Nurses Awareness on Work Related Musculoskeletal Disorders in Kakamega County Kenya

Micky Olutende[1], Anthony Muchiri Wangui[1], David Kaniaru[2], Edwin Wamukoya[1]

[1]Department of Health Promotion and Sports Science, Masinde Muliro University of Science and Technology, Kakamega, Kenya
[2]Department of Health Professions Education, Masinde Muliro University of Science and Technology, Kakamega, Kenya
Email: micky.oloo.mf@gmail.com

Abstract

The objective of the study was to investigate nurses' awareness of work-related musculoskeletal disorders (WRMSD) in Kakamega county. The study was a descriptive cross-sectional study and Quantitative methods were adopted. The study was carried out in hospitals in Kakamega county Kenya. A self-administered questionnaire was used to gather information from randomly selected nurses ($n = 130$). Data was presented using descriptive statistics in the form of frequencies and percentages for categorical variables and means and standard deviations for quantitative variables. Chi-square test of independence analysis was used for the assessment of quantitative variable interrelationships. Significance was considered at p ≤ 0.05. The main outcome measures were Sociodemographic data and awareness of work-related musculoskeletal disorders. The study showed that 76.9% of the nurses were female while 23.1% were males. The average age of the nurses was 35 years. The nurse's awareness of WRMSD and its association with working for many years was high (51% and above). From the study 53.8% of the nurses worked for 6 - 8 hours in a day while 46.2% worked for more than 8 hours in a day. The findings also showed that 66.2% attended to more than 15 patients in a day. Analysis showed that there was no significant association (P = 0.40) between any age category and the gender as well as nursing profession. In addition, Chi square test showed that there was statistically significant association (p = 0.00) between the number of years in the profession and the frequency of the nurses per category of work experience. The study concluded that nurses in Kakamega county are moderately aware of work-related musculoskeletal disorders. The study recommends retraining and short courses to refresh nurses' knowledge on WRMSD and best ways of prevention.

1. Introduction

Work-related musculoskeletal disorder (WRMSD) is a disorder that affects the tendons, muscles, joints, peripheral nerves, inter-vertebral discs and vascular system, resulting from work activities which are frequent and repetitive, or activities with awkward postures. In the nursing profession WRMSD is caused by repetitive movements, continuous static awkward postures, genetic predisposition and number of years in practice (Aptel *et al.*, 2002) [1]. The most common body regions that are affected by WRMSDs are the lower back, neck and shoulders (National Institute for Occupational Safety and Health, 2007) [2]. Most employees including Nurses complained most of back pain followed by neck and shoulder as a result of their day-to-day work activities (WHO, 2007) [3]. The WRMSDs are very common health problem experienced by workers and a major cause of disability throughout the world in the workplace (WHO, 2007) [3]. The WRMSDs are known as major causes of significant human suffering, and loss of productivity on industries. In addition, WRMSDs may result in discomfort, difficulty in performing jobs and absence from work. Others are; low work efficacy, economic impact due to reduced working hours, high costs of medical treatment, effects on daily life and premature retirement from the profession (Smith *et al.*, 2004 [4]; Leijon *et al.*, 2009 [5]; Holder *et al.*, 2009 [6]).

A study by Josephson *et al.*, (1997) [7] was designed to investigate the relation between WMSDs, job demand and burnout among nurses working in emergency departments in Egypt. The study findings indicate an increased prevalence of WMSDs, along with increased job demands, with about two fifths of the sample participants having a high level of burnout. Through multivariate analysis, it was found that increased job demands and a feeling of more severe low back pain positively predict the score of burnouts. The finding led to acceptance of the study hypothesis that increased job associated with of WMSDs and consequently high levels of burnout. About two thirds of the studied nurses had some type of WMSDs. This is commensurate with the type and nature of physically demanding work in emergency departments (Josephson *et al.*, 1997) [7]. A study in Nigeria found WRMSD to be positively and significantly correlated to the score of the job demand. A similarly increased prevalence of WMSDs was reported in a recent study in Nigeria, where the prevalence of WMSDs was 78% compared with 63.8% in our sample. This finding is also congruent with the figures reported in USA and Chinese studies (Smith *et al.*, 2004) [4].

