ORIGINAL ARTICLE

The prevalence, risk factors and coping strategies of low back pain among nurses in public hospitals in Kota Kinabalu, Sabah: A cross-sectional study

Alagi Selvy Perumal, MPH[1], Khamisah Awang Lukman, MBBS, M.Comm Med (OH)[2]

[1]Department of Public Health Medicine, Faculty of Medicine and Health Sciences Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia, [2]Centre for Occupational Safety & Health, Universiti Sabah Malaysia, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

ABSTRACT

Introduction: Healthcare workers are recognised to have a high prevalence of musculoskeletal disorders and nursing profession are well known with high prevalence of low back pain (LBP). There is a widespread consensus that low back discomfort is a major contributor to both inabilities to work and illness. Absenteeism is frequently employed as a proxy for the presence of a handicap. **Aim:** The purpose of this study was to determine the prevalence of LBP among nurses in six different wards in three general hospitals in Kota Kinabalu, Sabah as well as the associated workplace risk factors and coping strategies implemented by nurses in ward.

Materials and Methods: A cross-sectional study involved 420 nurses from three public hospitals in Kota Kinabalu, Sabah, was carried out. The respondents were carefully selected by proportionate stratified random sampling method. Nurses sociodemographic and occupational details, occupational health in nursing practice, seventeen work risk variables and nine coping techniques were collected via a self-administered questionnaire.

Results: Among the 420 participants, 57 did not report any discomfort. In the previous 12 months, 44.5% (95.0% CI: 39.74,49.25) of nurses experienced low back discomfort lasting longer than three days. The results of a simple logistic regression analysis revealed that gender and years of working experience were significantly associated with LBP. The department of intensive care unit nurses had the highest OR value of 2.4 (p = 0.03). There were no statistically significant association with age, marital status and body mass index (p > 0.05). Adjusting plinth or bed height (68.4%) was the top coping mechanism cited by respondents in the clinical context to reduce the risk of LBP, and working with perplexed or agitated patients posed the greatest occupational risk.

Conclusion: LBP is still a major work-related issue among nurses, with a high prevalence rate. To mitigate these impacts, multidisciplinary efforts are required. The outcomes of this study may help policy makers to allocate resources to reduce LBP among nurses.

INTRODUCTION

People from all over the world suffer from low back pain (LBP), a condition that is not only common but also debilitating, burdensome and incapacitating. Strains and sprains of the lumbar region, as well as injuries to the tendons, ligaments, or muscles in the lower back, are the most common causes of acute and chronic LBP, respectively. Back injuries can be caused by trauma, improper use or overuse, as well as the act of lifting a heavy object, twisting, bending, or extending the muscles, all of which result in strain and stretching. Back injuries may additionally be triggered by back overuse.[1] The location of LBP, also known as lumbago or lumbosacral pain, lies below the 12th rib and above the gluteal folds. Lumbago and lumbosacral pain are more correct terms for LBP. This discomfort is typically localised to the lower part of the back, and it can frequently be traced to a wide variety of underlying causes and disorders.[2]

According to the Global Burden of Disease Study 2015 (GBD), LBP is one of the top 10 conditions that causes disease and disability. It has an estimated number of disabilities adjusted life years higher than that of Hepatitis C, motor vehicle accidents, tuberculosis, lung cancer, chronic obstructive pulmonary disease and preterm birth complications.[3] There is a widespread consensus that low back discomfort is a major contributor to both inabilities to work and illness. It is projected that 116 million production days were lost in the United Kingdom as a result of work incapability caused by LBP in the year 1994–1995.[4] It is the primary factor in activity restriction and missed work across the globe, and imposes an enormous economic burden on people households, neighbourhoods, businesses and governments. Despite significant primary preventive efforts made in several nations throughout the years, a high prevalence of back pain among healthcare professionals has persisted.[5]

