FNJN

İSTANBUL UNIVERSITY CERRAHPAŞA

Florence Nightingale Journal of Nursing

DOI: 10.5152/FNJN.2021.19141

Research Article

Effects of Day and Night Shifts on Stress, Anxiety, Quality of Life, and Oxidative Stress Parameters in Nurses

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Cite this article as: Özyürek, P., Çevik, C., Kılıç, İ., & Aslan, A. (2021). Effects of day and night shifts on stress, anxiety, quality of life, and oxidative stress parameters in nurses. *Florence Nightingale J Nurs, 29*(1), 81-92.

Abstract

AIM: This study aimed to determine the effects of day and night shift work on stress, anxiety, quality of life, and oxidative stress parameters in nurses.

METHOD: This was a descriptive, cross-sectional study. The study was conducted between October 2014 and January 2015. The study sample included 60 nurses working in a university hospital who met the inclusion criteria (n=60). A questionnaire was used to evaluate stress, quality of life, satisfaction with life, and anxiety sensitivity, and blood samples were obtained. In blood samples, total oxidant status and total antioxidant status, cortisol, epinephrine, and norepinephrine levels were measured. Descriptive statistics, t test, analysis of variance, and correlation analysis were performed for statistical analyses.

RESULTS: These results revealed that the nurses employed in surgical clinics had a lower quality of life and higher anxiety sensitivity as compared to those employed in other clinics. In addition, significant relationships were detected between total oxidant status, total antioxidant status and cortisol levels and stress, quality of life, satisfaction with life, and anxiety sensitivity. TOS and TAS, epinephrine, norepinephrine, and cortisol levels; stress, quality of life, satisfaction with life, and anxiety sensitivity were similar between the nurses working daytime and in shifts.

CONCLUSION: As the stress level and anxiety sensitivity of the nurses increased, the total oxidant levels and cortisol levels increasedm and in contrast, the quality of life and overall satisfaction with life decreased.

Keywords: Anxiety sensitivity, cortisol, oxidative stress, perceived stress, quality of life

Introduction

Nursing is a challenging profession as it requires a high level of responsibility, performing difficult activities, and working in shifts. Nursing quite often involves working in night shifts, which is a characteristic of nursing which is very difficult to change. Working for long hours at night, having high workload, and having an impaired circadian ryhthm may lead to psychological and physiological problems. This makes it difficult for the nurses to continue their routine duties in nighttime and increases occupational accidents and injuries (Palhares et al., 2014). Impairment of the circadian rythym causes a change in sleep-awake cycle and quality of sleep (Bronsard and Bartolomei, 2013). In a study investigating sleep quality of nurses working in night shifts, low sleep quality was associated with night shift work (Zhang et al., 2016). In another study, it was found that 44.8% of the nurses who participated in the study and worked in night shifts described their sleep quality as bad and awful (Huth et al., 2013). Impaired sleep quality may lead to a low quality of life in nurses by negatively affecting their physical functions, psychological status, social relations within and outside the family.

Stress and night shift work are considered as main factors negatively affecting individual's quality of life. Stress appears with a stressor signal and induces a response in the brain for perceiving stress. Thereafter, physiological systems, such as immune, endocrine, and nervous systems, produce stress response (Niu et al., 2018).

Therefore, secretion of cortisol from the adrenal cortex and catecholamines (adrenaline, noradrenaline)

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Date of receipt: August 23, 2019
Date of acceptance: June 29, 2020

from the adrenal medulla increase (Niu et al., 2018; Whittaker & Gallagher, 2019). In almost all cases of psychological stress, physiological process initiates; cellular stress begins, and the level of reactive oxygen metabolites, which are the markers of this stress, increase in both intracellular and transcellular milieu. The antioxidant agents responsible for managing, directing, and terminating this oxidative process decrease due to mineralizing. Reactive oxygen species induce cell damage by influencing DNA, RNA, and cell membrane, and in this state, development of cancer is facilitated (Aschbacher et al., 2013). This also leads to the development of other diseases. In a study investigating the effects of night shift work on the oxidant-antioxidant system, it was found that the nurses working in the night shift showed increased oxidant parameters and decreased antioxidant parameters (Gowda, 2019). In another study, it was revealed that at the end of shift, the oxidant parameters of the nurses working in night shifts increased whereas antioxidant parameters decreased (Ulaş et al., 2012). In other studies, people working in nighttime have found to be at higher risk of developing colorectal cancer and cardiovascular disease as compared to the ones working in daytime. The underlying reasons were stated as the impairment in the secretion of melatonin as a result of exposure to light in nighttime working, sleep disorders, and change in endocrine functions (Davis et al., 2001; Eldevik et al., 2013; Korkmaz & Tamura, 2008; Schernhammer & Laden, 2003; Thomas & Power, 2010).

