Ergonomics and Work Related Stress among Staff Nurses

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Abstract

Background: The benefits of ergonomics in nursing include increasing of the quality of nursing care, decreasing nursing shortage, and staff burnout. Aim of the study: assessing the relationship between ergonomics and work-related stress among staff nurses. Subjects and methods: The study was conducted at Menouf Fevers Hospital using a descriptive correlational design on all 140 staff nurses in the setting. Data was collected using a self-administered questionnaire including an ergonomics questionnaire and a work-related stress rating scale. Result: Nurses’ age was mostly 20 to less than 25 years (41.4%), with a majority of females (89.3%), with diploma degree (81.4%). Only 17.9% of the nurses considered their workplace as ergonomically adequate, and the majority had high total stress (84.3%). The areas of highest stress the disagreement among nurses (90.7%), conflict with physicians (92.9%), and lack of support from leadership (93.6%), whereas the least stressful were those of nurse capability (28.6%) and dealing with dying patient (47.9%). A significant negative correlation was found between staff nurses’ scores of adequacy of ergonomics and work related stress. In multivariate analysis, male gender and nursing qualification were negative predictors of the score of adequacy of ergonomics, while the ergonomics adequacy score was a negative predictor of the stress score. Conclusion and recommendations: The ergonomics adequacy score is a negative predictor of the stress score. The study recommends training in ergonomics, and stress management programs, with intervention studies to investigate the effectiveness of improving workplace ergonomics on nurses’ job stress and productivity.

Key words: Ergonomics, Staff Nurses, Work Related Stress

Introduction

Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design to optimize human well-being and overall system performance (Zakerian et al, 2013). It is the science of fitting the job to the worker (International Ergonomics Association [IEA], 2013).

Ergonomic injuries may result when various human interactions with the environment result in repetitive motion, static or awkward posture, standing for long periods of time in one position, or heavy lifting. Nursing is ranked as one of the occupations with the most incidences of workplace related injury and illness (Seaward, 2011).

Back pain is reported as an important contributor to job changes among nurses.
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(Sheikhzadeh et al, 2009). Healthcare workers can develop musculoskeletal disorders from any number of common work activities, including the following: forceful exertions (activities that require a person to apply high levels of force, such as during lifting, pushing, or pulling heavy loads), awkward postures when lifting, repeated activities without adequate recovery time (Howard, 2010).

Nursing work involves a risk activity; with highly prevalent of musculoskeletal complaints related to the low back, neck and shoulder pain (Carneiro et al, 2012). Many factors in the work environment could contribute to nurses’ exposure to physical hazards and musculoskeletal disorder as potential consequences of physical hazards is considered one of serious issue among nurses (Yang et al, 2012).

The changing in the nature of nursing practice with the delivery of more acute care support, it is incumbent upon practitioners to minimize these risk and other occupation hazards with the careful assessment of risk and the adaption of recommended practices to maintain their safety and wellbeing (Royal College of Nursing, 2013).

A training program, designed and implemented aimed to provide continual education, training and maintaining clinical competency, in service education is one vehicle for monitoring the skills, knowledge and awareness of nurses (Lipman, 2013).

Significance of the Study:

The analyses of the associations between occupational stressors and work-related musculoskeletal injury outcomes may help to recognize the components and propose corrected actions and prevention programs. This study is an attempt to contribute to the knowledge base by exploring the influence of work behavior and occupational risk factors on the development musculoskeletal complaints as perceived by nurses.

Ergonomics is especially important in the caregiving setting, where many patients rely on staff members for mobility. Medical staff suffer from the highest work-related injury rates of all employees. To reduce injuries, in caregiving institutions provide special equipment to assist nurses with patient care. While these tools help, nurses ultimately create a safe work environment. So, Understanding ergonomics is important for nurses as a large portion of patient care activities involve lifting, moving or positioning patients and equipment. This places nurses at high risk for physical injury.

Aim of the study:

The aim of this study was to assess relationship between Ergonomics and work related stress among staff nurses through:

1- Determining ergonomics among staff nurses
2- Assessing work related stress among staff nurses
3- Finding out relationship between ergonomics and work related stress

Research questions:

Is there a relationship between ergonomics and work related stress among staff nurses?