A study done in Philippines by Smith, (2004) [4] showed that lower back was specifically the most commonly reported body site for pain, affecting nearly three fourths of the nurses. The finding is plausible and might be due to the work conditions with increased manual handling tasks, long standing hours, and awkward positions and movements during care provision. Added to this is the prevalence of overweight and obesity in half of the sample and which is considered a risk factor for low back pain. Similarly, more than three fourths of the participants in Philippines experienced back pain. In a study done by Trinkoff, (2009) [8] showed that, neck and shoulder pain was second to lower back pain among nurses, each affecting about one half of the sample. However, the severity index was slightly higher for shoulder pain, which might be explained by the recurrent lifting of heavy weights that these nurses experience in emergency situations while helping patients to be positioned on examination tables or preventing their falls. Similar figures were reported in previous studies (Zurbrügg, 2004 [9]; Trinkoff, 2009 [8]). Concerning burnout, there was an increased prevalence among emergency nurses. In agreement with these findings, a French study found that approximately one third of the critical care nurses had a high level of burnout (Embriaco *et al.*, 2007) [10], which is quite close to our finding. Similarly, higher levels of burnout among nurses working in emergency departments were reported in recent studies (Popa *et al.*, 2010) [11].

Embriaco *et al.*, (2007) [10] in his study showed that, there was a positive correlation between work demand and the severity of low back pain. These findings are quite possible because the feeling of greater work demands would increase the stress among the nurses. When a nurse experienced low back pain, this leads to a feeling of lack of control over the job. The interaction of this increased workload and a feeling of incapability may explain the higher levels of burnout. In line with these findings, WMSDs were associated with job stress and consequently burnout (Jourdain *et al.*, 2010) [12]. Job demands were the most important determinants of burnout (Sundin, 2009) [13]. More recently, a study done in China found that work overload had the greatest association with occupational stress (Wu *et al.*, 2011) [14]. Considering the significance of WRMSDs as a common problem in the nursing profession, the negative impact on nurses and the major role the nurses' play in hospitals. Therefore, the purpose of this study was to investigate nurses' awareness of work-related musculoskeletal disorders in Kakamega county.

2. Methods

A descriptive cross –sectional research design was used in this study. This is because the research was a fact-finding survey and this type of research design is the most recommended (Wiegmann *et al.*, 2007) [15]. Nurses working at selected private and public hospitals in Kakamega County took part in the study. Participants were excluded because of an incomplete questionnaire and others due to lack of a consent form. The purpose of the study and the procedures of the questionnaire were explained to the participants. Those who agreed to par-

ticipate completed an informed consent form and the questionnaire. The participants completed the questionnaires in person enabling them to ask questions or withdraw from the study at any time during the data collection.

2.1. Participants and Sampling Design

Bartlett, Kotrlik, & Higgins (2001) [16] table was used to determine the sample size. Categorical data which assume alpha levels of 0.10, 0.05, or 0.01 was used in this study. The margins of error used in the table are 0.05 (Bartlett, Kotrlik, & Higgins, 2001) [16], hence from the table a sample size of 130 nurses participated in the study. The study was based in both private and public hospitals and targeted the nurse's population. The target population was the nurses working in both private and public hospitals in the County. Identification of the hospitals in which to carry out the research was identified using purposive sampling. Stratified sampling method was used in this study; whereby the selected hospitals each made a stratum, then nurses were picked randomly from each hospital to participate in the study. In each hospital different number of nurses was selected to participate in the study depending on the total population of nurses per stratum. Nurses were assigned roman numbers randomly and those who picked odd numbers were selected until the required sample size per site was achieved. A ratio was used to get the sample size for each hospital guided by the sample size determined for each hospital. No incentive was provided to participants. All study protocols and the survey instrument were approved by the University Human Research Ethics committees and conducted in accordance with the ethical principles of the Declaration of Helsinki.

2.2. Protocol

A self-administered questionnaire was distributed randomly to individual nurses and then collected immediately after completion. The following information were gathered; Personal data; age, sex, duration of employment, nurses' awareness on musculoskeletal disorders and total working time in weeks.