Studies have shown the effects of night shifts on sleep quality, stress, and oxidant-antioxidant system. However, to the best of our knowledge, there is no study in the existing literature that evaluates stress, anxiety, quality of life, oxidative stress, and stress hormone parameters altogether among nurses. Therefore, this study aimed to determine the effects of day and night shift work on stress, anxiety, quality of life, and oxidative stress parameters and to establish the relationship between blood parameters and stress, anxiety, and quality of life in nurses. Therefore, our hypothesis is as follows: there is a significant difference in the levels of stress, anxiety, quality of life, and oxidative stress and stress hormone between nurses working in night shifts and those working only in day shifts; there is a relationship between oxidative stress and stress hormone parameters and stress, anxiety, and quality of life. In line with this hypothesis, our aim is to determine the effects of day and night shift work on stress, anxiety, quality of life and oxidative stress parameters in nurses. By evaluating the effect of night shifts on these parameters together, the relationship between all these parameters can be established; this will shed light on the etiology of the problems that arise from night shift nursing work. It will also provide data support for future work related to the night shift work.

Research Questions

1. Do quality of life, perceived stress, anxiety sensitivity and life satisfaction levels of nurses differ according to the clinic they work in?
2. Do quality of life, perceived stress, anxiety sensitivity and life satisfaction levels of nurses differ according to their education level?
3. Is there a relationship between "adrenaline, noradrenaline, cortisol, TAS, TOS levels" and "perceived stress, quality of life, anxiety sensitivity, life satisfaction levels" of nurses?
4. Do adrenaline, noradrenaline, cortisol, TAS, TOS, perceived stress, quality of life, anxiety sensitivity and life satisfaction levels of nurses differ according to shift status?

Method

Study Design

It is a descriptive, cross-sectional study.

Sample

The study was conducted between October 2014 and January 2015 in a university hospital in Afyonkarahisar Province in Turkey. The study sample included 60 nurses working in a university hospital who met the inclusion criteria (n=60). The inclusion criteria were: not being on any medication, not having habits such as alcohol and tobacco use, not having a chronic disease, not being pregnant, and not lactating. A total of 60 voluntary female nurses aged between 20 and 42 years who met these criteria participated in the study. Use of drugs, smoking, and alcohol consumption and having chronic diseases were accepted as exclusion criteria as they could alter the oxidative stress parameters (Liu et al., 2020; Ravarotto et al., 2018; Tobore, 2020). In addition, human physiology changes during pregnancy and breastfeeding; these physiological changes may affect the blood parameters. Therefore, breastfeeding and pregnancy were determined as exclusion criteria. The 302 nurses who did not meet these criteria were excluded. The study group was divided into 2 groups: the first group included nurses working between 08:00 and

16:00 (n=30), and the second group alternately included nurses working between 08:00 and 16:00 and between 16:00 and 08:00 (n=30).

Data Collection

Biochemical Analyses

For both the groups, at the end of the 08:00–16:00 shift, approximately 13 mL (amount required for blood tests) blood samples were taken into tubes with heparin for plasma and with gel for serum. The blood samples were taken at the same time for both the groups as the cortisol measurements vary according to the time. Before the collection of blood samples, questionnaire forms related to the quality of life, anxiety sensitivity index, and perceived stress were filled. After centrifugation was performed for blood samples at 10°C, 5,000 rpm for 10 minutes, serum and plasma were obtained. In the serum, cortisol levels were measured immediately. To measure total oxidant status (TOS) and total antioxidant status (TAS) in the serum and to measure epinephrine and norepinephrine levels in the plasma, the samples were stored at −20°C in deep freezer. Measurement of epinephrine and norepinephrine in frozen plasma samples were performed within 7 days. TOS and TAS were measured within 3 weeks.

Plasma Epinephrine and Norepinephrine Analysis

Reverse phase high-performance liquid chromatography was used. Measurements were performed in a special laboratory.

Total Antioxidant Status Analysis

Rel Assay commercial kits produced by Erel (Erel, 2004) were used. The measurements were performed in the biochemistry laboratory of a university hospital. Trolox, a water-soluble analog of vitamin E, was used as a calibrator. The results were expressed as mmol Trolox equivalent/L.

Total Oxidant Status Analysis

Rel Assay commercial kits produced by Erel (Erel, 2005) were used. The measurements were performed in the biochemistry laboratory of a university hospital. Hydrogen peroxide was used as a calibrator. The results were expressed as μmol H_2O_2 equivalent/L.

