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DETERMINANT RISK FACTORS OF WMSDS AMONG NURSES AT PUBLIC HOSPITAL IN BANDAR LAMPUNG, INDONESIA

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ABSTRACT

Background: An incompatibility of ergonomic principles in nurses often results in complaint of Work-related Musculoskeletal Disorders (WMSDs). Marital status, physical fitness, workload and work posture are risk factors of WMSDs.

Objective: To determine the risk factors of WMSDs among nurses at Public Hospital in Bandar Lampung. **Materials and Methods:** Design of this study was cross sectional**.** Data on marital status, physical fitness, workload, work posture and WMSDs was collected 124 nurses, through a purposive sampling technique. We used self-administered questionnaires for assessing marital status, physical fitness, and workload. Rapid Upper Limb Assessment (RULA) to assessed work posture and Nordic Body Map to assessed WMSDs. Logistic regression analyses were done to find determinant risk factors of WMSDs (CI = 95%).

Results: From 124 nurses we found that 33,5% (n=44) single, 64,5% (n=80) got married; 33.9% (n=42) with sufficient physical fitness; 66.1% (n=82) with less physical fitness; 21.0% (26) with underload workload; 45.2% (n=56) with moderate workload; 33.9%(n=42) with overload workload; 34.7% (n=43) with not risky work postures; 65.3% (n=81) with risky work postures; 25% (n=32) without WMSDs complaints; 74.2% (n=92) with WMSDs complaints. Multiple logistic regression analyses showed that physical fitness (OR= 5,9), work posture (OR=8,5) and workload (OR=14) significantly increased the risk of WMSDs.

Conclusion: There were significant association between physical fitness, workload, and work posture with risk of WMSDs. Physical activity and ergonomic program may be useful to reduce the risk of WMSDs.

Keywords: Ergonomic, Marital Status, Physical Fitness, Workload, Work Posture, Work Musculoskeletal Disorders

I. INTRODUCTION

Some potential hazards and risks to Occupational Health and Safety as known as Kesehatan dan Keselamatan Kerja (K3) in Indonesia are adapted to the principle of ergonomics, which is to match job for workers. Thus, harmony between workers and the environment, the ways and processes of job can be obtained. Even though job has been matched for workers, workers still have to pay attention to the right way of job. Non-ergonomic job methods, such as awkward postures can result in musculoskeletal complaints, excessive fatigue or other health problems. This complaint can reduce worker productivity. (1)

The level of muscle complaints is also strongly influenced by the level of physical fitness. Physical fitness is the ability of a person to carry out daily activities efficiently without significant fatigue so that the person can enjoy his leisure time. Numerous studies have investigated the effects of physical fitness or physical exercise on musculoskeletal pain. (2) Regular exercise can be used as an indicator of whether or not enough physical fitness of a person. Efficient exercise is done three to five times, with the duration of each sport approximately 30 minutes, for one week. Moreover, Pohjonen and Rata demonstrated that 9 months of supervised exercise twice a week improves physical capacity and prevents the decline in work ability after 1 year among female care aides

with muscle complaints. Jakobsen et al. also showed that 10 weeks of physical exercise was more effective to prevent deterioration in work ability. (3)

In addition to work posture and physical fitness, workload is also related to muscle condition. Workload is the number of jobs owned by a person or group of people which must be completed within a certain time. Objective workloads are assessed based on the conditions that occur in the field, namely the overall time spent doing their job. In addition, nurses usually have a 3-shift work system, and those on night shifts have to stay up all night. (4) This three risk factors can be grouped into individual factors, namely physical fitness; job factors, namely workload and work posture. (5)

