Job Stress and its Relationship with the Level of Secretory IgA in Saliva: A Comparison Between Nurses Working in Emergency Wards and Hospital Clerks

Parastoo Golshiri,1 Siyamak Pourabdian,2 Arash Najimi,3 Hamideh Mosa Zadeh,4 Javad Hasheminia
5
Department of Community Medicine, School of Medicine,1 Department of Occupational Health, School of Health,2
Department of Health Promotion and Health Education, School of Health,3 Department of Pediatrics, School of Medicine,4
Department of Immunology, School of Medicine,5 Isfahan University of Medical Sciences, Isfahan, Iran.
Corresponding Author: Arash Najimi. (a_najimi@hlth.mui.ac.ir).

Abstract

Background: The current study was carried out to evaluate and compare the job stress of female nurses working in emergency wards and female clerks and to analyze the possible relationship between the stress level and level of saliva secretory IgA (SIgA).

Methods: Eighty four female nurses in emergency wards and female clerks of hospitals were selected (42 in each group). Their stress level was measured using the Persian short version of generic job stress questionnaire of the National Institute for Occupational Safety and Health (NIOSH). Moreover, the SIgA level was determined using the ELISA method. SPSS software (version 17), independent t-test, variance analysis and partial correlation were used for data analysis.

Results: The mean score of job stress was 97.30 and 91.85 in nurses and clerks, respectively (p= 0.016). The levels of saliva SIgA in nurses and clerks were 338.04± 380.93 and 706± 354.70, respectively (p <0.001). The results showed a negative correlation between the levels of saliva SIgA and job stress (p= 0.02, r= -0.203).

Conclusion: Nurses have a higher stress level compared to clerks; while the saliva SIgA level of nurses was much lower than that of the clerks. Considering the negative correlation between the saliva SIgA level and job stress, further study to evaluate the potential uses of saliva SIgA as a biomarker can be performed.

Keywords: Nurses, Job stress, Saliva secretory IgA (SIgA) (JPMA 62: S-26; 2012).

Introduction

Nursing is considered a stressful job and the several stressing factors in the job lead to many physical and psychological disorders in nurses.1,2 Thus, after performing a study on the relative prevalence of health problems in stressful jobs, the American National Institute of Health reported that among the 130 jobs evaluated in the study, nursing was ranked 27 with regard to medical visits because of its psychological health problems. Moreover, nursing was ranked as the first stressful job among health-related occupations.3 Nurses experience stress, just as patients do, and many nurses suffer from stress levels beyond their coping ability. Different studies have shown that nurses are continuously affected by the stressing factors of their environment.4,5

Various factors are effective in the nurses’ job stress, including working in closed environments, shift working, lack of job satisfaction, fear of losing the job, working with inexperienced nurses, frequent exposure to death and pain of patients, not having enough time to meet the emotional and psychological needs of their patients and family, and undefined professional responsibility.6-9 These factors lead to several consequences such as losing the job, psychological complications, and dissatisfaction with life.10 It should be noted that the stress level and stressing factors for nurses working in different wards are different. The difference is attributed to the variability in the working condition and responsibilities of nurses. Working as a nurse in emergency wards is accompanied with higher levels of stress. The cause is existence of the job-related stressing factors mentioned above as well as some other factors including unexpected number of patients each time, rapid and unexpected changes in the patients’ condition, and dealing with victims of trauma and fights.11 In several studies, the hypothesis of influence of chronic stresses on the immune system dysfunction and higher susceptibility to infections and different diseases has been evaluated and confirmed.12,13 Saliva secretory IgA (SIgA) is an antibody, which is considered to be one of the most important factors in mucosal immune system and plays a considerable role in the defense against infections of various body systems, including respiratory, gastroenterology, and urinary systems.14,15 Different studies have demonstrated that psychological variation, with a significant effect on the level of IgA, lead to a decrease in the level of immunity.16,17 For instance, Jemmott et al. reported a decrease in the level of IgA
in acute stresses. Considering the various levels of stress staff experience in different hospital wards, it seems that the saliva SIgA levels of workers of different wards are different. The current study was performed to evaluate the stress and SIgA levels of female nurses working in emergency wards and the female hospital clerks, and to compare the levels obtained for the two groups.

Methods

This cross-sectional study carried out on female nurses of emergency wards and female clerks of Al-Zahra Hospital, Isfahan. Al-Zahra Hospital is the largest health-education center in the Isfahan province, located in the southern region of Isfahan (Isfahan, as the capital of Isfahan province, is one of central cities in Iran). The hospital has almost 600 active beds, and is considered as the referral hospital of Isfahan province as well as adjacent provinces.