It has been found that the prevalence of LBP among nurses varies from country to country, with England having the

highest rate (85.7%), followed by Hong Kong (80.9%) and Italy (62%). According to the findings of the research carried out in Africa, 70 % of nurses suffered with LBP. In 2015, research carried out in Qatar indicated that the prevalence of LBP among nurses was 54.3%. As is the case in a great number of other nations, LBP is a significant cause for worry among healthcare workers in the Kingdom of Saudi Arabia, particularly among registered nurses. In past cross-sectional studies, the prevalence of LBP in Saudi Arabia was shown to range from 48.41% in the Taif region, to 61% in the Sudayr region, and to 75 % in the capital of Riyadh.[3]

According to the World Health Organisation (WHO), musculoskeletal illnesses are the major cause of years lived with disability (YLDs) worldwide, accounting for approximately 149 million YLDs, which is equivalent to 17% of all YLDs. In addition, workplace musculoskeletal health policies, such as regulations for hard physical work and lifting, are frequently lacking or poorly monitored. This can lead to a variety of musculoskeletal injuries.[6] Although self-reported work-related musculoskeletal disorders (WRMSDs) appear to be on the decline, the Labour Force Survey (LFS) estimates that there were roughly 480,000 WRMSD cases with a prevalence rate of 1420 per 100,000 employees in 2019/2020.[7] Variables that may affect the prognosis of musculoskeletal pain have lately received increased attention, with a focus on the role of coping mechanisms and the opportunity for change to improve outcomes.[8] There is a significant relationship between the prevalence of back pain and some coping strategies used by respondents, such as asking for help when performing patient handling activities, using height and or angle adjustable work surfaces, resting and sitting after a long period of work, pausing regularly to stretch or use different body parts to administer procedures, avoiding monotonous or awkward body positions and taking sick leave when necessary.[9]

The Social Security Organisation Malaysia (SOCSO), has documented a rising trend in the amount of money paid out to employees for occupational diseases (including permanent and temporary benefits), going from RM2.65 million in 2009 to RM14.05 million in 2014. The compensation for MSDs makes up a sizeable share of the total compensation for occupational disorders, and from 2009 to 2014, it also increased generally.[10] Government healthcare facilities in Malaysia are among the busiest workplaces in comparison to those in other countries that need their personnel to be physically active and exposed to different occupational risks that enhance the risk of accidents and musculoskeletal ailments.[1] Unfortunately, not many published statistics on MSDs among those healthcare workers exist. Only information pertaining to private companies that pay contributions to the compensation systems that SOCSO oversees is made available online by the SOCSO. The aim of this study is to investigate the prevalence, risk factors and explore on coping strategies of LBP among nurses working at public hospitals in Kota Kinabalu Sabah.

MATERIALS AND METHODS
Study Design and Population
This cross-sectional study took place from October 2022 to June 2023 in Kota Kinabalu, Sabah, and included nurses from three public hospitals: Queen Elizabeth Hospital, Queen Elizabeth II Hospital, and Sabah Women and Children Hospital (HWKKS). Out of 712 eligible nurses, 420 were selected through proportionate stratified random sampling, which considered various inclusion and exclusion criteria. The study encompassed nurses working across six different departments within these hospitals. Participants ranged in age from 20 to 60 years old and had at least 1 year of experience in a public hospital. Exclusions were made for nurses who were on maternity leave, pregnant, on unrecorded leave, or had previous trauma or congenital spine issues. The prevalence of LBP, which was found to be 79.4% in a prior study conducted in Port Dickson, Malaysia, was employed to establish the sample size using a single proportion and dichotomous outcome.[12] Formula $n = z^2 (1-a/2) p(1-p)/d2$ was used with a 95% confidence level. This results in the requirement for 252 participants, and the final sample size (n = 420) after accounting for a 40% non-response rate adjustment.