2.3. Statistical Analysis

Data from returned surveys was entered into, and analyzed, using statistical packages for social sciences (SPSS Inc, USA) and Excel. Data was presented using descriptive statistics in the form of frequencies and percentages for categorical variables and means and standard deviations for quantitative variables. Chi-square test of independence analysis was used for the assessment of quantitative variable interrelationships. Significance was considered at $p \leq 0.05$.

3. Results

Majority of nurses were female (76.9%) while male nurses were few (23.1%) (Table 1). The Chi square test shows that there was significant association between the female gender and nursing profession ($p = 0.00$) while male gender had no significant association with the profession ($p > 0.05$).

The average age of the nurses was 35 years and standard deviation of 8.076 (35 ± 8.07). All the male nurses who participated in the study were in the age bracket of less than 30 years old. Majority (40%) old nurses were female. According to the results of this study there was no significant association between any age category and the gender as well as nursing profession (p > 0.05) any association seen could be by chance (Table 2).

Regarding work experience, 49.2% of the nurses in the study had a work experience of between 1 - 5 years, 15.4% of them had 5 - 10 and more than 20 years of work experience, respectively while the remaining 20% of them had the experience between 10 - 20 years (Table 3).

The nurse's awareness of WMSD and its association with working for many years was high (51% and above). Chi square test showed that there was statistically significant association (p = 0.00) between the number of years in the profession and the frequency of the nurses per category of work experience (Table 4).

Table 1. Gender of the participants.

Gender	Frequency (n)	Percent (%)	p-value
Male	30	23.1	0.15
Female	100	76.9	**0.00**
Total	130	100.0	

Table 2. Age categorization of the participants.

Age	Male (%)	Female (%)	p-value
<30 years	100.0	22.0	
>30 - 35 years		19.0	
>35 - 40 years		19.0	0.40
>40 years		40.0	
Total	100.0	100.0	

Table 3. Number of years in nursing employment.

Time in employment	Frequency (n)	Percent (%)
1 - 5 years	64	49.2
>5 - 10 years	20	15.4
>10 - 15 years	13	10.0
>15 - 20 years	13	10.0
>20 years	20	15.4
Total	130	100.0

Table 4. Nurses' awareness level on work related musculoskeletal disorders.

| Work experience in years	1 - 5	>5 - 10	>10 - 15	>15 - 20	>20	p-value
Aware	10.0%	25.0%	51.0%	70.0%	95%	
Not aware	90.0%	75.0%	49.0%	30.0%	5.0%	0.00
Total	100%	100%	100%	100%	100%	

Awareness level of work-related musculoskeletal disorders was rated as low, moderate and high (0% - 30%, 31% - 55% and 56% and above, respectively). This study showed that 12.3% of the nurses were working for 4 days in a week, 35.4% were working for 5 days in a week and 46.2% were working for 6 days in a week while 6.2% were working for 7 days in a week (Table 5).

From the study 53.8% of the nurses worked for 6 - 8 hours in a day while 46.2% worked for more than 8 hours in a day (Table 6). The p-value for daily working hours and the WMSD was 0.02 hence there was statistically significant association at 95% confidence interval.

From this study 9.2% of the nurses attended to patients between 0 - 5 patients in a day, 18.5% attended to 5 - 10 patients in a day, 6.2% attended to 10 - 15 patients in a day while 66.2% attended to more than 15 patients in a day (Table 7).

In this study 6.9% of the nurses were working in other fields that could cause WMSD while 93.1% were not (Figure 1).
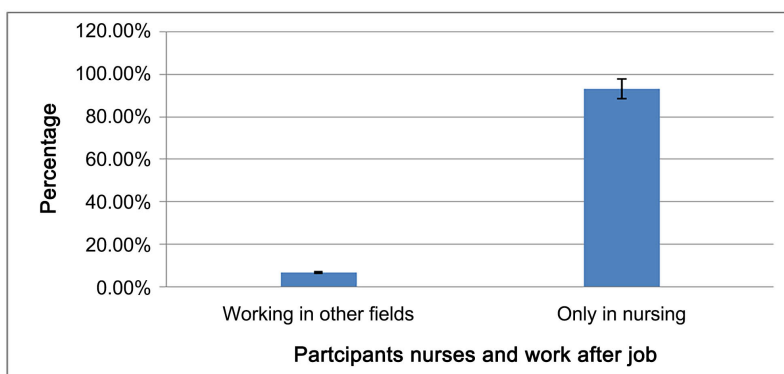
Figure 1. Nurses working in other fields that could cause WMS.