To select the study population, according to the census method, all female nurses in the three working shifts of the hospital emergency ward were included in the study. A similar number of female clerks in different sectors of the hospital were randomly selected and included in the study, proportionate to the number of staff of the sector (42 in each group). The inclusion criteria were willingness to participate in the study and having the minimum saliva flow (0.1 ml/min). Any selected individuals who were pregnant, or had the common cold or upper respiratory tract infections in the past one week, or suffered from chronic diseases that affect the immune system, were excluded from the study.

The job stress level of participants was measured using the Persian short version of generic job stress questionnaire of the National Institute for Occupational Safety and Health (NIOSH). The questionnaire included six items on demographic variables and 33 items on job stress, which evaluated the individual's stress in the five aspects of work load (six items), duality of role (nine items), job control (five items), social support (six items), and personal and organizational relationships (seven items). The scoring method of the questionnaire was as follows: for duality of role, it was designed on the 7-point Likert scales and score range of 1 to 7; other aspects were scored on a 5-point Likert scale ranging from 1 to 5. The validity of the given questionnaire was measured by content validity and face validity methods in a pilot study. The reliability of the given questionnaire was confirmed by internal reliability (α=0.71).

Saliva SIgA is measured using enzyme-linked immunosorbent assay (ELISA) method. The ELISA plates have 96 small plates, and their floor is covered with an antibody against SIgA. The antibody against SIgA is a rabbit polyclonal antibody, which is prepared with injection of SIgA to rabbits. At the first step, 100 µl of each sample is added to each plate and then 100µl of the standard solution is added. Then, the kit is incubated at room temperature for one hour on the shaker and washed five times with 250 µl of diluted washing buffer solution to remove unwanted materials from the plates. At the conjugation step, 1000 µl of mouse anti-SIgA antibody together with peroxidase is added to the plates and afterwards the plates are incubated at room temperature on the shaker. In this step, anti-SIgA reacts with saliva IgA molecules. The plates are again washed with 250 µl of buffer solution five times, and subsequently the substrate of peroxidase, and tetramethylbenzidine (TMB), is added to the plates and if SIgA exists in the sample, the chemical reaction, which causes its color to change to blue, occurs at room temperature within 5 to 15 minutes. Fifteen minutes later, the last step, which is the termination of the reaction, is initiated by adding 50µl of ELISA stop solution. The solution contains sulfuric acid and causes a change of color from blue to yellow. Afterwards, photoabsorption at the wavelength of 450 nm is read using a spectrophotometer. Moreover, the standard curve is drawn by ELISA-reader according to the current standards of the kit and the level of SIgA is determined for each sample.

All participants were informed about the study and attended voluntarily. Taking saliva samples and filling out the questionnaires were performed on the same day and each participant filled out the job stress questionnaire before the collection of saliva sample.

The participants' saliva samples were obtained using the stimulated whole saliva method. To control the normal circadian variation in saliva, all saliva samples were collected between 9-11 p.m. (the time of the least physiological changes). Since all samples were obtained in one season (summer), the variable of saliva flow variation in different seasons was controlled. Before taking the samples, the study was explained for the participants, and the guideline of saliva collection was given to them. Moreover, they were instructed to refrain from eating or drinking anything except water for at least one hour before saliva collection to avoid its influence on the level of SIgA. Then, they were asked to sit on chairs in a relaxed condition under normal light. The participants' saliva flow was stimulated by applying lemon juice swabbed on the dorsolateral side of the tongue bilaterally at 30-second intervals and participants were asked to collect the saliva in particular vials. The process was repeated three times, and the saliva collection process took six minutes. Considering the effect of prolonged stimulation on the level of saliva SIgA, it was tried to have a similar sample collection time for all participants. Since the interval between sample collection and the laboratory is an important step of sample preparation, all samples were transferred to laboratory within 45 minutes of collection to ensure timely preparation. Sample transfer was carried out using particular boxes containing ice to avoid exposure of samples to sunlight and also to have the least possible reaction and sample lysis. Following all these measures, all samples were transferred to the laboratory of
Department of Immunology in the Faculty of Medicine for determination of saliva SIgA level. The samples were centrifuged at 3000rpm for 10 minutes and then the supernatant solution was collected in particular vials. Finally, the samples prepared were kept at -20°C until immunological tests.

The data was analyzed using SPSS software (version 17). The job stress and saliva SIgA levels of the two groups were evaluated using independent t-test. Variance analysis was used for multivariate analysis to control the possible effect of participants' age on job stress and saliva SIgA levels. After control of the age effect, the correlation between job stress and saliva SIgA was evaluated using the partial correlation method. For all tests, p=0.05 was considered as the level of significance.