Musculoskeletal complaints are complaints that are felt by someone in the musculoskeletal system, such ad muscles, joints, ligaments, tendons, nerves, bones and blood vessels or circulatory sistem. Damage to this system can occur if the muscle receives a static load for a long time. Musculoskeletal complaints accompanied by damage to the musculoskeletal system structure or movement abnormalities are known as Musculoskeletal Disorder complaints. Musculoskeletal Disorder complaints that is caused by job are called Work-related Musculoskeletal Disorder (WMSDs). (6) There are three types of injuries that result in these complaints, namely muscle injury, tendon injury, and nerve injury. In muscle injury, lactic acid is retained and buried in muscle tissue irritates the surrounding tissue and causes pain. In tendon injuries, excessive extension due to repetitive movements or awkward positions can result in torn tendon fibers. The tendon becomes thickened and hardens due to inflammation.(7,8)

Research about the risk of complaints of Work-related Musculoskeletal Disorder with the cohort method 2004-2010 in nurses in Taiwan showed that in seven years there was an incidence of 76.24% of cases of Work-related Musculoskeletal Disorder. The body parts that most often experience complaints are the back and waist. (9,10)

Generally nurses in hospitals carry out activities of pushing, pulling, bending, sitting, standing, and lifting. Based on observations made on July 11st 2018, nurses at Bandar Lampung X Hospital carried out activities such as pushing patient beds, encouraging patients sitting in wheelchairs, installing IVs, injecting patients, and lifting patients. If these activitie are not carried out ergonomically, these can be risk factors for complaints of Work-related Musculoskeletal Disorder. The result of Azizpour et al. (2017) found that the prevalence of LBP and WMSDs in ward nurses was 62,9%, for operating room nurses it found 50%, while in aids nuses it was 49,4%. (11)

In 2016, a study was carried out using the Rapid Upper Limb Assessment (RULA) method for nurses in the inpatient installation of Abdul Moeloek Hospital. The results were obtained about the characteristics of nurses based on work posture, namely 19.4% not at risk, 31.3% low risk, 30.6% moderate risk, and 18.8% high risk. (12,13) Further research on 1179 nurses in 15 hospitals in Vietnam showed that WMSDs usually occur in workers who have excessive repetition, awkward postures, and heavy lifting. The activity of pushing a patient's bed or wheelchair is the most activity that results in complaints of Work-related Musculoskeletal Disorder. (14)

Therefore, it is important to conduct a study to analyze the risk factors of complaints of Work-related Musculoskeletal Disorder in nurses at Bandar Lampung X Hospital.

Aim and Objectives

To determine the risk factors of WMSDs among nurses at Public Hospital in Bandar Lampung.

II. MATERIALS AND METHODS

Study Type: This is a quantitative study with observational-analytic research methods and uses a cross-sectional approach.

Study Population: The study was all nurses at Bandar Lampung X Hospital.

Study Area: This research was conducted at Bandar Lampung X Hospital

Study Duration: The study was carried out from December 2018 to January 2019.

Sample Size calculation: The minimum sample is obtained using the Slovin formula, which is a minimum of 114 people. The sampling method used is total sampling.

Inclusion Criteria: Nurses of women aged 25-60 years who have a work period of more than one year.

Exclusion criteria: Nurses who have musculoskeletal system disorders or diseases, nurses who are pregnant or menopausal.

Stratefy for collection: Data were collected from all nurses aged 25-60 years who have work period of more than one year. Physical health variables were assessed based on exercise frequency in one week, workload was assessed using time and motion study, work posture was assessed using the Rapid Upper Limb Assessment (RULA) method, and complaints of Work-related Musculoskeletal Disorder were assessed using the Nordic Body Map questionnaire.

Working Definition: Physicall fitness is doing workout for 30 minutes duration everyday for one week, using a questionaire resulted ordinal cathegoric, less (<3x/week) and enough (3-5x/week). Workload are time precentage needed to do productive work compared to the total work time, overload if >90%, moderate if 85-90%, and underload if <85%. Work posture is upper body posture that recorded using camera while nurses inject medicine and taking care of infuse, resulted risky (>3) and not risky (<3) in RULA ergonomic table. WSMDs is actual complaints of nurses' muscles, tendon, or bone, such as pain while working, using Nordic Body Mao, cathegorized by no complaints (<28) and with complaints (>28).