Table 5. Nurses number of working days per week.

Number of working days in a week	Frequency (n)	Percent (%)
4 days	16	12.3
5 days	46	35.4
6 days	60	46.2
7 days	8	6.2
Total	130	100.0

Table 6. Awareness level of WRMSD verse number of working hours in day.

Awareness level on work related musculoskeletal disorders verse daily working hours				
No of work hours per day	Low	Moderate	High	p-value
6 - 8	25.0%	51.0%	56.0%	0.00
>8	5.0%	49.0%	78.0%	

Table 7. Number of patients attended to in a day.

Number of patients attended to in a day	Frequency (n)	Percent (%)
Below 5	12	9.2
>5 - 10	24	18.5
Below 15	8	6.2
Above 15	86	66.2
Total	130	100.0

4. Discussion

The objective of the study was to establish awareness of work-related musculoskeletal disorders among the nurses in Kakamega county. The Pearson chi square test showed that there was significant association between the female gender and nursing profession while male gender had no significant association with the profession. It was relevant to understand the importance of gender in WMSD. Nursing profession is very demanding jobs because it deals with patients which some are very sick hence requiring virtues like sympathy, perseverance and tolerance which most male lack. A similar study done by Derek *et al.* (2003) [17] on Musculoskeletal disorders among staff in South Korea's largest nursing home reported almost similar results in that majority participants were female (80.2%). Meanwhile, the study demonstrated that nurses' gender has an influence on the perception of workload and demand. Male gender was found to predict an increased perception of work demand. This might be attributed to the fact that the nursing profession has been, for centuries, linked to feminine gender. Therefore, female nurses may better cope with work situations, as they may be more convinced with their duties and responsibilities, which may give them a feeling of satisfaction with what they do and this may help alleviate some of the job stress perceived. It is also possible that male nurses were assigned or accepted heavier work assignments because of a perception that males can provide more labor-intensive care. These findings highlight the importance of job demand as a risk factor for the development of WMSDs, which consequently lead to burnout. Job demand was associated with WMSDs. The other sociodemographic characteristics of nurses had no influence on the number of WMSDs reported, as has been previously shown in a Korean study on emergency nurses (Kee *et al.*, 2007) [18].

In the study majority of the old nurses were female. The nursing profession in the past attracted mostly the female gender, although even at present the male gender in this profession are still few as evidence elsewhere in this study. The new generation has attracted both the male and female gender. The age of workers is very important since, the old workers are prone to diseases. Employees who have worked for many years are exposed to different kind of disease-causing agents, including occupational diseases. The results of Derek *et al.*, (2003) [17] are almost similar with the result of this study in that they reported

an average age of 47.0 years with a standard deviation of 8.0 and an age range of 27 to 62 years. A study on work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria reported an average age of 36.4 ± 7.75 years (Tinubu *et al.*, 2010) [19]. Report of other studies showed that none of the socio-demographic characteristics of the nurses had a significant effect on the burnout score. This might be explained by the stronger influence of workload and back pain than that of the socio-demographic characteristics. However, in disagreement with this, other studies showed a decline in burnout among nurses as they mature in age and a decrease of job stress level with increasing age (El-kahlout *et al.*, 2003) [20]. Also, found an association between burnout and sex and experience years. However, these factors may be confounders (Iglesias, 2010) [21]. A high percentage of the nurses reported increased job demands and greater workloads. These finding are expected, given the nature of emergency work (Adriaenssens *et al.*, 2011) [22].