Subjects and methods:

Technical design

The technical design includes a description of the research design, setting, subjects of the study, and the tools of data collection.
Research design

Descriptive correlational design was followed in this study.

Setting

The study was conducted at Menouf fever hospital, the hospital has nine departments and units providing multi service such as (emergency department - hemodialysis unit- intensive care unit for infectious diseases - acute hepatitis department- isolation for chest diseases department- hepatic diseases and endoscopy department- gastroenteritis department- fever of un known origin (FUO) department-isolation department) this 200 bed- capacity.

Subjects

The study sample consisted of the staff nurses in aforementioned setting. Their total number was 140 staff nurses. No inclusion or exclusion criteria were set except being working in the setting during the time of the study.

Sample size

This sample size was large enough to identify a correlation coefficient of 0.25 or higher with 90% power and at a 95% level of confidence between the score of ergonomics and work-related stress, using the Open-Epi software program, and after accounting for a non-response rate of about 10%.

Tools of data collection: Two tools used

Tools of this study consisted of Two tools namely;

Ergonomics profile and work related stress rating scale

Tool 1: ergonomic profile, it consisted of two parts.

Part1: Demographic data of the respondents such as age, gender, marital status, educational level, years of experience .... etc.

Part 2: ergonomic profile: This was used to assess the effect of ergonomics among staff nurses. It was developed by Nag (1988). They are categorized into five main domains as follows.

1) Manual materials handling, (6 items), 2) workplace/workplace design (13 items), 3) work posture (4 items), 4) work environment (9 items), 5) work time schedule (4 items).

Scoring system

The possible response for the tool items will be by using 5 point likert scale. (1 = strongly dis\agree; 2= disagree; 3= neither disagree nor agree; 4 = agree; 5= strongly agree) and are scored from 1-5.

Tool 2: Stress Rating Scale

Used to assess levels of work related stress among staff nurses. It was developed by Gray and Anderson (1981) and modified by Shehata (2008). The scale consists of 52 items.

The items are classified under eight main categories of stress.

Scoring system

The items checked from "No influence at all" to "very influential" Were respectively scored from one to five; a higher score indicates higher level of stress. Totals of the eight categories and the total scale were calculated and means, standard deviations, medians and inter quartile ranges were computed for quantitative analysis. Then, the sums of scores were converted into percent scores, and for the categorical analysis of each category as well as for the total score of stress, a score of 60% or higher was considered as
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high stress, while a lower score was considered low stress. For descriptive presentation of the items, the 5-point scale was compressed into three categories of stress "No influence," "Uncertain" and "influential."

Operational design:

The operational study included preparatory phase, pilot study and field work.

Preparatory phase:

It included reviewing current and past, local and international related literature using books, articles, periodicals, journals and internet to conduct this study.

Pilot study:

A pilot study was carried out on a sample of staff nurses representing about 10% of the study sample. The aim was to test the clarity and applicability of the tool and time needed for filling it out. Necessary modifications were done according to the results of the pilot study.

Fieldwork:

After securing official approvals for conducting the study, the researcher met with the Nursing Director of the hospital to explain the aim of the study and to determine the suitable time to collect the data. Then, the researcher met with the staff nurses individually to explain the purpose of the study and invite them to participate.

The researcher was present all the time to respond to any queries. The completed forms were then collected and checked for completeness. The work was done three days per week from 10:00 AM to 1:00 PM. The process of data collection lasted for one month, February 2018.

Ethical considerations:

The study protocol was approved by the Research and Ethics committee at the Faculty of Nursing, Ain-Shams University. Official permissions were obtained from the director of the study hospital to collect data for the study. The researcher met with the staff nurses to explain the purpose of the study, the data collection process, and to inform them about their rights to refuse or withdraw at any time. Those who gave their verbal consent to participate were reassured about the anonymity of the information collected, and that it would be used only for the purpose of scientific research.