Ethical Approval: It was obtained from Institutional Ethical Commitee of Medical of Faculty Lampung University letter numbred 5015/UN26.18/PP.05.02.00/2018.

Consent: The data were collected from the subjects after assurance of confidentiality of the data and obtaining informed written consent from them.

Data Analysis: The data was analysed by IBM SPSS Statistics for Windows, Version 20.0. Armonk, New York: IBM Corp. statistical software. Data used univariate and bivariate analysis also multivariate. The test used in this study is chi-square, provided that the number of cells that have an expected value of less than five does not exceed 20%. This study is used α=0.05. The assosiation between the two variables is considered significant if the value of $p<\alpha$. Then the binary logistic regression (Enter method) was applied and adjusted odds ratio were calculated to determine the association between physical fitness, workload, and work posture with risk of WMSDs.

III. RESULTS

Sampling is adjusted to the study inclusion and exclusion criteria. There were 132 people who met the inclusion criteria. However, 8 of them were included in the exclusion criteria. Thus there were 124 respondents who participated in this study, including 44 people (35.4%) unmarried respondents, 80 people (64.6%) respondents who were married. Married respondents consisting of 26 people (21.0%) did not have children, 27 people (21.8%) respondents had children less than 5 years old, and 27 people (21.8%) respondents had children over 5 years old. In more detail, the frequency distribution of respondents' characteristics can be seen in Table 1.

The respondents with adequate physical fitness were less (33.9%) than the respondents with inadequate physical fitness (66.1%). (Table 2)

In table 3, it can be stated that the respondents are mostly in the category of moderate workload (45.2%). Meanwhile, the respondents that at the underload workload category were 21.0% and respondents in the overload workload category were 33.9%.

The number of respondents with risky work posture was more (65.3%) than respondents who are not at risk (34.7%), can be seen in Table 4.

74.2% of respondents had complaints of Work-related Musculoskeletal Disorder, this was higher than respondents who did not have complaints (25.8%), can be seen in Table 5.

To assess the relationship between physical fitness and complaints of Work-related Musculoskeletal Disorder, a chi-square test was carried out. Among 82 respondents with less physical fitness, there were 84.1% who had complaints of Work-related Musculoskeletal Disorder while 15.9% had no complaints (p = 0.001). There is a significant relationship between physical fitness with complaints of Work-related Musculoskeletal Disorder (Table 6).

Respondents with an overload workload, 74.2% had Work-relateed Musculoskeletal Disorder complaints, while underload workloads only 53.8% (p=0,003). There is a statistically significant relationship between workload and Work-related Musculoskeletal Disorder complaints (Table 7).

Table 8 contains the results of data analysis showing that nurses who have work postures are at risk of experiencing Work-related Musculoskeletal Disorder complaints, 86.4% of respondents had complaints and 13.6% had no complaints (p=0,000). there is a significant relationship between work posture and complaints of Work-related Musculoskeletal Disorder.

The result of multivariate modeling analysis using multiple logistic regression are shown in Table 9. Out of the 4 risk factors studied, multivariate analysis found 3 major risk factors are correlated with WSMDs complaints. As for the model equation with 3 variables of 4 variables examined, by looking at p-value above 0.005, nutritional status variables are removed from the model. The selected model predicted the WSMDs complaints among woman nurses with regression equation Y (nurses with WSMDs complaints) = -2,224 + 1,787 (physical fitness) + 2,143 (work posture) + 2,464 (workload).

