, physical fitness levels, perceived barriers to prevention, and self-reported musculoskeletal disorders. The instrument was validated by 6 Occupational Health and Safety. The reliability index of the instrument was 0.89

Data Collection: Data collection was carried out through face-to-face questionnaire distribution with the selected plumbers. Trained researcher assistants administer the structured questionnaire to ensure consistency in data collection. Out of 400 copies administered, 329 were retrieved and used for the study. This means 82.25% return rate which is adequate enough for an empirical study.

Data Analysis: The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize demographic characteristics, work-related factors, ergonomic practices, physical fitness levels, and self-reported MSDs. Inferential analyses, including correlation analysis and regression analysis, were conducted to examine the relationships between the identified correlates and the occurrence of MSDs among plumbers.

RESULTS

Table 1: Summary Analysis of the Demographic Characteristics of the Respondents

Demography	Cohort	Frequency	%
Age	16-25	117	35.6
	26-35	106	32.2
	36-45	58	17.6
	46 & Above	48	14.6
	Total	329	100.0
Religion	Christianity	241	73.3
	Islam	37	11.2
	Traditional	44	13.4
	Others	7	2.1
	Total	329	100.0
Years OF Working Experience	<1	37	11.2
	1-5	152	46.2
	6-10	101	30.7
	11 and above	39	11.9
	Total	329	100.0

Table 4.1 showed the summary of percentage analysis of the respondents' demographic analysis. The result revealed that 117(35.6%) Of the respondents were within the age bracket of 16-25 years, 106(32.6%) were within the age bracket of 26-35 years, 58(17.6%) were within the age bracket of 36-43 years while 48(14.6%) were years old and above. this simply means that the youth dominates the larger population of the healthcare workforce in Rivers State. Furthermore, the results revealed that majority of the respondents 241(73.3%) of the respondents were Christians, 44(13.4%) were traditionalist, 37(11.2%) were Muslims while 7(2.1%) of the Respondents observed other forms of religion. this results is not

surprising due to the fact that Rivers State is a Christian dominated state. Also, the result showed that almost half of the respondents 152(46.2%) had 1-5 years of working experience, 101(30.7%) had 6-10 years of working experience, 39(11.9%) had worked for 11 years and above while 37(11.2%) had less than 1 year working experience.

Table 2: summary of correlation analysis of the correlates of MSD among plumbers in Rivers State

	R	R²	AdjR²	Df	F_{cal}	p-value	Decision
MSD prevalence* Physical Fitness	.678	.460	.458	328	278.125	.000	Significant H ₀ Rejected
MSD prevalence * Job demand	.292	.085	.082	328	30.373	.000	Significant H ₀ Rejected
MSD Prevalence*Years of working experiences	.260	.068	.065	328	23.715	.000	Significant H₀ Rejected

The correlation analysis in Table 2 examines the relationships between the prevalence of Musculoskeletal Disorders (MSD) among plumbers in Rivers State and several potential correlates. The study finds significant positive correlations between MSD prevalence and three variables. Firstly, a strong positive correlation exists between MSD prevalence and Physical Fitness (R = 0.678), indicating that plumbers with better physical fitness tend to experience fewer MSDs. Secondly, MSD prevalence is positively correlated with Job Demand (R = 0.292), demonstrating that increased job demands contribute to a higher prevalence of MSDs. Lastly, a positive correlation between MSD prevalence and Years of Working Experience (R = 0.260) suggests that longer work experience is associated with a higher likelihood of MSDs. These findings reject the null hypothesis, indicating that these correlates significantly impact the prevalence of MSDs among plumbers in Rivers State.

Table 3: Summary of mean and standard deviation analysis to ascertain the barriers to effective MSD prevention among plumbers in Rivers State

S/No	Statement	Mean	St.D
1	Lack of awareness about the hazards associated with MSDs poses a significant barrier to their prevention.	3.01	1.273
2	Inadequate training on proper lifting techniques and ergonomic practices hinders effective MSD prevention.	2.87	.923
3	The physically demanding nature of plumbing tasks often leads ignoring the MSC prevention practice	2.99	1.294
4	Limited access to ergonomic tools and equipment contributes to the challenges of preventing MSDs.	2.77	1.278
5	Time pressure and a heavy workload sometimes make plumbers to compromise on using proper work techniques to prevent MSD	2.66	1.044
6	Concerns about job security which discourages plumbers from taking breaks or prioritizing health during work hours constitute a barrier	2.49	1.220
7	Resistance to change and a preference for traditional methods make it difficult to adopt effective ergonomic practices.	2.68	1.034
8	Lack of employer support, including providing ergonomic equipment, hampers effective MSD prevention.	3.22	1.177
9	Cultural expectations that prioritize work over proper ergonomics hinder the prevention of MSDs.	2.50	1.377
10	Limited access to healthcare facilities delays prompt treatment for issues related to MSDs.	2.45	1.254
11	Financial constraints prevent timely medical care when experiencing symptoms related to MSDs.	2.53	1.017
12	Perceived negative impact on job performance discourages plumbers from taking precautions to prevent MSDs.	2.57	1.135
13	Plumbers resistance to adoption of new ergonomic practices or using updated tools deters the prevention of MSD	2.69	1.222
14	Employers' limited prioritization of workers' health and safety impedes the implementation of MSD preventive measures.	2.77	1.171
15	Over emphasis on physical, chemical and biological hazards compromise the employers' actions against MSD prevention	2.73	0.945
		2.73	1.158

The mean scores reveal that several barriers are accepted by plumbers as hindrances to the prevention of MSDs, with the highest mean being lack of employer support (3.22 ± 1.177). On the other hand, two statements were rejected as barriers (Limited access to healthcare facilities – 2.45 ± 1.254 ; and Concerns about job security - 2.49 ± 1.220), indicating that plumbers do not consider them significant impediments. The aggregate mean of 2.73 ± 1.158 suggests that, on average, plumbers perceive various barriers to the effective prevention of MSDs in their work.