The nurse's awareness of WMSD and its association with working for many years was high. This clearly indicates that nurses who have worked for many years are more knowledgeable in terms of their profession and how it could affect them in terms of WRMSD and other associated risk. The young nurses are flexible than the old especially while performing activities like carrying and transferring patients from bed to bed. Chi square test showed that there was statistically significant association between the number of years in the profession and the frequency of the nurses per category of work experience. Employees who are not familiar with the work process and procedures are prone to accidents and near miss. On the other hand, employees who have worked for many years also are prone to occupational diseases such WRMSDs, especially if they are exposed to disease causing agents for many years. The result of this study concurs with that of Akello (2013) [23] at KNH; he reported that more than half of the nurses (55.8%) had a work experience of 3 to 12 years

The findings showed that almost half of the respondents were working for 6 days in a week while only six percent were working for 7 days in a week. Possible reason is that since nurses are usually under staffed, they are forced to work extra days in a week. Level 4 - 5 hospitals have to operate twenty-four hours seven days in a week (WHO, 2007) [3]. Those working for long hours could be due to some local arrangements with their colleagues so that they can extend their off days. Performing similar task over and over again for long hours predispose workers to WMSDs; for example, carrying out injections by nurses while standing causes WMSDs. Under the Regulation of Wages (General) order, subsidiary to the Regulations of Wages and Conditions of Employment Act, the general working hours are 52 per week, but the normal working hours usually consist of 45 hours of work per week, Monday to Friday 8 hours each, 5 hours on Saturday under the special Orders for different sectors subsidiary to the Regulations of Wages and Conditions of Employment Act 2007 laws of Kenya (Kenya Constitution 2010). Collective agreements may modify the working hours, but general-

ly provide for weekly working hours of 40 up to 52 hours per week. Nurses who took part in the study reported that after long working hours they normally feel totally exhausted and their alertness is decreased and hence they cannot work properly (OSH, 2007) [24]. Munabi *et al.* (2014) [25] in their studies on musculoskeletal disorder risk factors among nursing professionals in low resource settings in Uganda found out that the average working hours per week was 43.7 (SD 18.9) hours. In this study 52.4% of the nurses worked for an average of 42 hours and above. Nurses working more than 12 hours at a time have a significantly greater risk of bearing a work-related injury (Lockley *et al.*, 2007) [26]. Working long hours with little break time between (to see friends and family) has negative mental effects. A study done by Beecroft *et al.* (2008) found that nurses who have control over their working hours experience more job satisfaction, while a study done by Akello (2013) [23] showed that long working hours had a significant negative impact on mental well-being of the nurses.

The findings clearly indicate that nurses working in Kakamega County may suffer from burnout and fatigue at the end of a long shift and the nurses were very much aware of this risk. It also supports the high cases of WMSDs reported in this study. Since majority of nurses in the study preferred working for 12-hour shifts, it is likely that they will suffer from burnout and other occupational diseases such as WMSDs. In order to reduce the harm, they can cause to patients because of loss of concentration and fatigue, introduction of breaks during working long shifts is very crucial in this profession. It reduces the chance of making errors and improves their work productivity and efficiency. Taking tea breaks and lunch breaks is very important and nurses working during the night should take nap breaks. Munabi *et al.* (2014) [25] in their study on musculoskeletal disorder risk factors among nursing in Uganda found that on average respondents had 1.5 (SD 1.3 breaks) during the course of their working day, however 60% of them reported that their breaks were insufficient and they were not rested after the breaks and this significantly contributed to their MSD. Their results concur with the current study.

The study also found that sixty six percent of the respondents attended to more than 15 patients in a day. Since nurses work for long hours, it is likely that they will attend to a large number of patients in a shift. Attending to large number of patients and working in the same posture has a direct relationship to WMSDs among the employees. Tinubu *et al.* (2010) [19] in their study found that attending to high number of patients in one day (44.9%) were the most perceived job risk factors for WMSDs among the nurses in Nigeria. They further stated that long working shifts could not allow them to work in other fields because of exhaustion and fatigue after work. Majority of nurses reported that after long shift they just take a shower and retire to bed till the next day to work. Due to economic status of the county and low salary, a few (6.9%) nurses might be forced to work in other fields to generate extra income for sustaining their families which may cause WMSDs other than their profession. This could be con-

founding factors for WMSDs among the few nurses who do other jobs. A similar study by Woolf and Pfleger, (2003) showed that 48.7% of nurses reported that circumstances in their private lives significantly affected their work and may lead to WMSDs. Adegoke *et al.* (2008) [27] posited that work may only be a contributory factor in the etiology of musculoskeletal disorders among workers and that it may be difficult to distinguish between WMSDs and musculoskeletal disorders since their consequences in response to work demands may be similar.