IV. DISCUSSION

In this study, data were obtained that total of nurses at Bandar Lampung Hospital X who had less physical fitness were almost twice bigger nurses with sufficient physical fitness. A study in Saudi Arabia stated that the reason for the low physical fitness of 64.6% of nurses from 412 nurses was the lack of facilities that supported exercise in their homes.(15) Similar result were found in China that showed that out of the 692 nurses in 5 hospital, 42% of them rarely excerside, and 40% had never exercised in the past year. (4) Physical fitness was also influenced by motivation. Low motivation to exercise will result in low frequency exercise. (16)

The results of data analysis also showed that most nurses at Bandar Lampung Hospital X had moderate workloads. This shows that nurses do productive work as much as 85-90% of their total working hours. The productive work referred to is adjusted to the time and motion study questionnaire, which is direct and indirect treatment to patients. In addition there are unproductive jobs and additional work, in the form of managing patient insurance.

The ratio of nurse-patients in hospital can cause differences in their workload. In developed countries, such as America, the ratio of nurse-patients recommended by the government is 1:5. The unmet ratio can increase the nurses's workload. Besides, the workload was severe due to lacking of adequate facility in the practice environment. In addition, the nurses' workload is influenced by the patients' ever-changing condition, the number of average hours of care needed to provide direct and indirect services to the patients, as well as some additional tasks done by the nurse, especially at night shift work. (4, 17)

The data in this study shows that 90,5% of nurses who work overload experience WMSDs. This similar result was found in Yao et al. Research of 692 patients in China which explained overload workload as the risk factors for WMSDs. Yan et al (2018) shows that workload can be a risk factor for WMSD if the duration of work is > 40 hours per week. This workload will disrupt rest periods, cause health problems, and disrupt the work performance of nurses. (17)

Epidemiological studies have shown that awkard postures, heavy manual handling and transferring of patients, repetitive movements, monotonous tasks, and standing positions for prolonged hours are ergonomic risk factors associated with nursing jobs. (18) The results showed that nurses with a work posture were at risk of having complaints of Work-related Musculuskeletal Disorder more than nurses who were not at risk. This research analyzed the work posture of injecting and installing an IV of nurses.

Figure 1. Work posture when injecting

The awkward work posture that is often done when injecting is the position of the lower body and the dominant hand in the twisting position, as can be seen in Figure 1. Meanwhile, the lowering position occurs due to a mismatch between the patient's bed height and the nurse's height. Model that was made by Carneiro et al. (2017) indicates that a patient's bed with inadequate height could cuase the nurse to acquire lumbar complaints, so it's suggested whenever possible, nurses should adjust the patient's bed to an adequate height. When installing an IV, inserting the infusion set requires a significant gripping force and unnatural flexed and twisted postures of the hand. Besides that, the odd posture that is often done is to lift the arm too far from the body when hanging the infusion bottle onto the hanger. The ideal posture is when the body parts are not too far from the axis of the body. The farther the position of the body part from the center of gravity, the posture is more at risk of causing complaints to the musculoskeletal system. (19)

Research on work posture and its predictors on

nurses showed data that 62.6% nurses have high-risk work postures. Work posture is related to gender and frequency of physical activity. More risky work postures are found in women and in nurses who do not carry out daily physical activities. (20)

The final results of the assessment of complaint of Work-related Musculoskeletal Disorder in this study are there or no complaints. Based on the results of the research that has been obtained, there are 92 people (74.2%) nurses who have complaints of Work-related Musculoskeletal Disorder. This number shows that nurses with complaints are more than nurses without complaints. The parts of body that are often complained about are the neck, shoulders, back, waist, calves and legs. These musculoskeletal complaints are consistent with the results of research on nurses in Saudi Arabia that showed 85% of the nurses reported experiencing at least one musculoskeletal symptom, and research in Cambodia that showed 95% of nurses have complaints, that are felt dominant in the neck, shoulders and back. (21,22)

