

# Occupational Stress in Nurse sAA

## —The Study Provided during the Urged Pandemic COVID-19 Quarantine Period

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### Abstract

**Introduction:** Nursing is considered to be a complex and high demanding profession. A combination of high workplace demands, over-responsibility, and over-authority has been identified as a major source of occupational stress among nursing staff. **Material and methods:** Our study measured level of  $\alpha$ -amylase in the saliva, non-invasive, reliable biomarker for stress exposure, of nurses using the Japanese device SALIVA AMYLASE MONITOR 2004. The questionnaire was considered to figure out how all 473 nurses from the Mongolian tertiary referral hospitals perceive and accept the stress. The Likert scale was used in measuring the questions. Participants were recommended not to eat any meal in the morning 8 - 10a.m. and after work for examination. The indicators were evaluated by cross-sectional research model. **Results:** The amylase levels of nurses in the study ranged from 2 - 34 in the low stress group to a minimum of 16,083, while in the morning, the amylase levels in the medium group ranged from 2 - 105 to a maximum of 25,226 KU/L. The one-way ANOVA results revealed that the differences between the morning sAA level groups were statistically significant ( $F = 3.481, p = 0.032$ ). Conversely, the evening sAA levels ( $F = 1.256, p = 0.286$ ) had no statistical differences ( $F = 1.144, (p = 0.331)$ ). Occasionally, our study was conducted at the quarantine period of pandemic COVID-19, and we can see clearly that the nurses at National Center for Infectious Diseases are working hard under the urged stressed condition.

### Keywords

Stress, Workplace Stress, Nurse, Saliva Alpha Amylase

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## 1. Background

Nursing is a stressful profession; accordingly, nurses are vulnerable to the effects of stress in their daily environment (McCraty, Atkinson, & Tomasino, 2003).

Work-related chronic stress leads to fatigue syndrome, lack of ability to work, which is exposed by emotional exhaustion, followed by an emotional numbness or a negative attitude towards oneself and others (Maslach, Schaufeli, & Leiter, 2001). It is impossible to wipe out work-related stress and stressors, but only effective coping techniques can help to reduce the stress caused outcomes (Benson, Beary, & Carol, 1974).

When stress is part of the work environment, it is difficult to control and can cause recurrent aggression, which in turn affects an individual's health and ability to act. In fact, sick leave is more common for people who suffer from work stress than other workers. Stressful work environments are prevalent among health professionals, and several studies have performed regarding the harmful effects of nursing workplace stress (Benson et al., 1974; Maslach et al., 2001; McCraty et al., 2003). The correlations between the workplace stressors and nurses' physical and mental health changes were determined in accordance with certain studies (Frantz & Holmgren, 2019). Nursing is considered to be a complex and highly demanding job. A combination of the high workplace requirements, over-responsibility, and over-authority has been identified as a major source of occupational stress among nursing staff (Burke, 2002; Gunkel, Lusk, Wolff, & Li, 2007; Wong, DeSanctis, & Staudenmayer, 2007; Gunkel, Wolf, & Li, 2007).

In recent years, there have been a number of stressors, such as emotional instability, anxiety, and worry, due to a variety of factors, including social and economic conditions, drastic changes in science, technology, information, urbanization, and overcrowding. Nurses who have the closest contact with a client need to study stressful situations in their work.

## 2. Purpose

We aimed to study the workplace stress for nurses from the Mongolian tertiary referral hospitals during the pandemic COVID-19.

## 3. Objectives

In the frame of our doctoral dissertation, to determine if the Mongolian nurses perceived stress correlated to their salivary alpha amylase level regarding their working areas.

- 1) Before the sAA testing we asked the participants to have the Work Stress Profile Questionnaire of Rice to see how the Mongolian nurses perceive the workplace stress.

- 2) Check the sAA using the Japanese device Saliva Amylase Monitor 2004.

## 4. Materials and Methods

The study involved totally 473 nurses from the tertiary referral hospitals of

Mongolia National Center for Traumatology and Orthopedics, NCTO (1), National Center for Mental Health, NCMH (2), National Center for Infectious Diseases, NCID (3), and National Cancer Center, NCC (4). We employed Work Stress Profile (WSP) questionnaire of Rice in 57 questions in 3 domains; the questions aim to assess the co-workers relations (1 - 26), the working environment (27 - 48) and the personal attributes (49 - 57). This questionnaire was considered to figure out how nurses perceive and accept the stress. The Likert scale was used in measuring the questions. The indicators were evaluated by cross-sectional research model. In addition we measured level of  $\alpha$ -amylase in the saliva of nurses using the SALIVA AMYLASE MONITOR 2004, a Japanese device. Participants were recommended not to eat any meal in the morning 8 - 10a.m. and after work for examination.

