

Work-Related Musculoskeletal Disorder (WMSDs) Studies of Aviation Maintenance Personnel

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Abstract: *Work-related musculoskeletal disorders (WMSDs) are a common health problem throughout the industrialized world and a major cause of disability. The aviation maintenance workers are equally affected to some extent, as their main tasks still involve manual activities since human skills and judgments are indispensable in this line of industry. Because so little research has been done in the past, a study on WMSD among aviation maintenance personnels is required. In Malaysia, it is reported by the “Department of Occupational Safety and Health (DOSH)” that MSDs are the highest reported occupational diseases compared to other occupational diseases and increasing yearly, resulting in sickness absenteeism as well as loss of productivity. The literature so far lacks insight about WMSDs in defence personnel, especially involved in maintenance and repair. Objective of this paper to identify the prevalence of MSDs based on the previous research as to provide basic information for intervention programs to prevent and manage musculoskeletal symptoms for the aviation maintenance personnel.*

Keywords: Aviation Maintenance Personnel, Work-Related Musculoskeletal Disorders (Wmsds), Prevalence

1. Introduction

Ergonomics involves the interaction between humans, technology, and organizations for the purpose of optimizing health, well-being, and performance (Dul et al., 2012). MSDs often involve strains and sprains mainly to the lower back, shoulder, and upper limbs. They can result in protracted pain, disability, medical treatment, and financial stress for those afflicted with them. Often, employers find themselves paying the bill, either directly or through employee’s compensation insurance, at the same time they must cope with the loss of the full capacity of their employees (DOSH, 2018). Work-related musculoskeletal disorders (WMSDs) are a common health problem throughout the industrialised world and a major cause of disability. Prevention of WMSDs is less costly than rehabilitation and preventive measures aim to detect the potentially harmful ergonomic work situations at an early stage, before WMSDs occur (Verbeek et al., 2009). In contrast to the importance, there are a limited number of studies on risk factors for MSD of Aircraft maintenance technician (Yazgan et al., 2021).

2. Literature Review

2.1 Previous Studies on Musculoskeletal disorder MSDs

MSDs are the most common problem among aircraft maintenance. According to the Ethiopian Airlines annual reports on ill-health morbidity statistics from 2009 to 2011, after upper respiratory tract infections, MSDs were the second most frequent reason for clinic visits by workers (Profile, 2012). Types of maintenance tasks carried out by the aircraft technicians such as engines removal, airframe parts, avionics equipment and so on. The aircraft servicing routines work carried out by aircraft technicians include jacking to carry out aircraft airframe checks, radome opening to perform on radar faulty checks, attach missile to the pylon of aircraft, jacking aircraft to perform tyre change, pulling trolley to slide out engine from aircraft, faulty component replacement activities (RMAF, 2018).

Aircraft mechanics and avionics equipment technicians experience high rates of workplace injuries, but injury risk exposures have not been systematically measured across the various jobs/tasks performed in this industry (Asadi et al., 2019). Aparajita and Astini (2018), concluded from their study that aircraft maintenance engineers mostly do work involving high-risk work positions. Moreover, maintenance and repair services are neglected in the literature, even though they are included in the occupational category that reports the highest number of WMSDs. Aircraft maintenance has been found to be the duty area resulting in the largest number of lost workdays (Deanna, 2006). Work-related musculoskeletal disorders are collective and descriptive symptoms caused or aggravated by work. These disorders are characterised by discomfort, impairment, disability or persistent pain in the joints, muscles, tendons and other soft tissues (Palmer et al. 2017). Maintenance work involves tasks that are performed in frequently and exceptional conditions by industrial machinery mechanics; machinery maintenance workers; and individuals who generally install, repair and assemble machinery (Feustel 2015). Maintenance workers' most common working posture contributes to the development of musculoskeletal symptoms (Abaraogu et al. 2016). Commonly, the working posture is considered awkward, particularly when performing work while sitting and bending. This type of working posture affects the back, upper limbs and lower limbs.