Most of nurses have less physical fitness and have complaints of Work-related Musculoskeletal Disorder, namely 69 people (55.6%). While nurses with less physical fitness without complaints of Work-related Musculoskeletal Disorder as many as 19 people (15.3%). According to Supriyanto, a person who have sufficient physical fitness have ability to carry out daily activities without causing excessive fatigue, so the person is still able to overcome the additional burden. One way to maintain physical fitness is exercise. Physical exercise can train the strength of muscles and bones, improve the body's sensitivity and coordination of muscles, improve blood circulation, and the response speed and effective action of human brain. It can also effectively delay the age-related decline in muscle strength. Proper physical exercise can effectively reduce the prevalence of low back pain (LBP) and WMSDs. Less physical fitness will increase the occurrence of musculoskeletal complaints. Nurses who have less physical fitness will have a risk three times greater to experience Work-related Musculoskeletal Disorder than nurses with sufficient physical fitness. (4)

The p value obtained in the study was smaller than 0.05, namely 0.001. It concludes that there is a significant assosiation between physical fitness with complaints of Work-related Musculoskeletal Disorder in nurses at X Bandar Lampung Hospital.

Bivariate analysis between workload and complaints of Work-related Musculoskeletal Disorder was assessed by the chi-square test. The results of this test show that among 92 nurses who had this complaint, there were 14 people with underload workload, 40 people with moderate workload and 38 nurses with overload workload. The

p value obtained in this study is 0.003. Statistically, there is a meaningful assosiation between workload and complaints.

This result is in line with the research in Konawe District in 2017 that the workload relates to complaints of Work-related Musculoskeletal Disorder. Tanui concluded that the increase in work demand is proportional to the increasing number of activities carried out by nurses. Thus, nurses will experience more fatigue due to reduced rest periods to restore their physical condition. The higher the number of nurse activities, the higher the workload. This condition has an impact on increasing the likelihood of complaints of work-related Musculoskeletal Disorder to nurses. (24)

In this study, most of nurses with risky work postures also had complaints of Work-related Musculoskeletal Disorder, namely 81 people. While nurses who are not at risk, the number of nurses who have no complaints is almost the same as the number of nurses who have complaints. In addition to work posture, the emergence of Work-related Musculoskeletal Disorder complaints is also influenced by other factors. After analyzing the research data manually, data were obtained that all (22 people) nurses who are not at risk in terms of work posture but who had complaints had one or two other risks, namely lack of physical fitness, overloaded workload, and moderate workload.The p value in this study is 0.000. It shows that there is assosiation between work posture and complaints of Work-related Musculoskeletal Disorder. Awkward postures or risk work postures are known to be the most common and most significant factors associated with the occurance of musculoskeletal disorders among nurses. (18) This result is supported by previous research at the inpatient installation of PGH Hospital in Zimbabwe by Chiwaridzo et al with p value 0.001 Stating the same thing about the assosiation between these variables. (25)

The most complained parts of body by nurses are the neck, shoulders, back, waist, calves and legs. The bending position when injecting and lowering activities contribute to in raising complaints in the neck and back. The position of the arm that is lifted and reaches the infusion hanger which is too far away contributes to the raising of complaints on the shoulder. In addition to the positions studied, nurses also carry out other activities such as making nursing documentation. This activity is generally carried out in a sitting position, so that this position contributes to raising complaints at the waist. Although the activity of injecting and installing an infusion that moves actively is the upper body, this activity is always done in a standing position. The lower limb becomes the fulcrum of the body when standing, so that this contributes to complaints in the calves and legs.

Zakerian, Monazzam, Dehgan et al. stated that nurses must get good technical training in dealing with stress and psychological stress to reduce work-related problems or injuries. This needs to be considered by hospital authorities to improve the effectiveness of nurses' work through decreasing the incidence of nurses with complaints of Work-related Musculoskeletal Disorder. (26)

V. CONCLUSION

There is a significant relationship between physical fitness (OR= 5,9), work posture (OR=8,5) and workload (OR=14) with complaints of Work-related Musculoskeletal Disorder. The most significant risk factor is the overloaded workload with odds 14 times increase in patients with WSMDs.

