

ASSESSMENT OF PREVALENCE AND IMPACTS OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG NURSES AT INTERMEDIATE HOSPITALS IN NAMIBIA

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ABSTRACT

Introduction: Work-related musculoskeletal disorders (WRMSDs) have been ranked as the major cause of disability globally. Namibian intermediate hospital (IH) nurses are overworked and susceptible to musculoskeletal diseases. The study aimed to determine the 12-month prevalence, and impacts of WRMSDs among nurses at IHs Katutura, Onandjokwe, Oshakati, and Rundu in Namibia. **Methods:** A self-administered Standardised Nordic Musculoskeletal Questionnaire was used as a data collection instrument for a cross-sectional study involving 808 randomly selected nurses at IHs Katutura, Onandjokwe, Oshakati, and Rundu. SPSS version 26 was used for descriptive statistical analysis. **Results:** Results revealed a high 12-month prevalence of WRMSDs in any body part (76%), (73%), (69%), and (65%) at IHs Katutura, Oshakati, Rundu, and Onandjokwe, respectively. The lower back was the most prevalent body part affected by the 12-month WRMSDs (74%), (72%), (71%), and (69%) at IHs Katutura, Onandjokwe, Rundu, and Oshakati, respectively. The WRMSDs are impacting nurses' work and daily lives. There is unnecessary money spent on medical consultations (68%), (62%), (59%), (51%), at IHs Katutura, Rundu, Oshakati, and Onandjokwe, respectively. Nurses might contribute poorly to the hospital's output since they have to pursue medical attention instead of attending to patients (67%), (66%), (61%), (59%), at IHs Rundu, Oshakati, Onandjokwe, and Katutura, respectively. **Conclusion:** WRMSDs are prevalent and impacting nurses' lives at IHs. Collaborative efforts between healthcare institutions, policymakers, and professional bodies are essential to creating a supportive workplace culture that prioritizes nurses' physical and psychosocial well-being and mitigates the effects of WRMSDs. Further research needs to be conducted to determine risk factors contributing to WRMSDs among nurses at IHs in Namibia.

Keywords: Musculoskeletal, Nurses, Pain ,Prevalence

Introduction:

Work-related musculoskeletal disorders (WRMSDs) refer to the impairments, discomfort, disability, and persistent pain in joints, muscles, bones, ligaments, and tendons (Chiwariidzo et al., 2018; M. El-Sallamy et al., 2019). These disorders develop as a result of workers being exposed to work-related risk factors as a result of employees being exposed to work-related risk factors such as physical, /or ergonomic, and psychosocial factors, hence it is called WRMSDs(Yang et al., 2019). The WRMSDs are biomechanical, meaning that an employee's body is at risk for injury as they complete their job duties(Griffin, 2018; Kumar, 2001). The development of WRMSDs occurs when there is a disruption of mechanical order within the human biological system (human body)(Griffin, 2018; Kumar, 2001).

Nursing is ranked as the most affected profession as it has the highest record of WRMSDs as compared to other professions in the world(Krishnan et al., 2021; Muthelo et al., 2023; Olutende et al., 2022; Rathore et al., 2017). Global data reports indicate that nurses have a very high prevalence of WRMSDs because the high prevalence of WRMSDs was recorded in Europe, from 10% to 50% in France, 89% in Portugal, and 85% in Macedonia; and in Asia, 78.6% in China, and 88% in Iran, and 85 in Saudi Arabia; in the Americans, from 35.1% to 47 in the United State of America and from 32.8% to 59.1% in Brazil; in Africa, 80.8% in Uganda (Akweetelela et al., 2019; Luan et al., 2018).

The WRMSDs are known to affect human body parts and/ or regions thus contributing to pains and/ or disorders in the upper back, lower back, neck, shoulder, elbow, wrist/hand, one or both hips/thighs/buttocks, one or both knees and one or both ankles/feet(Ngunde et al., 2020; Yang et al., 2019; Yasobant & Rajkumar, 2014; Yizengaw et al., 2021). Literature has proven that WRMSDs are most prevalent in the lower back, neck, and shoulders(Agwan & Shaikh, 2021; Cheung et al., 2018; Clari et al., 2021). These specific body parts are prone to WRMSDs, as a result of physical risk factors nurses are exposed to, and due to nurses' various working environments, and job demands (psychological risk factors) such as stress (Abla Kofi- Bediako et al., 2021; Krishnan et al., 2021; Olutende et al., 2022).

The World Health Organization (WHO) states that since nursing is the most physically demanding profession, WRMSD problems worsen when everyday tasks for nurses become chaotic and stressful(Krishnan et al., 2021). The WRMSDs are major public health problems because they significantly affect the quality of life of nurses, resulting in various degrees of disabilities, stress, high treatment cost and/ or increased financial burden, loss of labor time, and less productivity and they are the reason nurses are resigning and transferring to another job in different industries(Clari et al., 2021). As a result, WRMSDs have an impact on nurses' health as well as the health system, the financial health of healthcare facilities, and the social and financial expenses associated with managing their aftereffects.(Luan et al., 2018).