Variables
The variables studies consist of independent variables, mainly on the sociodemographic aspects and important variables such working experience in years, marital status, working department, body mass index, total number of children and work-related pain experience. As for the dependent variable is the dichotomous outcome of LBP (yes/no). As the survey instrument, a self-administered questionnaire that had been validated in the past was used to collect data on sociodemographic characteristics, the prevalence and pattern of work-related musculoskeletal disorders (WMSDs), associated employment risk factors, and coping techniques. A previously validated questionnaire on WMSDs among physical therapists served as the basis for this study's questionnaire, which was developed from that questionnaire. There were four sections, section A described information on respondents' demographic, section B on component of the occupational health in nursing practice. It was a modified form of the Standardized Nordic Questionnaire, and consisted of inquiries regarding nine different body sites.[13]

Statistical Analysis
All data obtained was entered into Microsoft Excel, then filtered and reviewed for any missing or incomplete data before being entered into IBM Statistical Package for Social Sciences (SPSS) version 28.0. The findings of this research have been summed up in tables, graphs, frequency and percentage distributions as part of the descriptive presentation of the findings. As for Inferential analysis the association of self-reported LBP symptoms with sociodemographic and occupational characteristics were determined with simple logistic regression, odds ratios (OR) and upper and lower 95.0% confidence intervals (CI) were calculated to determine the risk of LBP.

RESULTS
Demographic and Characteristics of Participants
The sociodemographic and occupational characteristics of the participants were presented in Table I, majority of the

Table I: Sociodemographic and occupational characteristics (n = 420)

Variables	Frequency (n)	Percentages (%)	Mean ± (SD)
Age (in years)			35.7 ± (6.4)
Less than 30	47	11.2	
31-40	281	66.9	
More than 41	92	21.9	
Gender			
Female	386	91.9	
Male	34	8.1	
Marital status			
Single	84	20.0	
Married	336	80.0	
BMI (kg/m2)			26.9 ± (9.8)
Underweight	4	1.0	
Normal	102	24.3	
Overweight	85	20.2	
Obesity	229	54.5	
No. of children			
0	141	33.6	
1-2	169	40.2	
3-4	95	22.6	
More than 4	15	3.6	
Highest education			
Diploma	395	94.0	
Degree	25	6.0	
Working department			
Intensive care unit (ICU)	113	26.9	
Medical	105	25.0	
Obstetrics & gynaecology	32	7.6	
Orthopaedics	40	9.5	
Paediatrics	44	10.5	
Surgical	86	20.5	
Working experience (years)			
1-5	43	10.2	
6-10	210	50.2	
11-20	122	29.0	
More than 20	45	10.7	
Nursing rank/cadre			
Community nurse	30	7.1	
Staff nurse	333	79.3	
Chief nurse	57	13.6	

respondents were between the age of 31 and 40 years old, with a mean age of 35.7 ± (6.4) and mainly female (91.9%). The nurses body mass index (BMI) ranged from 15.8 kg/m² to 43.56 kg/m², with a mean BMI of 26.9 kg/m² ± (9.8). In terms of the participants current line of work, the intensive care unit (ICU) department where the vast majority of the participants in this study were employed (26.9%), followed by medical department (25 %). About half of the respondents had worked in the nursing profession for between six and ten years and those worked less than five years and more than twenty years were 10.2% and 10.7% respectively. Out of 420 respondents, 48.6% had training on ergonomics. In terms of the educational background, 94 % of nurses have at least a diploma, and 25 nurses have pursued degrees in nursing. Most of the registered nurses, or approximately 79.3%, work as staff nurses. Another 7.1% were community nurses, while the remaining 13.6% were chief nurses.

Figure 1 shows the percentage of respondents who reported on coping strategies they used to reduce their risk of developing LBP. Adjusting the height of the plinth or bed, requesting assistance in managing heavy patients, and modifying the position of the patient or nurse were the top three coping techniques stated by the respondents in the clinical context to decrease the risk of low back discomfort. Figure 2 displays the 12-month prevalence rates of WMSDs in the various body regions of 363 respondents who complain of pain at any site of their body part, respondents were allowed to specify only one body area that has the most frequent or severe pain.