The study result tables/graphics and statistical data were developed and analyzed by Microsoft Excel-2018 and Statistical Package for the Social Sciences (SPSS)-25.0. The standard deviation (SD) and regression data, differences between the groups were revealed by Student's test, the statistical difference should be at  $p < 0.05$ .

## 5. Results

A total of 473 nurses were included in the study, including 121 NCTO, 89 NCMH, 146 NCID, and 117 NCC. Meanwhile, 46 administrative workers, 75 doctors, 208 nurse-midwives, 105 cleaners, and 46 organizational workers participated in our study, too. The general information of the study participants is demonstrated in **Table 1**.

**Table 1** illustrates that the gender 97.3% female and 2.7% male, but not the age and education statistical difference presents among the participants. However, we can see statistical significances in the working area/place and the years of working there. The nurse stress level is unified in **Table 2**.

We identified the nurses' stress at three levels: high, medium/normal, and low.

**Table 2** reveals that the workplace low, normal and high stress level groups occupied 7.6%, 27.1% and 65.3%, respectively.

**Table 3** demonstrates the nurse stress levels by their workplaces or hospitals.

The stress level groups were classified by the hospitals: nurses from National Center of Traumatology and Orthopedics occupied the most percentage in the low stress group as well as in the normal stress group, their stress level was at 13.2% and 33.1%, correspondingly. Cancer nurses were categorized to the group of high stress level 76.1% (**Table 3**).

Moreover, they (cancer nurses) occupied the less percentage in the low and normal (19.7%) stress groups. The NCTO nurses cover the less percentage in high stress level 53.7%.

The findings expose that the traumatology nurses perceived stress level is low rather than the other hospitals. Conversely, the cancer nurses are the participants who are mostly suffered from the workplace stress.

**Table 1.** General information of the participants.

Variables	Numbers (in percent)	P value
<b>Gender</b>		
Male	13 (2.7)	0.525
Female	460 (97.3)	
<b>Age group</b>		
18 - 24	34 (7.2)	0.002
25 - 30	139 (29.4)	
31 - 40	99 (20.9)	
41 - 50	169 (35.7)	
Above 51	32 (6.8)	
<b>Education</b>		
Diploma level	150 (31.7)	0.059
Bachelor	306 (64.7)	
Master	17 (3.6)	
<b>Work experience</b>		
1 year	32 (6.8)	0.035
1 - 3 years	64 (13.5)	
3 - 9 years	128 (27.1)	
above10 years	249 (52.6)	
<b>Work-years at the current place</b>		
1 year	48 (10.1)	0.146
1 - 3 years	67 (14.2)	
3 - 9 years	131 (27.7)	
Above 10 years	227 (48.0)	

**Table 2.** Participants stress levels.

N°	Stress level	Amount	%	Real%	Total%
1	>111 low stress	36	7.6	7.6	7.6
2	112 - 140 normal	128	27.1	27.1	34.7
3	141 - 167 < high stress	309	65.3	65.3	100.0
4	Total	473	100.0	100.0	

**Table 3.** Nurse stress levels (by hospitals).

Hospitals	Amount %	Stress level			Total
		Low stress level (>111)	Normal stress level (112 - 140)	High stress level (141 - 167<)	
NCID	Amount	8	39	99	146
	%	5.5%	26.7%	67.8%	100.0%
NCC	Amount	5	23	89	117
	%	4.3%	19.7%	76.1%	100.0%
NCMH	Amount	7	26	56	89
	%	7.9%	29.2%	62.9%	100.0%
NCTO	Amount	16	40	65	121
	%	13.2%	33.1%	53.7%	100.0%
Total	Too	36	128	309	473
	%	7.6%	27.1%	65.3%	100.0%

Nurse stress variability statistics also confirmed these results.

For instance, the occupational stress statistics of the nurses by hospitals revealed that the NCTO nurses have a lower stress level than other hospitals with 144,471 and the National Cancer Center has a higher stress level of 154,641 than other hospitals. However, the standard deviations demonstrate that the stress levels had gone up and down: the most fluctuated group was the NCTO nurses and the least one was National Cancer Center (**Table 4**).