Due to the shortage of referral state hospitals in Namibia, this has over the years overwhelmed district hospitals for referral patients to intermediate hospitals (IHs) (Stiftung, 2012). As a result, nurses at IHs in Namibia are understaffed and overloaded with work, resulting in them working while their body postures are prolonged sitting and standing, manual handling, and applying repetitive movements which may lead to WRMSDs (Soares et al., 2019; Widiyanto et al., 2022; Yang et al., 2020). Similar research has not been done to ascertain the frequency and effects of WRMSDs among Namibian IH nurses. There is a knowledge gap as a result. The purpose of this study was to ascertain the prevalence and impacts of WRMSDs among the nursing staff at the Namibian IHs Katutura, Onandjokwe, Oshakati, and Rundu.

Methods:

Study design and sample

This study was a quantitative cross-sectional study, conducted among 808 random sampled respondents who worked in the four intermediate hospitals (Katutura, Onandjokwe, Oshakati, and Rundu) in Namibia. This sample was extracted from 1702 nurses from all four intermediate hospitals, using the Yamane (1967) sample size calculation, as it is best proven to work in probability sampling (proportionate stratified random sampling) method, in calculating the sample size from the study population that is in different proportions/clusters (Adam, 2020). Descriptive studies describe a specific phenomenon as it occurs in its natural context, exploring possibilities of relationships between variables, and/ or attributes (Aggarwal & Ranganathan, 2019). Thus, the study employed a descriptive cross-sectional design, which is beneficial for gathering information on the determinants of health and prevalence of a particular issue within a given population at a given time (Wang & Cheng, 2020).

Inclusion and exclusion: All nurses who had worked in the four intermediate hospitals in Namibia for one year or more and were willing and available to participate, were included in the study. Nurses who had worked in these hospitals for a period of less than one year were excluded from the study.

Data Collection Tool

The self-administered close-ended Standardized Nordic Musculoskeletal Questionnaire (S-NMQ) was used to collect information on socio-demographic, and prevalence of WRMSDs. S-NMQ is a trustworthy tool for determining the prevalence and risk variables of WRMSDs, therefore, it was utilized (Gupta & Bhavana, 2020). The questionnaire was written in English because all participants are educated and entitled to officially communicate in English at work as the only official language in Namibia. Validity is a measure and assurance that the instrument used for data rectification has measured what it is intended to measure (Ranganathan et al., 2024). In this study, validity was ensured by using a literature review (content validity method), the use of an existing instrument (concurrent validity method), and expert reviews (face validity and content validity method). The stability, consistency, and repetition of the study's findings are measured by reliability (Ranganathan et al., 2024). This means that reliability is the measure to which a test consistently measures whatever it measures (Ranganathan et al., 2024). In this study, the stability method—a pilot study—was used to determine reliability. The questionnaires

were given to study participants to complete at their own pace, and the researcher then collected the completed forms.

Data analysis

The data were analysed by the Statistical Package for Social Science (SPSS) software version 26. Data was described using proportions, frequencies, and percentages, and were summarized in tables and figures.

Ethical considerations

Ethical clearance and research permission letter were obtained from the University of Namibia (UNAM) Decentralized Ethical Commute (DEC). Permission to conduct the study was obtained from the Executive Director (ED) of the Ministry of Health and Social Services (MoHSS), and the Medical superintendents of each IH in the four regions (Khomas, Oshikoto, Oshana, and Kavango). The principles of justice, respect for the person, as well as the principle of beneficence, were observed through ensuring anonymity, informed consent, and confidentiality. The informed consent (written) was obtained from all participants to participate in the study. The consent form was attached to the interview guide, and everyone who agreed to participate in the study indicated their willingness by signing the attached consent form on the interview guide as the data collection tool.

Results

Demographic information

Table 1: Socio-demographic information and occupational profile

Demographics		N (%)	N (%)	N (%)	N (%)
		IH Katutura	IH Onandjokwe	IH Oshakati	IH Rundu
Gender	Male	32 (14%)	34 (19%)	54 (23%)	45 (27%)
	Female	195 (86%)	147 (81%)	179 (77%)	122 (73%)
	Total	227 (100%)	181 (100%)	233 (100%)	167 (100%)
Age - groups	<30 years	32 (14%)	31 (17%)	33 (14%)	32 (19%)
	30–35 years	86 (38%)	71 (39%)	100 (43%)	57 (34%)
	36–40 years	75 (33%)	56 (31%)	84 (36%)	55 (33%)
	>40 years	34 (15%)	23 (13%)	16 (7%)	23 (14%)
	Total	227 (100%)	181 (100%)	233 (100%)	167 (100%)
Job experience	≥1 year	5 (2%)	7 (4%)	12 (5%)	0 (0%)
	2-3 years	36 (16%)	16 (9%)	28 (12%)	15 (9%)
	4-6 years	61 (27%)	65 (36%)	58 (25%)	63 (38%)
	≥6 years	125 (55%)	93 (51%)	135 (58%)	89 (53%)
	Total	227 (100%)	181 (100%)	233 (100%)	167 (100%)

Results revealed that there are more females in the nursing profession compared to males across all Intermediate Hospitals (IHs) in Namibia. The results revealed; IHs Katutura (14% male: 86% female), Onandjokwe, (19% male: 81% female), Oshakati, (23% male:77% female), and Rundu (27% male:73% female), respectively. Throughout all of Namibia's IHs, the bulk of study participants were between the ages of 30 and 35. The majority of the nurses at IH Oshakati (58%), IH Katutura (55%), IH Rundu (53%), and IH Onandjokwe (51%), have been in the nursing field for six years or more.