The association between LBP with sociodemographic and occupational factors was studied to identify risk factors causing the condition. The results from simple logistic regression conveyed in Table II. No statistically significant associations (p > 0.05) were found between age, marital status and BMI. Gender was statistically significant; woman have 2.38 times higher in odd compared to male. The vast majority of the study's nurses were obese and overweight accounted for about 75 % of all participants. Even though the proportion was high, noted that there is no significant association between BMI and LBP. Group with more than three children was significantly associated with LBP, p < 0.01, suggests that people with more than three children were 2.48

Table II: Simple logistic regression of sociodemographic factors and low back pain

Risk factors	Low back pain n (%)		p	Odds ratio (95% CI)
	Yes	No		
Socio-demographic				
Age				
Less than 30	23 (9.8)	24 (12.8)		ref
31-40	152 (65.2)	129 (69.0)	0.51	0.81(0.44,1.51)
More than 41	58 (24.9)	34 (18.2)	0.11	0.56(0.28,1.14)
Gender				
Male	25 (10.7)	9 (4.8)		ref
Female	208 (89.3)	178 (95.2)	0.03	2.38 (1.08,5.23)
Marital status				
Married	183 (78.5)	153 (81.8)		ref
Single	50 (21.5)	34 (18.2)	0.40	0.81 (0.50,1.32)
BMI (kg/m2)				
Normal	54 (23.1x)	47 (25.1)		ref
High	177 (75.9)	140 (74.9)	0.67	0.91 (0.58,1.42)
No. of children				
0	89 (38.2)	52 (27.8)		ref
1-2	99 (42.5)	70 (37.4)	0.42	1.21 (0.75,1.92)
More than 3	45 (19.3)	65 (34.8)	<0.01	2.48 (1.48,4.12)

p < 0.05 consider statistically significant
ref; reference category of the risk factor

Table III: Simple logistic regression of occupational characteristics and low back pain

Risk factors	Low back pain n (%)		p	Odds ratio (95% CI)
	Yes	No		
Occupational characteristics				
Working department				
Paediatrics	56 (65.1)	30 (34.9)		ref
Intensive Care Unit (ICU)	49 (43.4)	64 (56.6)	0.03	2.44(1.37,4.35)
Medical	50 (47.6)	55 (52.4)	0.02	2.05(1.14,3.69)
Obstetrics & Gynaecology	23 (71.9)	9 (28.1)	0.49	0.73(0.30,1.78)
Orthopaedics	23 (57.5)	17 (42.5)	0.41	1.38(0.64,2.97)
Surgical	32 (72.7)	12 (27.3)	0.38	0.70(0.315,1.56)
Working experience (years)				
>20	32(71.1)	13(28.9)		ref
1-5	22(51.2)	21(48.4)	0.05	2.35(0.97.5.66)
6-10	112(53.3)	98 46.7)	0.05	2.15(1.07,4.33)
11-20	67 (54.9)	55(45.1)	0.06	2.02(0.97,4.22)

p-value <0.05 consider statistically significant
ref; reference category of the risk factor

times more likely to experience LBP than people without children.

The association between the occupational characteristics and LBP were investigated and presented in Table III. The reported p=0.03 suggests statistical significance, indicating that the link between working in ICU and LBP is unlikely to have happened by chance. The odds ratio of 2.44 (95% CI: 1.37,4.35) indicated that nurses in the ICU are more likely than those in the paediatric department to experience LBP. Similarly, there is a stronger association between LBP and nurses working in the medical department. Nurses in the medical department are 2.05 times more likely to experience LBP than nurses in the paediatric department. This study also found that, working experience in years was significant associated with LBP among nurses. Based on the results, nurses who have experience working below 10 years were found to be associated with LBP. This working experience can be further categorized into two groups, those working in between 1-5 years, 2.35 (95% CI: 0.97,5.66, p = 0.05) and working in between 6-10 years, 2.15 (95% CI: 1.07,4.33, p = 0.05).