Results

All participants of the two groups completed the study (42 in each group). Out of the participants, 77.4% were 20-40 years old, and clerks had a higher mean age compared with the nurses (36.35±8.45 vs. 32.90±6.48) (p=0.03).

Among the nurses and clerks, 31% and 36.6% were single, respectively (p= 0.37). Considering the education level, in the nurse group, 19% had diploma or lower and 81% had B.Sc. or higher degrees; while in the clerk group, 31% had diploma or lower and 69% had B.Sc. or higher degrees (p= 0.2). The mean working experience was 12.21±6.66 and 9.86 ±7.45 for nurse and clerk groups, respectively (p=0.14) (Table-1).

The mean score of job stress in nurses and clerks were obtained to be 97.30 ± 9.29 and 91.85±10.91, respectively (p=0.01). After age adjustment, the two groups were significantly different with respect to job stress score (p= 0.02). The results show significant difference between the two groups with regard to the scores obtained for subscales; such that in the nurse group the mean scores of work load (p= 0.005), role control (p= 0.02) and social support (p= 0.004) were significantly higher than those of the clerk group. The results of variance analysis after adjustment for age demonstrate a significant difference between the two groups in the three sub-scales.

Table-1: Demographic Characteristics of the Sample.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Nurses n=42</th>
<th>Clerks n=84</th>
<th>Total n=126</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)*</td>
<td>Mean 32.9</td>
<td>36.35</td>
<td>34.76</td>
</tr>
<tr>
<td></td>
<td>SD 6.48</td>
<td>8.45</td>
<td>7.67</td>
</tr>
<tr>
<td>Min-Max</td>
<td>23-47</td>
<td>25-59</td>
<td>23-59</td>
</tr>
<tr>
<td>Marital status (%)**</td>
<td>Single 31</td>
<td>36.6</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>Married 69</td>
<td>63.4</td>
<td>67.7</td>
</tr>
<tr>
<td>Education (%)**</td>
<td>Diploma or lower 19</td>
<td>31</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Higher than diploma 81</td>
<td>69</td>
<td>75</td>
</tr>
<tr>
<td>Work experience (years)†</td>
<td>Mean 12.21</td>
<td>9.86</td>
<td>11.07</td>
</tr>
<tr>
<td></td>
<td>SD 6.66</td>
<td>7.45</td>
<td>7.11</td>
</tr>
<tr>
<td>Min-Max</td>
<td>26-Jan</td>
<td>30-Jan</td>
<td>30-Jan</td>
</tr>
</tbody>
</table>

*p Independent t-test P=0.03  **Chi-squared test, P >0.05  † Independent t-test P>0.05.

Table-2: Means and 95% CI of Scores of job stress, and its Sub-Scales.

<table>
<thead>
<tr>
<th>Scales</th>
<th>Nurses n=42</th>
<th>Clerks n=42</th>
<th>ED-GW 95% CI</th>
<th>*P</th>
<th>Adjusted p**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job stress</td>
<td>Mean 97.30</td>
<td>91.85</td>
<td>-9.85 to -1.05</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Work load</td>
<td>22.52</td>
<td>20.66</td>
<td>-3.14 to -0.56</td>
<td>0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>Duality of role</td>
<td>25.95</td>
<td>26.00</td>
<td>-2.70 to 2.80</td>
<td>0.97</td>
<td>0.84</td>
</tr>
<tr>
<td>Job control</td>
<td>12.41</td>
<td>10.47</td>
<td>-3.10 to -0.23</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Social support</td>
<td>17.59</td>
<td>15.80</td>
<td>-2.97 to -0.59</td>
<td>0.004</td>
<td>0.007</td>
</tr>
<tr>
<td>Personal and organizational relationships</td>
<td>19.9</td>
<td>18.90</td>
<td>-2.42 to 2.03</td>
<td>0.86</td>
<td>0.94</td>
</tr>
</tbody>
</table>

* P value was calculated using two sample-independent t-tests.  ** Adjusted P was calculated using general linear model to adjust for age (years).

Table-3: Means, minimum to maximum, and 95% CI of group difference (ED-GW) for salivary IgA of emergency Department Nurses and Hospital Clerks.

<table>
<thead>
<tr>
<th>Scales</th>
<th>Nurses</th>
<th>Clerks</th>
<th>ED-GW 95% CI</th>
<th>*P</th>
<th>Adjusted p**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Min-max</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>338.04</td>
<td>380.93</td>
<td>14 - 1200</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>706.78</td>
<td>354.70</td>
<td>60 -1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P value was calculated using two sample-independent t tests.  ** Adjusted P was calculated using general linear model to adjust for age (years).
subscals of job stress. There was no significant difference in
other subscales between the two groups (Table-2).