Prevalence of work-related musculoskeletal disorders (WRMSDs) among nurses

Prevalence of WRMSDs in any body parts

The prevalence of WRMSDs among study respondents, in any body part in the last 12 months at IHs Katutura, Onandjokwe, Oshakati, and Rundu is shown in Figure 1 below.

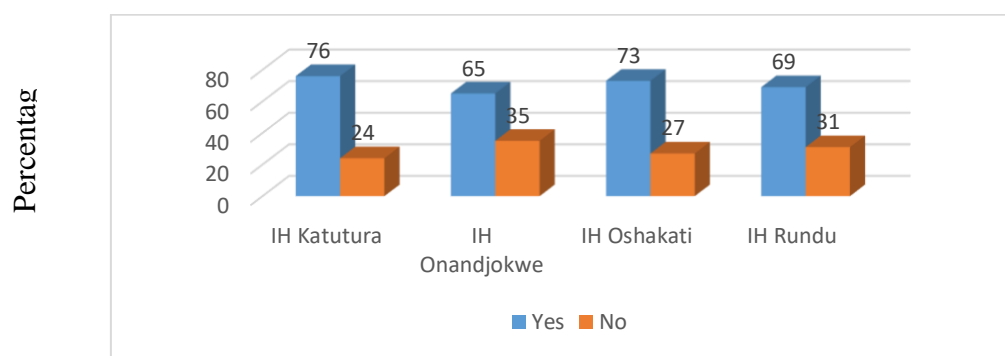


Figure 1: Prevalence of WRMSDs among study respondents in any body part

A high 12 months' prevalence of WRMSDs in any body part (76%), (73%), (69%), (65%) was reported at IHs Katutura, Oshakati Rundu, Onandjokwe, respectively. This high prevalence yielded a 71% average prevalence of WRMSDs in any body part among respondents from all four IHs. Few respondents from IHs Onandjokwe, Rundu, Oshakati, and Katutura, respectively (35%), (31%), (27%), and (24%), reported having no WRMSDs in any region of their bodies in the previous 12 months.

Prevalence of WRMSDs in the specific body parts

The prevalence of WRMSDs in the specific body parts among study respondents, in the last 12 months at IHs Katutura, Onandjokwe, Oshakati, and Rundu is shown in Figure 2 below.

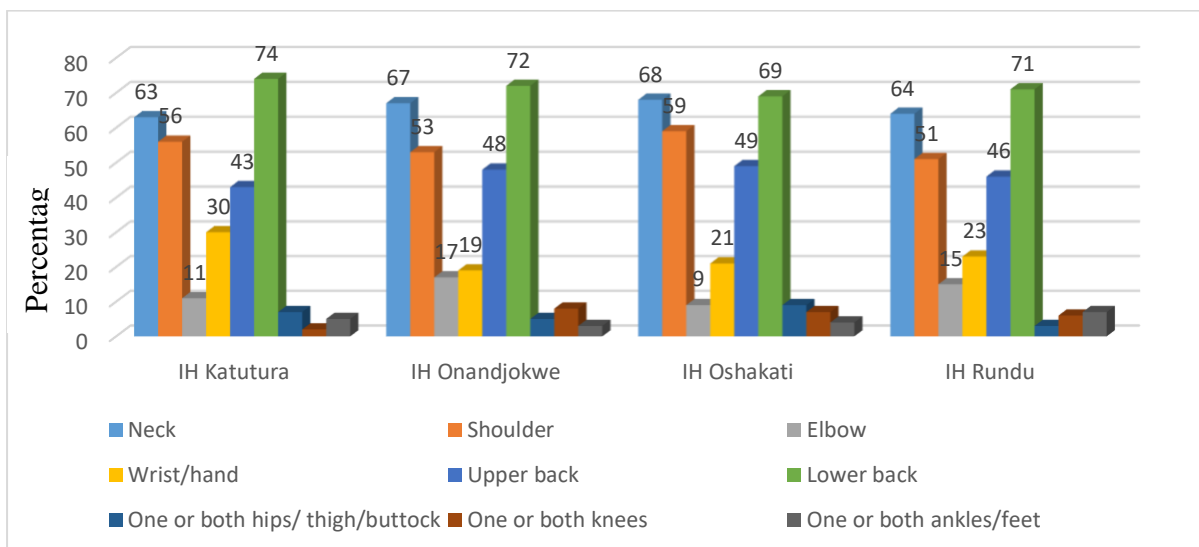


Figure 2: Prevalence of WRMSDs in the specific body parts and/ or regions among nurses