5. Conclusion & Recommendation

From this study it is clear that nursing as a profession attracts mostly female population than the male counterparts in Kakamega County. This is because the female participants were many as compared to the male participants hence more female are likely to be affected by WRMSD. The level of awareness of ergonomic hazards among the nurses was generally moderate (31% - 55%) to high (56% and above). The study recommends retraining and short courses to refresh nurses' knowledge on WRMSD and best ways of prevention.

Declarations

Authors & Contributions

Micky Olutende Oloo, Anthony Muchiri and Dr. David Kaniaru conceived the paper, designed and performed the study. Prof Edwin Wamukoya contributed the analysis software and analyzed the data and was the paper's peer reviewer. All authors read and approved the final manuscript.

Disclaimer

The findings and conclusions presented in this manuscript are those of the authors and do not necessarily reflect the official position of Masinde Muliro University.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Aptel, M., Aublet-Cuvelier, A. and Cnockaert, J. (2002) Work Related Musculoskeletal Disorders of the Upper Limb. *Joint Bone Spine*, **69**, 546-555.
https://doi.org/10.1016/S1297-319X(02)00450-5

[2] National Institute for Occupational Safety and Health (2007) Ergonomic Guidelines for Manual Material Handling. DHHS (NIOSH) Publication No. 2007-131. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Washington DC.

[3] WHO (2007) Global Goals for Occupational Health and Safety. Federation Health Safety Internationale. *International Archives of Occupational and Environmental Health*, **32**, 74-77.

[4] Smith, D.R. and Leggat, P.A. (2004) Musculoskeletal Disorders among Rural Aus-

tralian Nursing Students. *Australian Journal of Rural Health*, **12**, 241-245.
https://doi.org/10.1111/j.1440-1854.2004.00620.x

[5] Leijon, M., Hensing, G. and Alexanderson, K. (2009) Gender Trends in Sick Listing with Musculoskeletal Symptoms in a Swedish County during a Period of Rapid Increase in Sickness Absence. *Scandinavian Journal of Social Medicine*, **24**, 56-68.

[6] Holder, N., Clark, J., Di Blasio, J., Hughes, C., Schrpf, J., Harding, L. and Shepard, K. (2009) Cause, Prevalence, and Response to Occupational Musculoskeletal Injuries Reported by Physical Therapists and Physical Therapist Assistants. *Physical Therapy*, **79**, 45-52.

[7] Josephson, M., Lagerstrom, M., Hagberg, M. and Wigaeus, H.E. (1997) Musculoskeletal Symptoms and Job Strain among Nursing Personnel: A Study over a Three-Year Period. *Occupational & Environmental Medicine*, **54**, 681-685.
https://doi.org/10.1136/oem.54.9.681

[8] Trinkoff, A.M., Lipscomb, J.A., Geiger-Brown, J. and Storr, C.L. (2009) Perceived Physical Demands and Reported Musculoskeletal Problems in Registered Nurses. *American Journal of Preventive Medicine*, **24**, 270-275.
https://doi.org/10.1016/S0749-3797(02)00639-6

[9] Zurbrüg, C. (2004). Urban Solid Waste Management in Low-Income Countries of Asia. How to Cope with the Garbage Crisis. *Scientific Committee on Problems of the Environment* (*SCOPE*), *Urban Solid Waste Management Review Session*, Durban, November 2002, 1-13.

[10] Embriaco, N., Papazian, L., Kentish-Barnes, N., Pochard, F. and Azoulay, E. (2007) Burnout Syndrome among Critical Care Healthcare Workers. *Current Opinion in Critical Care*, **13**, 482-488. https://doi.org/10.1097/MCC.0b013e3282efd28a

[11] Popa, F., Raed, A. and Purcarea, V. (2010) Occupational Burnout Levels in Emergency Medicine: A Nationwide Study and Analysis. *Journal of Medicine and Life*, **3**, 207-215.

[12] Jourdain, G. and Chênevert, D. (2010) Job Demands—Resources, Burnout and Intention to Leave the Nursing Profession: A Questionnaire Survey. *International Journal of Nursing Studies*, **47**, 709-722. https://doi.org/10.1016/j.ijnurstu.2009.11.007

[13] Sundin, L. (2009) Work Related Social Support Job Demands and Burnout, Studies of Swedish Workers, Predominantly Employed Health Care. Department of Neuroscience, Section of Psychology, Karolinska Institutet, Stockholm.