We examined whether the nurse stress levels differ regarding the work-related stress level groups by one-way ANOVA and the statistical real differences ( $F = 3.071$ ), ( $p = 0.028$ ) were confirmed (**Table 5**).

In order to evaluate the Workplace stress we added all the corresponding scores to each questions and organized in following three levels:

>91 - 111 low-stress level -	1
112 - 140 normal stress level -	2
141 - 167< high-stress level -	5

We employed SALIVA AMYLASE MONITOR apparatus, product of Japan, in determining process of stress level by the participants' salivary alpha amylase (sAA) Here we categorized workplace stress in four levels:

0 - 30 (KU/L) low-stress level	1
31 - 45 (KU/L) normal	2
46 - 60 (KU/L) high-stress level	5
Above 61(KU/L) very high-stress level	6

Using **CROSSTABS** analyzing method we attempted to figure out the WPS questionnaire with the participants' sAA stress scores (See **Table 6**).

In accordance with the salivary alpha amylase statistics, the morning sAA levels were 2 - 34 (at least 16,083 KU/L) and 2 - 105 (the highest 25,226 KU/L) in the low and normal stress groups, correspondingly (**Table 7**).

The one-way ANOVA results revealed that the differences between the morning sAA level groups were statistically significant ( $F = 3.481$ ,  $p = 0.032$ ). Conversely, the evening sAA levels ( $F = 1.256$ ,  $p = 0.286$ ) had no statistical differences ( $F = 1.144$ ), ( $p = 0.331$ ) (**Table 8**).

**Table 4.** Stress statistical indices among the participants (by hospitals).

	N	M	Std. Dev	Std. Err	95% И.И.		Min	Max
					Lower Bound	Upper Bound		
NCID	146	152.7466	29.67451	2.45588	147.8926	157.6005	59.00	270.00
NCC	117	154.6410	26.90451	2.48732	149.7146	159.5675	57.00	240.00
NCMH	89	147.2247	27.87340	2.95457	141.3531	153.0963	75.00	221.00
NCMO	121	144.4711	32.58376	2.96216	138.6062	150.3359	58.00	250.00
TOTAL	473	150.0592	29.66723	1.36410	147.3787	152.7397	57.00	270.00

**Table 5.** One-way ANOVA analysis.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8004.142	3	2668.047	3.071	0.028
Within Groups	407,424.201	469	868.708		
Total	415,428.342	472			

**Table 6.** Stress levels due to the WPS and sAA.

Stress levels (by sAA)	Number/ percentage	Stress levels (WPS)			Total
		Low-stress (>111)	Normal (112 - 140)	High-stress (141 - 167<)	
Low-stress 0 - 30 (KU/L)	Number %	33 8.9%	99 26.8%	238 64.3%	370 100.0%
Normal stress 31 - 45 (KU/L)	Number %	3 5.7%	18 34.0%	32 60.4%	53 100.0%
High stress 46 - 60 (KU/L)	Number %	0 0.0%	6 20.7%	23 79.3%	29 100.0%
Very high stress <61 (KU/L)	Number %	0 0.0%	5 23.8%	16 76.2%	21 100.0%
Total	Number %	36 7.6%	128 27.1%	309 65.3%	473 100.0%

Meanwhile we compiled the stress levels into three groups by the scoring/numbering way.

**Table 7.** Participants sAA results by their stress levels.

	N	Mean	Std. Dev	Std. Err	95% I.I.		Min	Max	
					Lower Bound	Upper Bound			
sAA morning	>111- Low stress	36	16.0833	8.65984	1.44331	13.1533	19.0134	2.00	34.00
	112 - 140 normal	128	25.2266	19.44312	1.71855	21.8259	28.6273	2.00	105.00
	141 - 167< High stress	309	25.0583	20.73213	1.17941	22.7375	27.3790	2.00	130.00
	Total	473	24.4207	19.83680	.91210	22.6284	26.2130	2.00	130.00
sAA evening	>111 Low stress	36	18.4444	9.11966	1.51994	15.3588	21.5301	5.00	47.00
	112 - 140 normal	128	22.9688	19.41018	1.71563	19.5738	26.3637	2.00	131.00
	141 - 167< High stress	309	23.4045	17.82039	1.01377	21.4097	25.3993	2.00	135.00
	Total	473	22.9091	17.78896	0.81794	21.3018	24.5163	2.00	135.00
Average sAA	>111- Low stress	36	17.2639	7.56730	1.26122	14.7035	19.8243	7.00	40.50
	112 - 140 normal	128	24.0977	16.48371	1.45697	21.2146	26.9807	2.00	112.00
	141 - 167< High stress	309	24.2314	17.06193	0.97062	22.3215	26.1413	2.00	132.50
	Total	473	23.6649	16.45304	0.75651	22.1784	25.1515	2.00	132.50