Recommendation

Specifically compared workload of nurses based on work shifts should be done in order to reduce complaints of Work-related Musculoskeletal Disorder. Further research is expected to examine other risk factors that can lead to the emergence of WMSDs.

Limitation of the study

This study only asses the workload of nurses sofor further research it is important to further assess the subjective workload and mental on nurses.

Relevance of the study

There is a significant relationship between physical fitness, workload, and work posture with complaints of Work-related Musculoskeletal Disorder.

Authors Contribution

Concepts: FS; Design: FS, DGPS; Literature search: FS, ETS; Data acquisition: FS, ETS; Data analysis: FS; Statistical analysis: FS; Manuscript preparation: FS, DGPS; Manuscript editing: FS, ETS; Manuscript editing: FS, DGPS; Manuscript review: FS, DGPS; Guarantor: FS.

REFERENCES

1 Keselamatan dan Kesehatan Kerja: Keselamatan dan Kesehatan Sarana untuk Produktivitas. Jakarta: International Labour Organization; 2013.
2 Serra MV, Camargo PR, Zaia JE, Tonello MG, Quemelo PR. Effects of Physical Exercise in Musculoskeletal Disorders, Stress, and Quality of Life in Workers. Taylor & Francis & Central Institute for Labour Protection. 2016; 16(1): 2376.
3 Jakobsen MD, Sundstrup E, Brandt M, Jay K, Agaard P, Andersen LL. Physical Exercise at the Workplace Prevents Deterioration of Work Ability Among Healthcare Workers: Cluster Randomized Controlled Trial. BMC Public Health. 2015; 15(1): 1174
4 Yao Y, zhao S, Zhen A, Shouying W, Li H, Lu L, Yao S. The associations of work style and physical exercise with the risk of work related musculoskeletal disorders in nurses. International Journal of Occupational Medicine and Environmental Health. 2019; 32(1): 15-24.
5 Cheung K, Szeto G, Lai GK, Ching SS. Prevalance of and Factors Associated with Work-Related Musculoskeletal Symptoms in Nursing Asistans Working in Nursing Homes. International Journal of Environmental Research and Public Health. 2018; 15(1): 265.
6 Bernal D, Campos-Serna J, Tobias A, Vargas-Prada S, Benavides F, Serra C. Work related psychosocial risk factors and musculoskeletal disorders in hospital nurses and nursing aides: a systematic review and meta-analysis. International Journal of Nursing Studies. 2014; 14 (11): 2-5.
7 Ratzon NZ, Bar-Niv NA, Froom P. The Effect of a Structured Personalized Ergonomic Intervention Program for Hospital Nurses with Reported Musculoskeletal Pain: An Assigned Randomized Control Trial. IOS Press. 2016; 54(16): 367-377.
8 Work-related Musculoskeletal Disorders. Canada: CCOHS; 2018.
9 Kraemer WJ, Ratamess NA. Fundamentals of Resistance Training Progression and Exercise Prescription. Medica & Science in Sports & Exercise. 2004; 36(4):674.
10 Chung YC, Hung CT, Li SF, Lee HM, Wang SG, Chang SC, Yang JH. Risk of musculoskeletal disorder among Taiwanese nurses cohort: a nationwide population-based study. BMC Musculoskeletal Disorders. 2013; 14(1): 144.