Administrative design:

To carry out the study at the selected settings, official letters were issued from the Faculty of Nursing, Ain-Shams University to get permission from the hospital administration and the nursing director. The purpose of the study and its procedures were explained to them to get their consent and cooperation.

Statistical design:

Data entry and statistical analysis were done using SPSS 20.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations and medians and interquartile ranges for quantitative variables. Cronbach alpha coefficient was calculated to test the reliability of the scales through their internal consistency. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In larger than 2x2 cross-tables, no test could be applied whenever the expected value in 10% or more of the cells was less than 5. Spearman rank correlation was used for assessment of the inter-relationships among quantitative
variables and ranked ones. In order to identify the independent predictors of the ergonomics and stress scores, multiple linear regression analysis was used, and analysis of variance for the full regression models done. Statistical significance was considered at p-value <0.05.

Results

Table (1): Demographic characteristics of nurses in the study sample (n=140)

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-</td>
<td>58</td>
<td>41.4</td>
</tr>
<tr>
<td>25-</td>
<td>47</td>
<td>33.6</td>
</tr>
<tr>
<td>&gt;30</td>
<td>35</td>
<td>25.0</td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15</td>
<td>10.7</td>
</tr>
<tr>
<td>Female</td>
<td>125</td>
<td>89.3</td>
</tr>
<tr>
<td>Nursing qualifications:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>114</td>
<td>81.4</td>
</tr>
<tr>
<td>Bachelor</td>
<td>26</td>
<td>18.6</td>
</tr>
<tr>
<td>Experience year:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10</td>
<td>88</td>
<td>62.9</td>
</tr>
<tr>
<td>10+</td>
<td>52</td>
<td>37.1</td>
</tr>
<tr>
<td>Marital Status:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>34</td>
<td>24.3</td>
</tr>
<tr>
<td>Married</td>
<td>106</td>
<td>75.7</td>
</tr>
<tr>
<td>Training courses:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>41</td>
<td>29.3</td>
</tr>
<tr>
<td>Yes</td>
<td>99</td>
<td>70.7</td>
</tr>
</tbody>
</table>

Table (1): The study sample involved 140 nurses whose age was mostly 20 to less than 25 years (41.4%) as shown in Table 1. The majority were females (89.3%) having a diploma degree (81.4%), and married (75.7%). Slightly less than two-thirds of them (62.9%) had less than 10-year experience, and 70.7% had previously attended training courses.

Figure (1): Total level of stress as reported by nurses in the study sample (n=140).

Figure (1): As illustrated in Figure 1, the majority of the nurses in the study sample were having high total work stress (84.3%).
### Table (2): Correlation matrix of ergonomics scale domains scores

<table>
<thead>
<tr>
<th>Ergonomics domains</th>
<th>Spearman's rank correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1. Manual materials handling</td>
<td></td>
</tr>
<tr>
<td>2. Workplace design</td>
<td>-.179*</td>
</tr>
<tr>
<td>3. Work posture</td>
<td>-.019</td>
</tr>
<tr>
<td>4. Work environment</td>
<td>-.005</td>
</tr>
<tr>
<td>5. Work time schedule</td>
<td>-.204*</td>
</tr>
</tbody>
</table>

(*) Statistically significant at p<0.05
(**) Statistically significant at p < 0.01

Table (2): demonstrates statistically significant weak positive correlations between nurses' scores of ergonomics of workplace design and work environment (r=0.417) and work time schedule (r=0.296). Conversely, negative weak correlations were shown between their scores of ergonomics of manual material handling and workplace design (r=-0.179) and work time schedule (r=-0.204).