**Table 8.** One-way ANOVA.

		Sum of Squares	df	Mean Square	F	Sig.
Morning sAA	Between Groups	2711.146	2	1355.573	3.481	0.032
	Within Groups	183,020.131	470	389.405		
	Нийт	185,731.277	472			
Evening sAA	Between Groups	793.893	2	396.947	1.256	0.286
	Within Groups	148,569.198	470	316.105		
	Нийт	149,363.091	472			
Average sAA	Between Groups	1598.160	2	799.080	2.977	0.052
	Within Groups	126,173.478	470	268.454		
	Total	127,771.637	472			

## 6. Discussion

Various of the scientists, for instance, Weiman (1978), Holmgren (Frantz & Holmgren, 2019) (1990) and Rice (1999) have been developed different self-administered questionnaires in order to identify the workplace stress in its early stages; by the early detection, the person or the organization can be prevented or avoid from the numerous unpleasant consequences such as sick-leave, physiological and psychological illnesses, work burnout, and other organizational expenses. Nevertheless, we chose the Rice (1999) WPS self-esteem questionnaire because we considered that our study participants will be categorized to relatively healthy, i.e. they never complain on being sick and leave the work. Furthermore, we decided that it would be reasonable if the participants assess themselves whether they are in a work-related stress by reading and getting idea what can be called workplace stress indeed (Rice, 1992).

It is clear that women dominate nursing around the world, however regardless of the work environment, requirements, or workload, regardless of gender all are exposed to workplace stress. The results of our study agree that it depends only on individuals. Our study gave proof that due to ANOVA the gender differences on workplace stress is absent ( $F = 0.404$ ), ( $p = 0.525$ ) statistically.

According to literatures, workplace stress is often treated by the gender of nurses, but the results vary. Certain researchers noted that there is no gender difference in work stress (Wong et al., 2007), and others claimed that female nurses are more vulnerable to various occupational stresses than men (Gunkel et al., 2007). Moreover, some researchers figured out that female nurses are more intended to psychological stress, meanwhile the men are tend to physiological stressors (Burke, 2002).

If correlate the age with workplace stress, it would cover the personal issues as the perception, the experiences, the adapting abilities and etc.

According to our study, when working stress is related to the age of nurses, the lowest percentage was in the low-stress group, 4.0% in the 31 - 40 age group, the lowest in the middle group, and 16.2% in the 31 - 40 age group, and the

highest in the high-stress group a small percentage was identified as 55.9% in the 18 - 24 age group. This suggests that the stress levels of nurses in the 18 - 24 age group are lower than in other age groups, while the stress levels of nurses in the 31 - 40 age group are higher than in other age groups.

The results of this study are similar to the results of a 2013 study by Finnish researchers as well as Mauno that found that young nurses are less exposed to workplace stress than older nurses (Mauno, Ruokolainen, & Kinnunen, 2013).

We agreed with the global studies that the nurses at younger age are less exposed to the work stress because they are working in fellowship system and they are always relying on co-workers help.

Particular researchers, such as Takase, Teraoka, and Yabase, suggested in a 2016 study that nurses over the age of twenty-five who want to keep their workplaces are more stressed than middle-aged and older nurses (Takase, Teraoka, & Yabase, 2016). The statistically significant differences in the stress levels ( $F = 1.923$ ) and ( $p = 0.105$ ) regarding the nurses' education levels were refuted when we examine it by ANOVA. And the result is agreed with Kim Oliver study findings (2007) (Oliver, 2007).

## 7. Conclusion

1) The results revealed that the work-related stress is at high level among the nurses regarding their work places.

2) The one-way ANOVA results revealed that the differences between the morning sAA level groups were statistically significant ( $F = 3.481$ ,  $p = 0.032$ ). Conversely, the evening sAA levels ( $F = 1.256$ ,  $p = 0.286$ ) had no statistical differences ( $F = 1.144$ ), ( $p = 0.331$ ).

3) Occasionally, our study was conducted at the quarantine period of pandemic COVID-19, and we can see clearly that the nurses at National Center for Infectious Diseases are working hard under the urged stressed condition.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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