11 Azizpour Y, Delpisheh A, Montazeri A, Sayehmiri K. Prevalance of Low Back Pain in Iranian Nurses: A Systematic Review and Metaanalysis. BMC Nursing. 2017; 17(16): 50.
12 Middlesworth M. Rapid Upper Limb Assessment (RULA) A Step-by-step Guide. Ergonomic Plus. 2015;1-13.
13 Simanjuntak D. Hubungan Postur Kerja dengan Keluhan Musculoskeletal Disorder pada Perawat di Instalasi Rawat Inap RSUD Abdul Moeloek [skripsi]. Bandar Lampung: FK Unila. 2017.
14 Luan HD, Hai NT, Xanh PT, Giang HT, Thuc PV, Hong NM, Khue PM. Musculoskeletal Disorders: Prevalence and Associated Factors among District Hospital Nurses in Haiphong, Vietnam. BioMed Research International. 2018; 18(1): 1-9.
15 Tannir MA, Kobrosly SY, Elbakri NK, Shaheen AKA. Prevalence of Predictors of Physical Exercise among Nurses: A Cross-sectional Study. Saudi Med J. 2017; 38(2): 209-212.
16 Zebis MK, Andersen LL, Pedersen MT, Mortensen P, Andersen CH, Pesersen MM, Boysen M, Roessler KK, Hannerz H, Mortensen OS, Sjogaard G. Implementation of Neck/Shoulder Exercises for Pain Relief among Industrial Workers: A randomized controlled trial. BMC Musculoskeletal Disorders. 2011; 11(12): 205.
17 Yan P, Yang Y, Zhang L, Li F, Huang A, Wang Y, Dai Y, Yao H. Correlation analysis between work-related musculoskeletal disorders and the nursing practice environment, quality of life, and social support in the nursing professionals. Wolters Kluwer Health, Inc. 2018; 18(97): 9.
18 Nourollahi M, Afshari D, Dianat I. Awkward Trunk Postures and Their Relationship with Low Back Pain in Hospital Nurses. IOS Press. 2018; 59(18): 317-323.
19 Garosi E, Mazloumi A, Kalantari R, Vahedi Z, Shirzhiyan Z. Design and Ergonomic Assessment of an Infusion Set Connector Tool Used in Nursing Work. Elsevier. 2019; 75(19): 91-98.
20 Abdollahzade F, Mohammadi F, Dianat I, Asghari E, Jafarabadi MA, Sokhanvar Z. Working Posture and Its Predictors in Hospital Operating Room Nurses. Health Promot Perspect. 2016; 6(1): 17-22.
21 Van, L. Prevalence of Musculoskeletal Symptoms among Garment Workers in Kandal Province. J Occup Health. 2016; 58:107-117.
22 Attar, SM. Frequency and Risk Factors of Musculoskeletal Pain in Nurses at a Tertiary Centre in Jeddah, Saudi Arabia: A Cross Sectional Study. BMC Research Notes. 2014; 14(7): 61.
23 Tanui BC. Assessment of Work-related Musculoskeletal Disorders among Nurses in Mombasa County Kenya [thesis]. Kenya: Jomo Kenyatta University of Agricultural and Technology. 2015.
24 Tanui BC. Assessment of Work-related Musculoskeletal Disorders among Nurses in Mombasa County Kenya [tesis]. Kenya: Jomo Kenyatta University of Agricultural and Technology. 2015.
25 Chiwaridzo M, Makotore V, Dambi JM, Munambah N, Mhlanga M. Work-related Musculoskeletal Disorders among Registered General Nurses: A Case of a Large Central Hospital in Harare Zimbabwe. BMC Res Notes. 2018; 18(11): 315.
26 Zakerian S, Monazzam MR, Dehghan SF, Mohraz MH, Safari H, Asghari M. Relationship between Knowledge of Ergonomics and Workplace Conditions with Musculoskeletal Disorder among Nurses: A Questionaire Survey. World Appl Sci J. 2013; 24(2)

TABLE 1. FREQUENCY DISTRIBUTION OF RESPONDENTS' CHARACTERISTICS.