### Table (3): Correlation matrix of stress scale domains scores

<table>
<thead>
<tr>
<th>Stress Domains</th>
<th>Spearman's rank correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1. Dealing with dying patients</td>
<td></td>
</tr>
<tr>
<td>2. Disagreement among nurses</td>
<td>.192*</td>
</tr>
<tr>
<td>3. Uncertainty about treatment</td>
<td>.261***</td>
</tr>
<tr>
<td>4. Conflict with physicians</td>
<td>-.018</td>
</tr>
<tr>
<td>5. Lack of leader support</td>
<td>.056</td>
</tr>
<tr>
<td>6. Workload</td>
<td>.417**</td>
</tr>
<tr>
<td>7. understaffing</td>
<td>.164</td>
</tr>
<tr>
<td>8. nurse capability</td>
<td>.344**</td>
</tr>
</tbody>
</table>

(*) Statistically significant at <0.05
(**) Statistically significant at P < 0.01

Table (3): As displayed in nurses' scores of the eight stress areas had statistically significant weak to moderate positive correlations in almost all areas. The strongest correlation was between the scores of nurse capability and workload (r=0.492).

### Table (4): Correlation between nurses' ergonomics and stress scores and their characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Spearman's rank correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ergonomic adequacy scores</td>
</tr>
<tr>
<td>Stress</td>
<td>-.276**</td>
</tr>
<tr>
<td>Age</td>
<td>.072</td>
</tr>
<tr>
<td>Qualifications</td>
<td>-.122</td>
</tr>
<tr>
<td>Experience</td>
<td>.147</td>
</tr>
</tbody>
</table>

(**) Statistically significant at p<0.01

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Table (4): indicates a statistically significant weak negative correlation between nurses scores of adequacy of ergonomics and work stress (r= -0.276). Meanwhile, no significant correlations could be revealed with their age, qualification, or experience.

Figure (2): Total ergonomic adequacy of work as reported by nurses in the study sample (n= 140).

Figure (2): illustrates, slightly less than one-fifth of the nurses in the study sample considered their workplace as ergonomically adequate (17.9%).

Discussion:

According to the present study findings, the area of least ergonomic adequacy was that of work time schedule, where only less than one-tenth of them considered it adequate. This was mostly related to working night shifts, overtime/extra work time, in addition to the uneven distribution of the work throughout the shift, and working at a predetermined pace/time limit. This would lead to inefficient use of time, and consequently lower quality nursing care.

The area of work posture was second lowest in the adequacy of ergonomics as reported by the staff nurses in the present study. This was mainly due to working with the back bent and twisted, in addition to working with arms above shoulder and/or away from the body. These awkward working positions would certainly harm the nurses and lead to a number of musculoskeletal disorders (MSD), which are common in the nursing profession as reported by Thinkhamrop and Laohasiriwong (2015) and Chiwaridzo et al (2018). Moreover, Bulduk et al (2014) mentioned that work-related musculoskeletal problems is a world challenge across countries, and they have become an international issue in ergonomic disorders.

The present study results also demonstrated that the area of workplace design was considered ergonomically inadequate by a majority of the nurses. This is one of the most important area in ergonomics, which is mainly aimed at fitting the work to the worker. This would make the performance of the job easier for the nurse, with more efficient use of the time and effort. In congruence with this, a study in the United States demonstrated an improvement in work efficiency and a decrease in musculoskeletal disorders following an intervention aimed at re-designing the workplace to be more ergonomically adequate (Robertson et al, 2017).

The inadequacy of the ergonomics of workplace design in the present study was mainly attributed to three major areas. The first is the work surface floors, which are slippery, uneven, cluttered or unstable, thus exposing nurses to workplace falls and
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Accidents. The second area was related to seats with dimensions mismatched with human dimensions, with minimum adjustability, and providing no hold/support to work with the machinery. The third area is related to the equipment handholds and footholds that demand awkward position of limbs, with design mismatch of handles and supports unrecognizable by their place, form or construction. In this respect, adequate seating with ergonomically designed chairs was shown to be associated with better work performance and less ergonomic hazards among dentists in the United Kingdom (Plessas and Bernardes Delgado, 2018).

Lastly, slightly more than a half of the nurses in the current study considered their work environment as being ergonomically adequate. This was mainly attributed to lack of noise, good lighting, adequate ventilation with dust-free environment, and protection from radiation. These factors provide a comfortable environment for the nurses to work in and to feel safe while performing their job. In congruence with this, a study in the United States demonstrated that the ergonomic improvement of the work environment with proper temperature, lighting, and ventilation led to better productivity and less musculoskeletal disorders among radiologists (Sze et al, 2017).