DISCUSSION
According to the research conducted at three public hospitals in Kota Kinabalu, 86.4% of workers experienced musculoskeletal disorders related to their jobs within a 12-month period, with 51.5% of the instances involving LBP. The 95% confidence interval (CI) indicated that the true prevalence of LBP in the population falls between 45.96% and 56.64%. Consistent with previous research from Malaysia and elsewhere, this study found that LBP was the most common MSD-related symptom overall. The prevalence
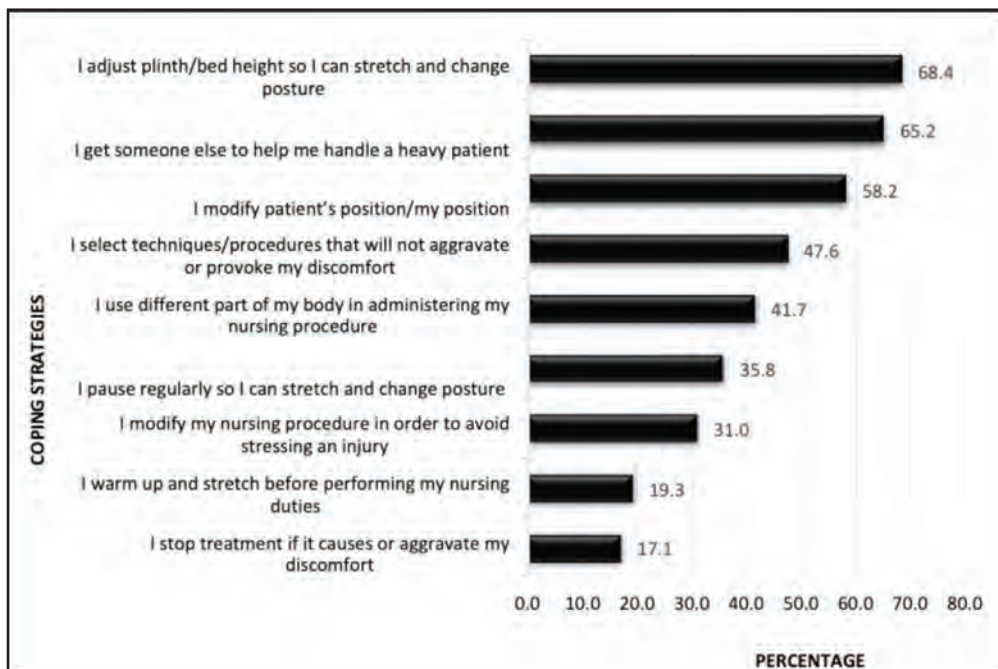
Fig. 1: Low back pain coping strategies adopted by respondents (almost always in the scale).
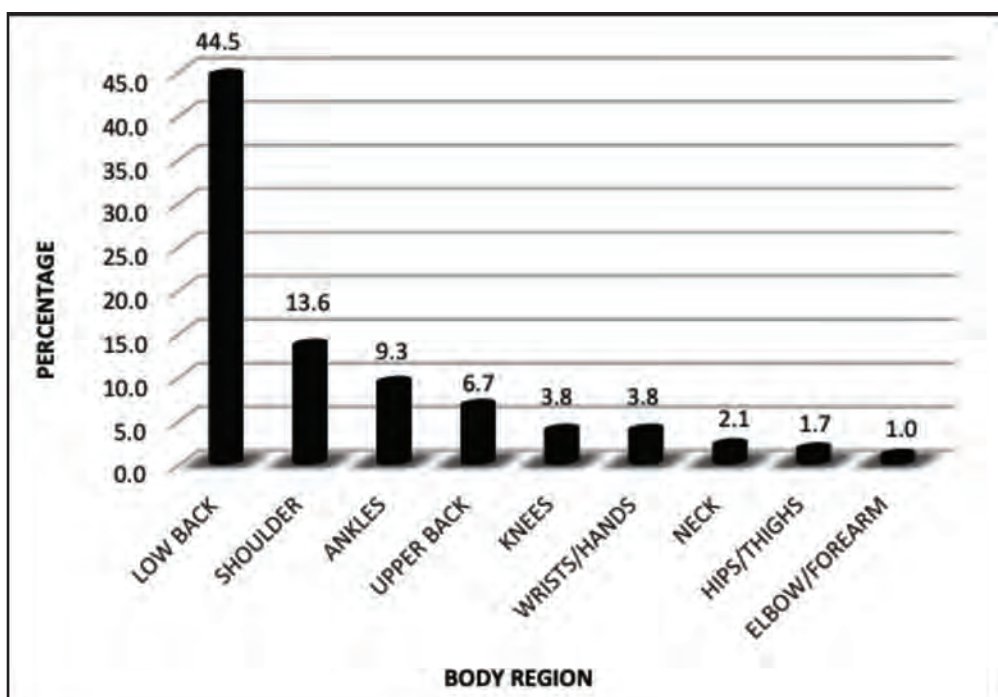