Lower back was the most prevalent body part affected by the 12 months WRMSDs (74%), (72%), (71%), (69%) at IHs Katutura, Onandjokwe, Rundu, and Oshakati, respectively. Notably, the second highest recorded 12-month prevalence rate of WRMSDs among study participants was neck pain (68%), (67%), (64%), (63%) at IHs Oshakati, Onandjokwe, Rundu, and Katutura, respectively. The third most body part of study respondents affected by the 12-month prevalence rate of WRMSDs was shoulder (59%), (56%), (53%), (51%), at IHs Oshakati, Katutura, Onandjokwe, and Rundu, respectively. In this study of nurses, the elbow, one or both hips, one or both knees, and one or both ankles/feet had the lowest 12-month prevalence rates of WRMSDs. Over a 12-month period, responders in all IHs had difficulties with aches, pains, or discomfort in any body area three times or more.

The impacts of WRMSDs among nurses at Intermediate Hospitals

The impacts of WRMSDs on nurses at IHs Katutura, Onandjokwe, Oshakati, and Rundu are shown in Figure 3 below.

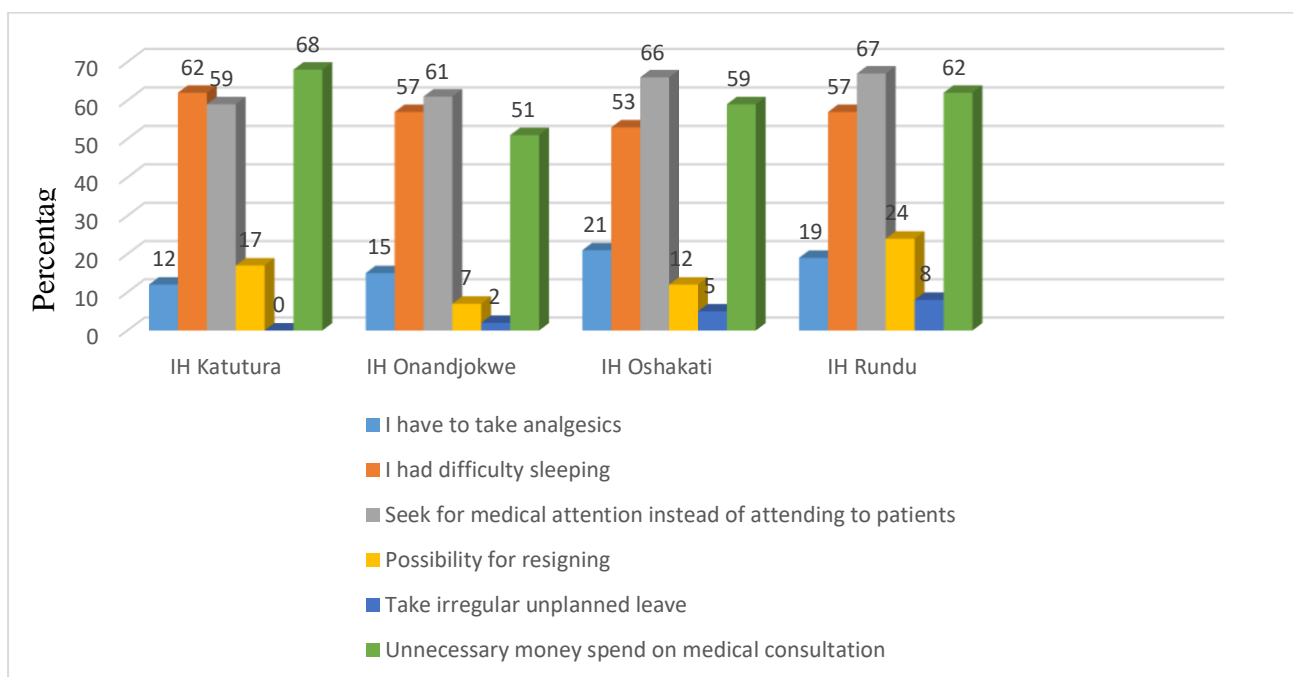


Figure 33: Impact of WRMSDs among study respondents

On average, most respondents who experienced WRMSDs in the past 12 months had experienced the impact of WRMSDs in terms of them seeking medical attention instead of attending to patients (67%), (66%), (61%), (59%), at IHs Rundu, Oshakati, Onandjokwe, and Katutura, respectively. The second leading impact of WRMSDs among study respondents was the issue of unnecessary money spent on medical consultations (68%), (62%), (59%), (51%), at IHs Katutura, Rundu, Oshakati, and Onandjokwe, respectively. The respondents at IHs Katutura, Onandjokwe, Rundu, and Oshakati, also indicated that they had difficulty sleeping (62%), (57%), (57%), (and 53%) as a result of WRMSDs' pain.