[14] Wu, H., Sun, W. and Wang, L. (2011). Factors Associated with Occupational Stress among Chinese Female Emergency Nurses. *Emergency Medicine Journal*, **29**, 554-558. https://doi.org/10.1136/emj.2010.094391

[15] Wiegmann, D.A., Thaden, T.L.V. and Gibbons, A.M. (2007). A Review of Safety Culture Theory and Its Potential Application to Traffic Safety. AAA Foundation for Traffic Safety, Washington DC.
https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.170.2219&rep=rep1&type=pdf

[16] Bartlett, J.E., Kotrlik, J.W. & Higgins, C.C. (2001) Organizational Research: Determining Appropriate Sample Size in Survey Research. *Learning and Performance Journal*, **19**, 43-50.

[17] Smith, D.R., Choi, J.W., Ki, M., Kim, J.Y. and Yamagata, Z. (2003) Musculoskeletal Disorders among Staff in South Korea's Largest Nursing Home. *Environmental Health and Preventive Medicine*, **8**, Article No. 23.
https://doi.org/10.1007/BF02897940

[18] Kee, D. and Seo, S.R. (2007) Musculoskeletal Disorders among Nursing Personnel

in Korea. *International Journal of Industrial Ergonomics*, **37**, 207-212.
https://doi.org/10.1016/j.ergon.2006.10.020

[19] Tinubu, B.M.S., Mbada, C.E., Oyeyemi, A.L. and Fabunmi, A.A. (2010) Work-Related Musculoskeletal Disorders among Nurses in Ibadan, South-West Nigeria: A Cross-Sectional Survey. *BMC Musculoskeletal Disorders*, **11**, Article No. 12.
https://doi.org/10.1186/1471-2474-11-12

[20] Elkahlout, G. and Algaed, A. (2003) The Effect of Some Socio-Demographic Factors on Job Stress Level in Nursing Work. *Umm Al‐Qura University Journal of Educational and Social Sciences and Humanities*, **15**, 34-53.

[21] Iglesias, M., Vallejo, B. and Fuentes, P. (2010) The Relationship between Experiential Avoidance and Burnout Syndrome in Critical Care Nurses: A Cross-Sectional Questionnaire Survey. *International Journal of Nursing Studies*, **47**, 30-37.
https://doi.org/10.1016/j.ijnurstu.2009.06.014

[22] Adriaenssens, J., De gucht, V., Dan, der doef, M. and Maes, S. (2011) Exploring the Burden of Emergency Care: Predictors of Stress-Health Outcomes in Emergency Nurses. *Journal of Advanced Nursing*, **6**, 1317-1328.

[23] Akello, J.M. (2013) Analysis of Musculoskeletal Disorders amongst Nurses: A Case Study of Kenyatta National Hospital. Master of Science in Occupational Safety and Health, Jomo Kenyatta University of Agriculture and Technology, Juja.

[24] OSH (2007) Occupational Safety and Health Act No 15 of 2007. Government Printer, Nairobi.

[25] Munabi, I.G., William, B., David, L.K., Joseph, O. and Erisa, S.M. (2014) Musculoskeletal Disorder Risk Factors among Nursing Professionals in Low Resource Settings: A Cross-Sectional Study in Uganda. *BMC Nursing*, **13**, Article No. 7.
https://doi.org/10.1186/1472-6955-13-7

[26] Lockley, S.W., Barger, L.K., Ayas, N.T., Rothschild, J.M., Czeisler, C.A. and Landrigan, C.P. (2007) Effects of Health Care Provider Work Hours and Sleep Deprivation on Safety and Performance. *The Joint Commission Journal on Quality and Patient Safety*, **33**, 7-18. https://doi.org/10.1016/S1553-7250(07)33109-7

[27] Adegoke, B.A., Akodu, A.K. and Oyeyemi, A.L. (2008) Work-Related Musculoskeletal Disorders among Nigerian Physiotherapists. *BMC Musculoskeletal Disorders*, **9**, Article No. 112. https://doi.org/10.1186/1471-2474-9-112