The level of saliva SlgA in the nurse group was
significantly lower than that of the clerk group (338.04±380.93
vs. 706.78±354.70) (p<0.001). The difference was also
observed after adjustment of the two groups for age (Table-3).

After the adjustment the two groups for age, in analysis
of partial correlation, a negative correlation was observed
between the level of saliva SlgA and job stress score (p= 0.02,
r=-0.203). Additionally, the test showed a significant negative
correlation between the level of saliva SlgA with the
components of work load and social support (Table-4).

Discussion

Among the demographic variables, the two groups
were significantly different with respect to age. Previous
studies have reported that nurses in higher age groups
experience lower levels of stress compared to nurses in lower
age groups. Therefore, in the current study all results were
adjusted for participants' age. Working experience, education
level, and marital status are other demographic variable, which
can have significant effect on nurses' job stress. With respect to
these variables, in the current study, the two groups were
similar.

In the present study, the mean score of job stress in
nurses was significantly higher than that of clerks. This shows
that nurses working in emergency wards consider themselves
to have more exposure to stressing factors. In many studies, it
has been stated that working as a nurse in emergency wards is
associated with high levels of stress. Yang et al. also
obtained similar results on the difference between the stress
level of emergency ward nurses and nurses in other wards.
Landeweerd et al. stated that nurses working in different wards
experience different levels of job stress, owing to their different
types of activities.

This is while few studies such as the one carried out by
Callaghan et al. reported the job stress of nurses lower than that
of other staff. This can probably be attributed to the
differences in the study population, and the adjustment of
nurses to severe and chronic exposure to stressful working
condition. Comparison of job stress in the two groups indicates
that nurses obtained significantly higher mean scores in work
load, role control, and social support. This shows that these
components are of greater importance in determination of job
stress in nurses.

McAbee consistently introduced work load, lack of
control on the job, and unsupported job environment as the
stressing factors, which can be considered as the factors which
make an individual susceptible to Psychological disorders.
The studies carried out by Ospow and Arafa et al. considered work load and lack of support from the family as
the main predictive factors for health status or psychological
disorders among nurses. Furthermore, Segerstrom et al.
demonstrated that social support is the most important factor,
in environmentally moderating the negative effects of
psychological stress; and besides the personal and personality
characteristics, the social support network plays a crucial role
in reducing the reaction to psychological stress. In the study
carried out by Shen in Thailand, it was stated that low levels of
social support is an important factor in the job stress of nurses
working in psychiatry wards. However, contrary to the findings
of the current study, job control of nurses was higher than that
of other groups studied. In addition to the cultural and
environmental differences of the individuals studied, it seems
that the different nature of working in emergency and
psychiatry wards is an important factor in the job control
perceived by the nurses.

In the present study, nurses had a statistically
significant lower level of saliva SlgA in comparison with the
clerks. The nurses whose job stress score was determined to be
higher than the clerks had a saliva SlgA level less than half of
the clerks studied. Moreover, there was a significant negative
correlation between the mean job stress score and saliva SlgA.
This negative correlation has been confirmed in many previous
studies. With regard to the subscales of job stress, workload and social support, they had significant negative
correlations with saliva SlgA level. Consistent with the
findings of the present study, Mocci et al. pointed out work
load and communication with colleagues as effective factors in
nurses' job stress. In addition, a negative correlation was
reported between these factors and saliva SlgA level. In the
Yang's study, a negative correlation was found between social
support in organizational framework and saliva SlgA level.
Blalock et al. demonstrated that continuous exposure to stress
leads to weak function of the immune system. However, if the
individual is supported by a mechanism of social support
network, he/she would be protected against the negative effects
of stress.

The limitations of the study to be mentioned are as
follows. In a cross-sectional study, considering the lack of
knowledge about the sequence of relationships, causal
conclusions cannot be obtained. Moreover, in spite of using a
job-specific stress questionnaire, the role of non-occupational
factors in development of stress and their effect on saliva SlgA
cannot be excluded. Self-reported method should also be
carefully considered in obtaining further conclusions. Finally,
the results of the current study confirm that working in a
stressful environment has a significant relationship with the
decrease in saliva SlgA level. This finding was in agreement
with the results reported in previous studies. The results
obtained can pave the way for further study on the use of saliva
SlgA as a potential biomarker.

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Conflict of Interests:
Authors have no conflict of interests.

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