Discussion

The majority of respondents in this study were female, aged between 30 and 35 years across all IHs Katutura, Onandjokwe, Rundu, and Oshakati, in Namibia. It is reasonable that more women than men work as nurses at those IHs in Namibia because there are more women than men in Namibia (Shipanga et al., 2022). According to the updated 2021 Namibian Demographic Survey, the country's population is largely made up of youth (Shipanga et al., 2022). Across all IHs in Namibia, the majority of responders have been employed as nurses for six years or more. The results of this study are consistent with those of a comparable study conducted in hospitals in the Xinjiang Uygur Autonomous Region, which found that study participants had worked as nurses for at least six years (Yan et al., 2017).

In this study, a high prevalence of work-related musculoskeletal disorders (WRMSDs) occurring in any body part over 12 months (76%), (73%) (69%), (65%) were reported at IHs Katutura, Oshakati, Rundu, and Onandjokwe, respectively. Respondents had trouble aches, pain, or discomfort in any part of their body in the last 12 months 3 times or more (83%), (74%), (85%), (79%) at IHs Katutura, Onandjokwe, Oshakati, and Rundu IH, respectively. This study's findings coincide with scholars that indicated that

the prevalence of WRMSDs over 12-month periods in any body part among nurses has been estimated to range from 40% to 90% across the world(Lim et al., 2021; Sirisawasd et al., 2018). Likewise, other studies have shown similar results of prevalence of WRMSDs among nurses in some individual public hospitals to be; 76.6% in Fako Cameroon, 79% at the Lekma hospital in Ghana, and 84% high-acuity region at a South African tertiary hospital, respectively(Akweetelela et al., 2019; Chiwaridzo et al., 2018; Kgakge et al., 2021; Yang et al., 2019). A variety of ergonomic studies have published that, the workplace in many countries regardless of developed and developing countries has failed to change with the advancements in technology, and this may have attributed to the higher prevalence of WRMSDs among nurses in the world(Krishnan et al., 2021) In addition, the fact that these tasks are the most physically demanding and require a lot of manual patient handling as well as occasionally awkward posture during operations may further contribute to their high prevalence(Chiwaridzo et al., 2018; M. El-Sallamy et al., 2019; Yang et al., 2020). The prevalence of WRMSDs is very high, increasing, and underreported because WRMSDs continue to be empirically under-represented and less prioritised in all nations, primarily in low- and middle-income regions of world, Africa and the SADEC overall(Gebreyesus et al., 2020). This is due to the fact that these nations prioritise health challenges such as infectious diseases (ID) and non-communicable diseases (NCD) since they are seen as more urgent and potentially fatal(Gebreyesus et al., 2020). In addition, Health facilities in Africa have a shortage of qualified nurses to address the burden of disease. Despite this, nurses on the continent work very hard to meet the demands of their jobs, therefore this situation had raised the prevalence of WRMSDs among nurses in African(Anaemene, 2017; Kgakge et al., 2021).

Across all IHs, including Katutura, Onandjokwe, Oshakati, and Rundu, the most common types of WRMSDs that impacted study participants in the previous 12 months were lower back, neck, and shoulder pain. Low back, neck, and shoulder are human body parts and/ or regions that are recorded to be most prevalent in WRMSDs(Akweetelela et al., 2019; Olutende et al., 2022; Yang et al., 2019). A similar study conducted on the prevalence of WRMSDs among nurses: A meta-analysis found that the lower back (59.5%), neck (53.0%), and shoulder (46.8%) were the three anatomical regions where WRMSDs were most common among nurses (Sun et al., 2023). Likewise, the study conducted in Ghana among nurses at the Ho Teaching Hospital has revealed that the most prevalent WRMSDs by body region were low back pain (73.3), and upper back pain (55.3) (Abla Kofi- Bediako et al., 2021). The common problem with these nursing procedures is that they require prolonged muscle contraction in the lower back, neck, and shoulder due to the prolonged position, which can lead to fatigue and probable injury(Sun et al., 2023). Furthermore, the demands of an ageing population and an increase in the number of critically sick patients have led to an increase in the number of routine procedures performed, including dressing changes, venepunctures, daily care, and changes of clothes. Often, nurses must assume twisted, bending, and bowing postures during these procedures, which can cause pain in the neck, shoulders, and lower back(Sun et al., 2023).

This study revealed that the prevalence of WRMSD has caused various impacts on nurses at IHs; such as unnecessary money spent on medical consultations, nurses may contribute poorly to the output of the hospital, since they have to seek medical attention instead of attending to patients, as well as nurses had difficulty sleeping. This research findings are consistent with those of a related study, which showed

that the WRMSDs are serious public health issues because they have a substantial negative impact on nurses' quality of life, leading to a range of disabilities, stress, high treatment costs, and/or increased financial burden, lost work time, and decreased productivity (Bhatta et al., 2023; Chandralekha et al., 2022; Muthelo et al., 2023; Sun et al., 2023). About 37.8% of nurses in Haiphong, Vietnam, stated in comparable research that WRMSDs restricted their ability to do their jobs(Luan et al., 2018). About one-third of all sick leave cases for Ethiopian healthcare workers, including nurses, are due to WRMSDs in the spine, shoulder, and back(Yizengaw et al., 2021). This could reduce the productivity of the hospital as nurses might end up seeking medical attention instead of attending to patients, as alluded to in the result of this study. Likewise, a study conducted in Fako Cameroon has reported that WRMSDs slowed down nurses' activities at work and resulted in a decrease in the efficiency of nursing care rendered (50%)(Ngunde et al., 2020). This study's findings on the impacts of RMSDs experienced among nurses at IHS Katutura, Onandjokwe, Oshakati, and Rundu, are thus consistence with other studies.