Fig. 2: Prevalence of work-related musculoskeletal disorders in the different body regions of all respondents.

of LBP among adults in the last 12 months was reported to be 56.9% in a study conducted in Sibu, Sarawak.[12] The frequency of LBP among nurses was found to be 58.8% in another study conducted at a medical centre in Pahang.[13] Similar studies conducted in public hospitals around Bangkok found a prevalence of 47.6% of LBP, therefore our study complements those findings.[14] Another study conducted in Jeddah found that the annual prevalence rate of LBP was 85.5%.[15] The 12-

month prevalence of LBP among nurses in a multi-centre research done in rural Maharashtra, India, was 48%.[16]

The group with more than three children has higher risk of LBP, 2.5 times more likely to experience LBP compare to other subgroup with children less than three. This is not out of place with other studies conducted in several other countries such as in Nigeria and Egypt.[8,17] It is essential to point out that

the mechanisms that underlie the link between the number of children and LBP are not completely known. This is especially crucial given the correlation between the two factors. It is possible that the higher occurrence of LBP in women who have had children is caused by hormonal shifts that occur during pregnancy as well as the physical demands of childrearing, such as lifting and carrying newborns.[18]

Another interesting study was conducted in Hospital University Sains Malaysia (HUSM), presented that younger nurse with the age range between 20-30 years old had higher risk of LBP. Junior nurses were more likely to experience back pain because they did perform more manual work, whereas senior professionals were more responsible for organisational and management activities. Junior nurses were also less proficient in proper lifting and body mechanics techniques while senior nurses may have established suitable coping mechanisms over time. Younger nurses also reported higher levels of occupational stress than older nurses.[19]

Nurses working in the ICU department had the highest odd of LBP when compared to other wards. This could be due to the increased physical effort and work pressure caused by preoperative and postoperative patients. They need additional assistance in the ICU when transferring and moving in and out of bed. These results are in line with earlier studies that showed that nurses working in intensive care units had a higher incidence of LBP. Low back discomfort is more common in this context due to the physical demands of caring for critically sick patients, which include bending forward, lifting and relocating patients, and standing for long periods of time.[20] On the other hand, workers working in the orthopaedic ward were more frequently subjected to significant levels of physical pressure when managing and transporting patients who were suffering from serious fractures. Patient handling chores in the orthopaedic ward, such as holding a patient's extremities and prepping a limb, transferring a patient from a chair to a bed, and transferring a patient between a bed and a stretcher, can lead to awkward postures and an increased physical effort. Other patient-handling tasks include transporting a patient between a bed and a stretcher. Research done in the past has also revealed that tasks involving the care of patients can result in a higher proportion of awkward postures than duties that do not involve the handling of patients.[21]

Supporting patients in their everyday lives, placing them on beds, carrying and lifting them, transporting medical tools of varied weights and sizes, and tidying beds of varying heights all increase the risk of a low back injury for nurses. According to the American Nurses Association (ANA), nursing duties that include carrying patients are linked to LBP. LBP has been associated to receiving assistance or support during nursing care practices. A study discovered that performing particular nursing practices without assistance/support from equipment increases the frequency and intensity of LBP.[22] Prolonged durations of standing, leaning over, sitting, or kneeling can put undue strain on the lower back, resulting in back pain. Maintaining the same position for lengthy periods of time without proper breaks or postural adjustments might lead to the development of pain. A study conducted in Ethiopia

supports this.[23] Another study conducted in Port Dickson found that carrying heavy loads among nurses is a major factor associated with low back discomfort.[12]