Characteristics	Frequency	Percentage
Status		
Single	44	35,5
Married, no children	26	21,0
Married, child/children < 5 years old	27	21,8
Married, child/children ≥ 5 years old	27	21,8
Length of work		
< 10 years	97	78,2
≥ 10 years	27	21,8
Smoking		

Yes	0	0
No	124	100

TABLE 2. FREQUENCY DISTRIBUTION OF RESPONDENTS BASED ON PHYSICAL FITNESS IN NURSES AT BANDAR LAMPUNG X HOSPITAL

Physical Fitness	Frequency	Percentage
Adequate	42	33,9
Inadequate	82	66,1
Total	124	100

TABLE 3. FREQUENCY DISTRIBUTION OF RESPONDENTS BASED ON WORKLOAD IN NURSES AT BANDAR LAMPUNG X HOSPITAL

Workload	Frequency	Percentage
Underload	26	21,0
Moderate	56	45,2
Overload	42	33,9
Total	124	100

TABLE 4. FREQUENCY DISTRIBUTION OF RESPONDENTS BASED ON WORK POSTURE AT NURSES AT BANDAR LAMPUNG X HOSPITAL.

Work posture	Frequency	Percentage
Risky	43	34,7
Not risky	81	65,3
Total	124	100

TABLE 5. FREQUENCY DISTRIBUTION OF RESPONDENTS BASED ON THE COMPLAINTS OF WORK-RELATED MUSCULOSKELETAL DISORDER IN NURSES AT BANDAR LAMPUNG HOSPITAL X.

Complaint of Work-related Musculoskeletal Disorder	Frequency (n)	Percentage
No complaints	32	25,8
Complaints	92	74,2
Total	124	100

TABLE 6. ASSOSSIATION BETWEEN PHYSICAL FITNESS AND COMPLAINTS OF WORK-RELATED MUSCULOSKELETAL DISORDER

Physical Fitness	Complaint of Work-related Musculoskeletal Disorder				Total		P
	No		**Yes**				
					n	**%**	
	n	**%**	**n**	**%**			
Adequate	19	45.2	23	54.8	42	100	0,001
Inadequate	13	15,9	69	84,1	82	100	
Total	32	25,8	92	74,2	124	100	

TABLE 7. ASSOSIATION BETWEEN WORKLOAD WITH COMPLAINT OF WORK-RELATED MUSCULOSKELETAL DISORDER

Workload	Complaint of Work-related Musculoskeletal Disorder	Total	P

	No		Yes				
					n	%	
	n	%	n	%			
Underload	12	46,2	14	53,8	26	100	0,003
Moderate	16	28,6	40	71,4	56	100	
Overload	4	9,5	38	90,5	42	100	
Total	32	25,8	92	74,2	124	100	

TABLE 8. ASSOSIATION BETWEEN WORK POSTURE WITH COMPLAINT OF WORK-RELATED MUSCULOSKELETAL DISORDER

Work Posture	Complaint of Work-related Musculoskeletal Disorder				Total		P
	No		Yes				
					n	%	
	n	%	n	%			
Not risky	21	48,8	22	51,2	43	100	0,000
Risky	11	13,6	70	86,4	81	100	
Total	32	25,8	92	74,2	124	100	

TABLE 9. MULTIPLE LOGISTIC REGRESSION ANALYSES OF PHYSICAL FITNESS, WORK POSTURE AND WORK LOAD WITH COMPLAINTS OF WORK-RELATED MUSCULOSKELETAL DISORDER

		Coefficient	p-value	OR	95% C.I.for EXP(B)	
					Lower	Upper
Step 1*	Nutritional Status	1.209	.156	3.349	.630	17.811
	Physical Fitness	1.897	.001	6.666	2.205	20.151
	Work Posture	2.210	.000	9.117	3.037	27.371
	Workload	2.547	.002	12.772	2.645	61.677
	Constant	-2.238	.005	.107		
Step 2[a]	Physical Fitness	1.787	.001	5.972	2.097	17.006
	Work Posture	2.143	.000	8.525	2.969	24.478
	Workload	2.646	.001	14.092	3.109	63.882
	Constant	-2.224	.001	.108		