Limitation of the Study

Accessing the entire sample size of participants during the daytime was a limitation due to day-night work shifts. The researcher addressed this limitation by distributing the data collection tool during both day and night shifts.

Conclusion

This study concluded that WRMSDs are most prevalent among nursing personnel at IHS Katutura, Onandjokwe, Oshakati, and Rundu. The most common types of WRMSDs among study respondents were lower back, neck, and shoulder pain. The WRMSDs are impacting nurses' work and daily life. There is unnecessary money spent on medical consultations, and nurses may contribute poorly to the output of the hospital since they have to seek medical attention instead of attending to patients. Recommendation: collaborative efforts between healthcare institutions, policymakers, and professional bodies are essential to create a supportive workplace culture that prioritizes nurses' physical and psychosocial well-being and mitigates the effects of WRMSDs. Further research needs to be conducted to determine risk factors associated with WRMSDs among nurses at IHS in Namibia.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- Abia Kofi- Bediako, W., Sama, G., Yarli, C., Ed-Bansah, D., & Appah Acquah, A. (2021). Work-Related Musculoskeletal Disorders among Nurses at the Ho Teaching Hospital, Ghana. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 65(1), 1291–1294. <https://doi.org/10.1177/1071181321651342>

- Adam, A. (2020). Sample Size Determination in Survey Research. *Journal of Scientific Research and Reports*, 26, 90–97. <https://doi.org/10.9734/JSRR/2020/v26i530263>
- Aggarwal, R., & Ranganathan, P. (2019). Study designs: Part 2 – Descriptive studies. *Perspectives in Clinical Research*, 10(1), 34–36. https://doi.org/10.4103/picr.PICR_154_18
- Agwan, M., & Shaikh, S. (2021). *Musculoskeletal Disorders Among Healthcare Workers: Prevalence and Risk Factors in the Arab World* (pp. 1–40). © Springer Nature Switzerland AG 2021. https://doi.org/10.1007/978-3-319-74365-3_129-1
- Akodu, A. K., & Ashalejo, Z. O. (2019). Work-related musculoskeletal disorders and work ability among hospital nurses. *Journal of Taibah University Medical Sciences*, 14(3), 252–261. <https://doi.org/10.1016/j.jtumed.2019.02.009>
- Akweetelela, A., Iita, H., & Van Der Westhuizen, L. (2019). *Investigation of the prevalence, risk factors and impact of musculoskeletal disorders among nurses at Katutura Intermediate Hospital, Khomas region, Namibia* [University of Namibia]. <http://hdl.handle.net/11070/2520>
- Anaemene, B. (2017). Health and Diseases in Africa. *The Development of Africa*, 71(1), 207–226. https://doi.org/10.1007/978-3-319-66242-8_12
- Bhatta, D. K., Bhandari, G. P., Duwadi, N., Bhatta, B. K., Gurung, I., & Dahal, A. (2023). *Work-Related Musculoskeletal Disorders among Nurses Working at Hospitals of Sudurpaschim Province, Nepal* (p. 2023.09.24.23296044). medRxiv. <https://doi.org/10.1101/2023.09.24.23296044>
- Chandralekha, K., Joseph, M., & Joseph, B. (2022). Work-related Musculoskeletal Disorders and Quality of Life Among Staff Nurses in a Tertiary Care Hospital of Bangalore. *Indian Journal of Occupational and Environmental Medicine*, 26(3), 178–182. https://doi.org/10.4103/ijoem.ijoem_25_22
- Cheung, K., Szeto, G., Lai, G. K. B., & Ching, S. S. Y. (2018). Prevalence of and Factors Associated with Work-Related Musculoskeletal Symptoms in Nursing Assistants Working in Nursing Homes. *International Journal of Environmental Research and Public Health*, 15(2), 1–14. <https://doi.org/10.3390/ijerph15020265>
- Chiwaridzo, M., Makotore, V., Dambi, J. M., Munambah, N., & Mhlanga, M. (2018). Work-related musculoskeletal disorders among registered general nurses: A case of a large central hospital in Harare, Zimbabwe. *BMC Research Notes*, 11(1), 1–7. <https://doi.org/10.1186/s13104-018-3412-8>
- Clari, M., Godono, A., Garzaro, G., Voglino, G., Gualano, M. R., Migliaretti, G., Gullino, A., Ciocan, C., & Dimonte, V. (2021). Prevalence of musculoskeletal disorders among perioperative nurses: A systematic review and META-analysis. *BMC Musculoskeletal Disorders*, 22(1), 1–12. <https://doi.org/10.1186/s12891-021-04057-3>
- Gebreyesus, T., Nigussie, K., Gashaw, M., & Janakiraman, B. (2020). The prevalence and risk factors of work-related musculoskeletal disorders among adults in Ethiopia: A study protocol for extending a systematic review with meta-analysis of observational studies. *Systematic Reviews*, 9(1), 1–6. <https://doi.org/10.1186/s13643-020-01403-9>
- Griffin, H. (2018). *Work-related Musculoskeletal Disorders in Radiation Therapists: An Exploration of Self-Reported Symptoms*. The Ohio State University.
- Gupta, G. & Bhavana. (2020). *Reliability and Validity of Hindi Version of Nordic Musculoskeletal Questionnaire*.
- Kgakge, K., Hlongwa, M., & Ginindza, T. (2021). The distribution of work-related musculoskeletal disorders among nurses in sub-Saharan Africa: A scoping review protocol. *Systematic Reviews*, 10(1), 1–6. <https://doi.org/10.1186/s13643-021-01774-7>
- Krishnan, K. S., Raju, G., & Shawkataly, O. (2021). Prevalence of Work-Related Musculoskeletal Disorders: Psychological and Physical Risk Factors. *International Journal of Environmental Research and Public Health*, 18(17), 1–11. <https://doi.org/10.3390/ijerph18179361>
- Kroczeck, M. (2024). Analyzing nurses' decisions to leave their profession—A duration analysis. *The European Journal of Health Economics*, 25(3), 471–496. <https://doi.org/10.1007/s10198-023-01600-y>
- Kumar, S. (2001). Theories of musculoskeletal injury causation. *Ergonomics*, 44(1), 17–47. <https://doi.org/10.1080/00140130120716>
- Leigh, H., Flores, C., Grace, D., Atanoza, A., Tomondog, A., Ross, J., Perolino, A., & Timonera, P. (2024). *LIVED EXPERIENCES OF MALE NURSING STUDENTS IN A FEMALE-DOMINATED FIELD: A PHENOMENOLOGICAL STUDY*. <https://doi.org/10.13140/RG.2.2.27314.58565>