Overall, only less than one-fifth of the staff nurses in the present study considered their workplace as ergonomically adequate. This is a finding of major concern since it might have a negative impact on the work of the nurses in this setting and on their wellbeing, and consequently on the quality of patient care.

Concerning the factors influencing staff nurses’ view of the ergonomic adequacy of their workplace, the bivariate analysis of the current study the attendance of training courses was shown to be significantly associated with a higher percentage of reported adequate ergonomics. However, in the multivariate analysis, female gender and higher nursing qualification were identified as statistically significant independent negative predictors of the ergonomic adequacy score. The negative impact of the female gender could be due to their longer experience in the nursing profession, with more ability of critical evaluation of the work environment. Similarly, a nurse with higher qualification would have a more exigent evaluation of the work setting regarding its ergonomic adequacy. A similar association with higher nursing qualification was reported by in a study on nurses in Zimbabwe (Chiwaridzo et al, 2018).

The present study has also evaluated work-related stress among nurses. The findings indicate generally high levels of stress among them. According to the study findings, the lack of support from leadership turned to be the area with the highest stress among the nurses. This was attributed to a multitude of causes such as the lack of hospital administration support, lack of attention to complaints of nurses, lack of opportunities for staff development, inadequate support from direct head who takes decisions individually, and lack of justice in dealing with nurses. These factors should be the main focus for any intervention to relieve job stress among nurses. In agreement with this, a study in Finland highlighted the importance of leadership support and of paying great attention to nurses’ needs to prevent work-related stress among them (Seitovirta et al, 2016).

The area of conflict with physicians came second in highest ranking of stress factors among the staff nurses in the current study. This is mainly due to the deeply-rooted awkward relation between nurses and physicians with the latter assuming an authoritative role in this relationship. Moreover, physicians may intrude in nurses’ work, and often have delayed response when
the nurses request their attendance. Many of these conflicts might be resolved through regular meetings between medical team and nursing staff; however, this was lacking in the study setting. Thus, Levin and Parker (2015) suggested a mediation model with a communication-training approach in order to mitigate such conflicts.

In agreement with the foregoing present study findings, a study in Italy found high nurse-physician conflicts and attributed it to the ambiguous roles and different perspectives where physicians’ expectations refer to technical preparation and efficiency, while nurses look for collaboration, teamwork and emotional support (Panari et al., 2016).

The disagreement among nurses was the third most commonly reported area leading to high stress among the nurses in the present study. This was mainly attributed to the failure to regulate nursing role, leading to role ambiguity and more conflicts among staff nurses. Other underlying factors included the competition for incentives and for upgrading to a higher position, lack of cooperation, wrangling and loud talking among nurses. This would create a negative working environment leading to high job stress. In congruence with this, a study in the United States reported that nurse-to-nurse conflict was a major source of work-related stress among nurses. The authors concluded that conveying respect could help nurses manage and even avoid conflict and stress (Moreland and Apker, 2016).

In total, the majority of the staff nurses in the current study had high level of total work-related stress. Such stress had no statistically significant relation with any of their personal characteristics, neither in bivariate nor in multivariate analyses. This indicates that their stress is universal regardless age, gender, qualification, or experience. Such a high level of stress is alarming given its negative influence on the quality of care provided by these nurses, which necessitates prompt corrective interventions. In line with this, a study in Taiwan reported that nurses suffer high levels of work-related stress, with possible negative impacts such as the undue use of drugs such as hypnotics, sedatives, and antipsychotic medications (Ke et al., 2018).

Similarly high levels of job stress and burnout were demonstrated among nurses in a study in Ireland (Chernoff et al., 2018).

Conclusion

In view of the main study findings, it is concluded that only a small minority of the staff nurses in the study setting consider their workplace ergonomically adequate, with the area of work time schedule being the least adequate.

Recommendation

In view of the main study findings, the following is recommended:

- Nurses need training in ergonomics to improve their knowledge about it and their skills in dealing adequately with workplace ergonomic problems.
- Stress management programs are recommended for nurses in order to deal with the high levels of job stress detected among them.

References

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