Top three coping methods in minimising the risk of low back discomfort were modifying bed heights (68.4%), receiving aid or support personnel in handling heavier patients (65.2%), and changing the patient's or nurse's position (58.2%). These coping methods among current study nurses appear to be consistent with another study in Ibadan.[17] The disparities in ways of coping may be due to the various facilities that can be provided to nurses in their workplace to lower the chance of developing work-related musculoskeletal condition in the various nations and types of hospitals included in this research. As we can concluded that, hospitals in Kota Kinabalu mostly equipped with semi-electric or fully-electric medical bed, easily the height of the bed can be adjusted. Whereby to move or carry a heavier patient, there are no proper equipment and still need to it manually so in this case definitely nurses to work in a team and seeking for support. In the case of changing the position, examples are like shifting weight from one leg to another or alternating between siting and standing positions. These changes help distribute the load and reduce the risk of overloading specific muscles or structures in the lower back.

Current study revealed that more than half of the participants (56.2%) had training on ergonomic. However, this could lead to an important critical thinking why the prevalence of LBP still high even though the nurses had been trained. In the nursing profession, "ergonomic training" refers to the instruction and implementation of ergonomic concepts and practices to increase safety, efficiency, and well-being among those who work in the nursing field. There is a high risk of musculoskeletal disorders (MSDs) and work-related accidents for nurses because their jobs require them to perform physically taxing duties and work in surroundings that can exacerbate these risks. Nurses in developing nations have minimal understanding of ergonomic concepts at work and are not trained to prevent and control occupational hazards. Knowledge of ergonomics can assist nurses in avoiding specific risk factors that can lead to the development of musculoskeletal illnesses and can improve workplace health and safety. Musculoskeletal diseases are more common in nurses who have received little or no training. Many elements in the workplace could contribute to nurses being exposed to physical danger.[25]

CONCLUSION
The reported 12-month prevalence rate of work-related musculoskeletal problem at any of the body areas was 86.4%, while the prevalence of (LBP) among nurses working in public hospitals in Kota Kinabalu was 44.5%. Almost half of the nurses who participated in this study received training on ergonomics. It is clear from the results that musculoskeletal issues, most notably LBP, continue to be a significant issue for nurses over the years may due to the cause of the specifics of their line of work, in contrast to those of other industries. Therefore, it is possible to argue that LBP follows a recurrent rather than an aggravating course, which is something that needs to be taken into consideration in the future

management of LBP in the healthcare sector. These assessments will make it possible to conduct an exhaustive study of the ergonomic elements of the workplace and the participants potential effects on their health and well-being as a result of those factors. An organisation can provide a more secure and comforting working environment for its employees by conducting an ergonomic risk assessment and addressing any issues that are discovered. This may include forming partnerships with professionals in the field of ergonomics, employing assessment instruments that have been vetted, and including ergonomic considerations into the process of survey design and data analysis.

CONFLICT OF INTEREST
The authors declare they have no conflicts of interest.