- Lim, S., Henriksson, A., & Zdravkovic, J. (2021). Data-Driven Requirements Elicitation: A Systematic Literature Review. *SN Computer Science*, 2(1), 1–35. <https://doi.org/10.1007/s42979-020-00416-4>
- Luan, H. D., Hai, N. T., Xanh, P. T., Giang, H. T., Van Thuc, P., Hong, N. M., & Khue, P. M. (2018). Musculoskeletal Disorders: Prevalence and Associated Factors among District Hospital Nurses in Haiphong, Vietnam. *BioMed Research International*, 2018(1), 1–9. <https://doi.org/10.1155/2018/3162564>
- Lyu, X.-C., Huang, S.-S., Ye, X.-M., Zhang, L.-Y., Zhang, P., & Wang, Y.-J. (2024). What influences newly graduated registered nurses' intention to leave the nursing profession? An integrative review. *BMC Nursing*, 23, 57. <https://doi.org/10.1186/s12912-023-01685-z>
- M. El-Sallamy, R., Zayed, H., Saied, S., & Shehata, W. (2019). Work-Related Musculoskeletal Disorders among nursing staff of Tanta University Hospitals: Pattern, risk factors, and coping strategies. *Community Medicine*, 37(1), 51–61.
- Munabi, I. G., Buwembo, W., Kitara, D. L., Ochieng, J., & Mwaka, E. S. (2014). Musculoskeletal disorder risk factors among nursing professionals in low resource settings: A cross-sectional study in Uganda. *BMC Nursing*, 13(1), 7. <https://doi.org/10.1186/1472-6955-13-7>
- Muthelo, L., Sinyegwe, N. F., Phukubye, T. A., Mbombi, M. O., Ntho, T. A., & Mothiba, T. M. (2023). Prevalence of Work-Related Musculoskeletal Disorders and Its Effects amongst Nurses in the Selected Intellectual Disability Unit of the Limpopo Province. *Healthcare*, 11(5), Article 5. <https://doi.org/10.3390/healthcare11050777>
- Ngunde, P. J., Elb, K., Théophile, N. C., Mokake, N. D. M., Eta, A. V., Bassa, N. E., Malika, E., Udoamaka, G. N., Kemayim, F., & Pius, F. (2020). Prevalence, risk factors and effects of work related musculoskeletal disorders on nurses in Fako division, Cameroon. *Revue de Médecine et de Pharmacie*, 10(2), Article 2.
- Olutende, M. O., Wangui, A. M., Kaniaru, D., & Mse, E. (2022). Prevalence of Work-Related Musculoskeletal Disorders among Nurses in Kakamega County, Kenya. *Open Access Library Journal*, 9(6), Article 6. <https://doi.org/10.4236/oalib.1108561>
- Ranganathan, P., Caduff, C., & Frampton, C. M. A. (2024). Designing and validating a research questionnaire—Part 2. *Perspectives in Clinical Research*, 15(1), 42–45. https://doi.org/10.4103/picr.picr_318_23
- Rathore, F. A., Attique, R., & Asmaa, Y. (2017). Prevalence and Perceptions of Musculoskeletal Disorders Among Hospital Nurses in Pakistan: A Cross-sectional Survey. *Cureus*, 9(1), 1–10. <https://doi.org/10.7759/cureus.1001>
- Shipanga, I., Oyedele, O., & Matengu, T. (2022). Socio-Demographic Variations on Age-Sex Mortality in Namibia: An Analysis of the 2016 Civil Registration and Vital Statistics Data. *Namibian Journal for Research, Science and Technology*, 4, 65–72. <https://doi.org/10.54421/njrst.v4i1.88>
- Sirisawasd, S., Taptagaporn, S., Boonshuyar, C., & Earde, P. (2018). Interventions commonly used to prevent work-related musculoskeletal disorders among healthcare workers. *Journal of Health Research*, 32(5), 371–383. <https://doi.org/10.1108/JHR-08-2018-044>
- Soares, C. O., Pereira, B. F., Pereira Gomes, M. V., Marcondes, L. P., de Campos Gomes, F., & de Melo-Neto, J. S. (2019). Preventive factors against work-related musculoskeletal disorders: Narrative review. *Revista Brasileira de Medicina Do Trabalho: Publicacao Oficial Da Associacao Nacional de Medicina Do Trabalho-ANAMT*, 17(3), 415–430. <https://doi.org/10.5327/Z1679443520190360>
- Stiftung, F. E. (2012). *The Health System in Namibia* (Vol. 045).
- Sun, W., Yin, L., Zhang, T., Zhang, H., Zhang, R., & Cai, W. (2023). Prevalence of Work-Related Musculoskeletal Disorders among Nurses: A Meta-Analysis. *Iranian Journal of Public Health*, 52(3), 463–475. <https://doi.org/10.18502/ijph.v52i3.12130>
- Tanui, B. C. (2016). *Assessment of Work-Related Musculoskeletal Disorders among Nurses in Mombasa County, Kenya* [JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY]. <https://www.semanticscholar.org/paper/Assessment-of-Work-Related-Musculoskeletal-among-in-Tanui/0fe2e899dc5f8940819cc1afa8a1c40b69543399>
- Walker, L., Clendon, J., & Willis, J. (2018). WHY OLDER NURSES LEAVE THE PROFESSION. *Kai Tiaki Nursing Research*, 9(1), 5–12.
- Wang, X., & Cheng, Z. (2020). Cross-Sectional Studies: Strengths, Weaknesses, and Recommendations. *Chest*, 158(1S), S65–S71. <https://doi.org/10.1016/j.chest.2020.03.012>

