Original Article

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

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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 leads 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 systemdysfunction 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 decreasein the level of immunity.[16,17] For instance, Jemmott et al. reported a decrease in the level of IgA

in acute stresses.[18] 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 (a=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).[19] 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 intervalsand 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.[19] 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 -20º 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

Table-1: Demographic Characteristics of the Sample.

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

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

Table-4: Partial Correlations between Salivary IgA and Scores of job stress and Its Sub-scales.

Scales	Salivary IgA	
	r	P*
Job stress	-0.203	0.02
Work load	-0.285	0.004
Duality of role	-0.165	0.13
Job control	0.05	0.64
Social support	-0.261	0.007
Personal and organizational relationships	-0.143	0.19

*Partial correlations were calculated after controlling for age (years).

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

Scales	Nurses n=42		Clerks n=42		ED-GW 95% CI	*P	Adjusted p**
	Mean	SD	Mean	SD			
Job stress	97.30	9.29	91.85	10.91	-9.85 to -1.05	0.02	0.03
Work load	22.52	2.94	20.66	2.98	-3.14 to -0.56	0.005	0.005
Duality of role	25.95	5.48	26.00	7.09	-2.70 to 2.80	0.97	0.84
Job control	12.41	3.12	10.47	3.47	-3.10 to -0.23	0.02	0.01
Social support	17.59	2.34	15.80	3.07	-2.97 to -0.59	0.004	0.007
Personal and organizational relationships	19.9	4.47	18.90	5.72	-2.42 to 2.03	0.86	0.94

* 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.

	Mean	SD	Min-max	ED-GW 95% CI	*P	Adjusted p*
Nurses	338.04	380.93	14 - 1200	208.96 to 528.51	<0.001	<0.001
Clerks	706.78	354.70	60 -1200			

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

subscales of job stress. There was no significant difference in other subscales between the two groups (Table-2).

The level of saliva SIgA 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 SIgA and job stress score ($p= 0.02$, $r= -0.203$). Additionally, the test showed a significant negative correlation between the level of saliva SIgA 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.[20,21] 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.[22,23] Yang et al. also obtained similar results on the difference between the stress level of emergency ward nurses and nurses in other wards.[24] Landeweerd et al. stated that nurses working in different wards experience different levels of job stress, owing to their different types of activities.[25]

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.[9] 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 Psychologicaldisorders.[26] The studies carried out by Osipow[27] and Arafa et al.[28] 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.[29] 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.[30]

In the present study, nurses had a statistically significant lower level of saliva SIgA in comparison with the clerks. The nurses whose job stress score was determined to be higher than the clerks had a saliva SIgA level less than half of the clerks studied. Moreover, there was a significant negative correlation between the mean job stress score and saliva SIgA. This negative correlation has been confirmed in many previous studies.[22,24,31] With regard to the subscales of job stress, workload and social support, they had significant negative correlations with saliva SIgA 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 SIgA level.[16] In the Yang's study, a negative correlation was found between social support in organizational framework and saliva SIgA level.[24] 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.[32]

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 SIgA 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 SIgA 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 SIgA as a potential biomarker.

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Conflict of Interests:

Authors have no conflict of interests.

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