Several studies have pointed out that back, neck and shoulder pains are major problems amongst maintenance workers (Nogueira et al. 2012; Pollard et al. 2014; Sigh et al. 2015;). When their tasks involve changing their posture from standing to sitting or lying down, musculoskeletal pain in the lower back, neck and shoulders becomes more prevalent (Abaraogu et al. 2016). A study in this domain is complex and difficult because literature on the maintenance industry is limited.

High prevalence of MSDs (73.45%) among engineering maintenance was reported, and MSD, frequency and severity of pain had significant negative impact on Well-being. Highest WMSDs were reported in low back (44.85%), followed by knee (28.23%), elbow/forearm (15.83%), ankle/foot (22.95%), shoulder (18.46%), upper back (18.46%), neck (15.83%) and wrist/fingers (12.92%). (Dave, 2020). Stader, 2013 indicated that risks to the low back as well as hands and wrists are present in these tasks with risks largely dependent on task duration among general aviation maintenance. Low back WMSDs was high among all job titles (44.85%) of heavy engineering. High Prevalence of low back WMSDs is also reported by Torp et al., (1996) in car mechanics and Morken et al., (2007) in Norwegian Royal navy. However, other studies found that the highest prevalence of musculoskeletal disorders was in the neck (57%), knees (56%), and wrist (52%), respectively (Rad, 2023). Tegeren, 2020 also found reported that the higher prevalence in neck followed by shoulder. Like other studies on injuries

in aircraft maintenance technicians (Nogueira et al., 2012; Fajardo Rodriguez et al., 2016; Zungu and Nigatu, 2015; Chae and Kim, 2005), the current study observed that the low back was the most reported body region experiencing aches, pain, and discomfort.

3. Results

Table 1: Summary of MSD Risk Factors in Aviation Maintenance Studies

No	Researcher	Population	Findings
1.	Dave et al (2020)	Defence Personnel Involved in Heavy Engineering Maintenance	Revealed that large numbers of defence personnel involved in maintenance and repair suffer from WMSDs.
2.	Asadi et. al (2019)	airline maintenance, repair & overhaul	Nordic Musculoskeletal Questionnaire indicated that the low back was the most commonly reported region of the body experiencing aches, pain, and discomfort (41% of participants), while knees were the highest (68%) in cabin maintenance, likely due to constraints in the aircraft cabin.
3.	Tegern et. al., (2020)	Swedish air force personnel and army soldiers	higher prevalence of MSD (i.e. neck, shoulder, and thoracic regions)
4.	Stader (2013)	aviation maintenance personnel	the highest prevalence was detected in the lower back region. The results indicate the presence of a high risk of injury to the lower back as well as hands and wrists due to work tasks, and the risks largely depend on the task duration.
5.	Nogueira et al. (2012)	aircraft maintenance personnel	Results of the NMQ indicate the lower back as the most affected body region.
6.	Zungu and Nigatu (2015)	Aircraft Technicians (ACTs)	The prevalence of LBP among ACTs was 47.1% during the past six months.
7.	Yusof, et al (2023).	Aviation Maintenance Personnel	The highest prevalence was detected in the lower back region.
8.	Ghazali and Mohammad (2016)	maintenance technician of fighter jet	These findings showed that maintenance technicians of the fighter jet were at high-risk of suffering from WRLBP
9.	Chae & Kim (2005)	Aviation Maintenance technician	the prevalence of symptoms was (12.9%) in the lower back, (10.2%) in the shoulders, (9.4%) in the legs/feet, (9%) in the neck, (5.9%) in the hands/wrists/fingers, and (2.7%) in the arms/elbows
10.	Mahmood et al (2022).	Aviation Maintenance Workers.	There is significant positive effect on WMSDs, and an increase in tasks performed by aviation maintenance workers led to increasing in WMSDs.
11.	Thulasy et al (2021)	Aircraft technicians	Awkward postures, forceful movement, repetitive task, static loading, and vibration effects were discovered as ergonomic risk factors to aircraft servicing technicians

4. Conclusion

In summary, WMSD has an impact on the wellbeing of employees in the aviation maintenance sector. Research study of MSD among aircraft maintenance is really important because there haven't been much WMSD research on the topic of aircraft maintenance and to improve the productivity of the workers.

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