DISCUSSION OF FINDINGS

The findings of this study offer valuable insights into the factors influencing the prevalence of Musculoskeletal Disorders (MSDs) among plumbers in Rivers State. The correlations between MSD prevalence and physical fitness, job demands, and years of working experience align with existing literature while shedding light on contextual factors specific to the region.

The strong positive correlation between physical fitness and lower MSD prevalence is consistent with prior research (Waters et al., 2019). Plumbers engaged in physically demanding tasks are likely to experience reduced MSDs when they maintain better physical fitness levels, as enhanced muscular strength and endurance can provide protection against the strains and stresses inherent in plumbing work. This finding emphasizes the potential benefits of incorporating fitness programs and exercises tailored to the demands of plumbing tasks, ultimately contributing to better occupational health and reduced MSD risks.

The positive correlation between job demands and higher MSD prevalence corroborates studies in similar industries (Bao et al., 2018). Plumbers facing increased job demands may encounter greater physical strain, awkward postures, and repetitive movements, thereby increasing their vulnerability to MSDs. The finding underscores the importance of implementing job design modifications, such as workload management and task rotation, to distribute physical stress more evenly across the workforce. Additionally, providing plumbers with training in ergonomic techniques to mitigate the impact of demanding tasks could be instrumental in reducing the burden of MSDs.

The positive relationship between years of working experience and higher MSD prevalence concurs with findings from diverse occupational settings (Chen et al., 2018). The cumulative effect of prolonged exposure to physical stressors and repetitive motions could explain this correlation. However, interventions such as regular health check-ups, ergonomic training, and access to preventive resources may help mitigate the increased risk associated with longer working experience. Recognizing the potential health implications of long-term plumbing careers is vital for fostering a sustainable and healthy workforce.

The study's identification of barriers to effective MSD prevention, such as lack of awareness, inadequate training, limited access to ergonomic tools, and resistance to change, resonates with broader research on occupational health barriers (Smith et al., 2020). It underscores the need for comprehensive interventions that target both individual and organizational factors. Increasing awareness about MSD risks through educational campaigns and providing tailored training on proper lifting techniques and ergonomic practices could enhance plumbers' safety practices. Moreover, addressing resistance to adopting new practices requires engaging plumbers in the decision-making process and promoting a supportive organizational culture that values worker health and safety.

Comparing these findings with the broader literature on occupational health, it becomes evident that while there are universal factors influencing MSD prevalence, context-specific challenges also play a significant role. The study's focus on plumbers in Rivers State adds to the limited body of research in the region, highlighting the need to consider cultural, economic, and organizational factors unique to the local context. By integrating these findings into a holistic framework, policymakers, employers, and occupational health professionals can tailor interventions to the specific challenges faced by plumbers in the region.

In conclusion, the study's findings offer a comprehensive perspective on the factors contributing to MSD prevalence among plumbers in Rivers State. The correlations between MSD prevalence and physical fitness, job demands, and years of working experience underscore the importance of addressing both individual and organizational aspects of worker health. Moreover, the identification of barriers to MSD prevention emphasizes the need for multifaceted interventions that consider local nuances and promote a culture of safety and well-being within the plumbing industry in the region.

CONCLUSION

This study sheds light on significant correlations between the prevalence of Musculoskeletal Disorders (MSDs) among plumbers in Rivers State and their physical fitness, job demands, and years of working experience. These findings highlight the complex interplay of individual factors and work-related conditions in influencing the occurrence of MSDs within the plumbing industry. Moreover, the identification of barriers to effective MSD prevention underscores the importance of addressing awareness gaps, providing appropriate training, and fostering a supportive work environment to mitigate these challenges.

RECOMMENDATIONS

Given the positive correlation between physical fitness and lower MSD prevalence, it is recommended that plumbing companies collaborate with occupational health experts to develop integrated ergonomic training programs. These programs should focus on improving physical fitness through targeted exercises and educating plumbers about proper lifting techniques and posture maintenance during work. These initiatives can enhance their ability to cope with physical demands, reduce the risk of MSDs, and promote their overall well-being.

To address the identified barriers, plumbing companies should initiate awareness campaigns about the hazards of MSDs and the benefits of preventive measures. Simultaneously, fostering a culture of health and safety within the workplace, where the importance of worker well-being is prioritized, can lead to reduced resistance to change and greater acceptance of new ergonomic practices. Creating an environment that supports regular breaks, health-conscious choices, and the use of ergonomic tools can contribute to a healthier workforce and lower MSD prevalence.

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