ACKNOWLEDGEMENTS

REFERENCES
1. Ibrahim MI, Zubair IU, Yaacob NM, Ahmad MI, Shafei MN. Low back pain and its associated factors among nurses in public hospitals of Penang, Malaysia. Int J Environ Res Public Health 2019; 16(21): 4254.
2. Sikiru L, Hanifa S. Prevalence and risk factors of low back pain among nurses in a typical Nigerian hospital. Afr Health Sci 2010; 10(1): 26.
3. Jradi H, Alanazi H, Mohammad Y. Psychosocial and occupational factors associated with low back pain among nurses in Saudi Arabia. J Occup Health 2020; 62(1): e12126.
4. Cunningham C, Flynn T, Blake C. Low back pain and occupation among Irish health service workers. Occup Med (Lond) 2006; 56(7): 447-54.
5. Ike EU, Olawumi JO. The prevalence, risk factors and coping measures of back pain among nurses in Federal Medical Centre, Abeokuta, Ogun state, Nigeria. Int J Car Sci 2018; 11(2):955-68.
6. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, Hoy D, Karppinen J, Pransky G, Sieper J, Smeets RJ. What low back pain is and why we need to pay attention. Lancet 2018; 391(10137): 2356-67.
7. Lim MC, Awang Lukman K, Giloi N, Lim JF, Salleh H, Radzran AS, Jeffree MS, Syed Abdul Rahim SS. Landscaping work: work-related musculoskeletal problems and ergonomic risk factors. Risk Manag Healthc Policy 2021; 14: 3411-21.
8. Moussa MM, El-Ezaby HH, El-Mowafy RI. Low back pain and coping strategies among nurses in Port Said City, Egypt. J Nurs Educ Pract 2015; 5(7): 55-62.
9. Iyaoromi OO, Madaki Aboi JK, Dankyau M. Coping strategies used by nurses with low back pain in a tertiary hospital in North Central Nigeria. International Journal of Nursing and Health Science, 2018; 5(2): 42-7.
10. Department of Occupational Safety and Health, Ministry of Human Resources Malaysia. Guidelines on Ergonomics Risk Assessment at Workplace.2017. Accessed from: https://www.dosh.gov.my/index.php/legislation/guidelines/ergonomic/2621-01-guidelines-ergonomics-risk-assessment-at-workplace-2017/file.
11. Rahmah MA, Rozy J, Halim I, Jamsiah M, Shamsul AS. Prevalence of back pain among nurses working in government health clinics and hospital in Port Dickson, Malaysia. J Commun Health. 2008; 2:11-8.
12. Tinubu BM, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional survey. BMC Musculoskel Dis 2010; 11: 1-8.
13. Thon CC, Feng PK, Lian CW. Risk factors of low back pain among nurses working in Sarawak General Hospital. Health 2016; 7(1): 13–24.
14. Mokhtar A, Abd Rahman R. The prevalence of low back pain and its associated factors among staff nurses at Sultan Ahmad Shah Medical Centre@IIUM,Kuantan Pahang. Inter J All Heal Sci 2022; 6(1): 2562-8.
15. Sopajareeya C, Viwatwongkasem C, Lapvongwatana P, Hong O, Kalampakorn S. Prevalence and risk factors of low back pain among nurses in a Thai public hospital. J Med Assoc Thai 2009; 92(Suppl 7): S93-9.
16. Almaghrabi A, Alsharif F. Prevalence of low back pain and associated risk factors among nurses at King Abdul Aziz University hospital. Int J Environ ResPublic Health 2021; 18(4): 1567.
17. Anap D, Iyer C, Rao K. Work related musculoskeletal disorders among hospital nurses in rural Maharashtra, India: a multi-centre survey. Int J Res Med Sci 2013; 1(2): 101-7.
18. Ike EU, Olawumi JO. The prevalence, risk factors and coping measures of back pain among nurses in Federal Medical Centre, Abeokuta, Ogun state, Nigeria. Int J Car Sci 2018; 11(2): 955-68.
19. Heuch I, Hagen K, Storheim K, Zwart JA. Associations between the number of children, age at childbirths and prevalence of chronic low back pain: the Nord-Trøndelag Health Study. BMC Public Health 2020; 20: 1-1.
20. Jann N, Gim CS. Low back pain among registered nurses in surgical unit at Raja Perempuan Zainab (RPZ) II Hospital, Kota Bharu, Kelantan. Malaysia J Nurs2018; 10(1): 35-41.
21. Wang M, Ding Q, Sang L, Song L. Prevalence of pain and its risk factors among ICU personnel in Tertiary Hospital in China: a cross-sectional study. J Pain Res 2022; 15: 1749-58.
22. Nourollahi M, Afshari D, Dianat I. Awkward trunk postures and their relationship with low back pain in hospital nurses. Work 2018; 59(3): 317-23.
23. Tosunoz IK, Oztunc G. Low back pain in nurses. Int J Caring Sci 2017; 10(3): 1728-32.
24. Negash NA, Tadele A, Jember Ferede A. Prevalence and associated factors of low back pain among healthcare professionals at University of Gondar Comprehensive and Specialized Hospital, Northwest Ethiopia: cross-sectional study. J Pain Res 2022; 15: 1543-52.
25. Zakerian SA, Monazzam MR, Dehghan SF, Mohraz MH, Safari H, Asghari M. Relationship between knowledge of ergonomics and workplace conditions with musculoskeletal disorders among nurses: a questionnaire survey. World Appl Sci J 2013; 24(2): 227-33.