- Widiyanto, A., Ellina, A., Peristiowati, Y., Atmojo, J., & Livana, P. (2022). Risk factor of work-related musculoskeletal disorders among health workers: A systematic review. *International Journal of Health Sciences*, 3(1), 4687–4701. <https://doi.org/10.53730/ijhs.v6nS5.9573>
- Yan, P., Li, F., Zhang, L., Yang, Y., Huang, A., Wang, Y., & Yao, H. (2017). Prevalence of Work-Related Musculoskeletal Disorders in the Nurses Working in Hospitals of Xinjiang Uygur Autonomous Region. *Pain Research & Management*, 2017, 5757108. <https://doi.org/10.1155/2017/5757108>
- Yang, S., Li, L., Wang, L., Zeng, J., & Li, Y. (2020). Risk Factors for Work-Related Musculoskeletal Disorders Among Intensive Care Unit Nurses in China: A Structural Equation Model Approach. *Asian Nursing Research*, 14(4), 241–248. <https://doi.org/10.1016/j.anr.2020.08.004>
- Yang, S., Lu, J., Zeng, J., Wang, L., & Li, Y. (2019). Prevalence and Risk Factors of Work-Related Musculoskeletal Disorders Among Intensive Care Unit Nurses in China. *Workplace Health & Safety*, 67(6), 275–287. <https://doi.org/10.1177/2165079918809107>
- Yasobant, S., & Rajkumar, P. (2014). Work-related musculoskeletal disorders among health care professionals: A cross-sectional assessment of risk factors in a tertiary hospital, India. *Indian Journal of Occupational and Environmental Medicine*, 18(2), 75–81. <https://doi.org/10.4103/0019-5278.146896>
- Yizengaw, M. A., Mustofa, S. Y., Ashagrie, H. E., & Zeleke, T. G. (2021). Prevalence and factors associated with work-related musculoskeletal disorder among health care providers working in the operation room. *Annals of Medicine and Surgery (2012)*, 72(1), 1–7. <https://doi.org/10.1016/j.amsu.2021.102989>