Cortisol Analysis

Serum cortisol analyses were performed by chemiluminescent enzyme immunoassay method. The measurements were performed in the biochemistry laboratory of a university hospital.

Personal Information Form

To obtain data on personal and working characteristics of the nurses, a personal information form prepared by the researchers including 16 questions about age, gender, education, marital status, body mass index, shift status, unit of employment, and job definitions was used. Moreover, 4 scales that were completed by the nurses were also applied.

Perceived Stress Scale

Perceived Stress Scale (PSS) is a widely used self-assessment tool developed by Cohen et al., (1983) to measure how stressful some states in an individual's life are perceived by them (Cohen et al., 1983; Golden et al., 2004). It includes 8 items, and the Turkish validity and reliability studies were performed by Bilge et al., (2009) with a Cronbach's alpha coefficient of 0.81. Cronbach's alpha value in this study is 0.73. Each item of the 5-point Likert-type scale (never=0 and very often=4) measures the change in emotional status during the past month. Moreover, 3 items are scaled reversely (4^{th}, 5^{th}, and 6^{th}); the others (1^{st}, 2^{nd}, 3^{rd}, 7^{th}, and 8^{th}) are scaled directly. There are 2 sub-items namely perceived desperation (1^{st}, 2^{nd}, 3^{rd}, 7^{th}, and 8^{th}) and perceived competition (4^{th}, 5^{th}, 6^{th}). Total scores are between 0 and 32 points. The points from each item are summed to determine the perceived level of stress. Higher points refer to a high perceived level of stress (Bilge et al., 2009).

Short Form of Quality of Life

Short form of quality of life (SF-36) is a self-assessment tool developed by Ware & Sherbourne (1992) to determine the health-related quality of life of individuals (Ergün et al., 2011; Ware & Sherbourne, 1992). The Turkish translation, validity, and reliability studies of SF-36 were performed by Pınar et al., (1995) with a Cronbach's alpha coefficient of 0.91. Cronbach's alpha value in this study is 0.90. The scale includes 36 items with 8 sub-items related to health. These sub-items are the perception of physical function, social function, role limitations owing to physical problems, role limitations owing to emotional problems, psychological health, vitality, body pain, and general health. All expressions related to the scale are evaluated by considering the last 4 weeks (Pınar et al., 1995). Total scores are between 0 and 100 points. The total score and scores of the sub-items are summed to obtain Physical (Physical Health Component Summary Scale-PCS) and Mental (Mental Health Component Summary Scale-MCS) Health Summary Scale.

Anxiety Sensitivity Index-3

Anxiety Sensitivity Index-3 (ASI-3) was developed by Taylor et al., (2007) to determine the anxiety sensitivity of a healthy person's or a patient's expectations to experience anxiety or fear "in certain circumstances" (Taylor et al., 2007). The Turkish validity and reliability of ASI-3 were performed by Mantar et al., (2011) with a Crohnbach's alpha coefficient of 0.93. Cronbach's alpha value in this study is 0.92. ASI-3 included 5-point Likert-type scale (never=0 and very often=4) with a total of 18 items. The respondents are expected to scale each item by considering their experiences, or if there is no expressed experience related to the item, they are expected to think how they will feel if they experience the circumstance once. Total scores are between 0 and 72 points (Mantar et al., 2011).

Satisfaction with Life Scale

Satisfaction with life scale (SWLS) was developed by Diener et al., (1985) to determine an individual's satisfaction with life, and it may be performed across all ages, including adolescents and adults. It is a 5-point Likert-type scale (1: I totally agree, 7: I never agree) with 5 items (Diener et al., 1985). Turkish validity and reliability studies were performed by Köker (1991) and Yetim (1993), with Cronbach's alpha coefficients of 0.85 and 0.73, respectively. Cronbach's alpha value in this study is 0.76. (Köker, 1991; Yetim, 1993). Total scores are between 5 and 35 points. Higher points indicate higher satisfaction with life.

Statistical Analyses

Data were analyzed using the Statistical Package for the Social Sciences 18.0 for Windows software (SPSS Inc., Chicago, IL, USA). The sociodemographic characteristics, blood parameters, and the scales and subscales of perceived stress, quality of life, and anxiety sensitivity were evaluated by descriptive analyses, including frequency, percentage, mean, and standard deviation. Moreover, the independent samples t test (for 2 groups) and one-way analysis of variance (ANOVA) (for more than 2 groups) were used in comparison of mean scale points with sociodemographic variables. In addition, to establish the relationship between stress, quality of life, satisfaction with life, anxiety sensitivity, and some blood parameters, the Pearson correlation coefficients were calculated.

Limitations

This study was performed with a small sample owing to inclusion of only 1 center and the sociodemographic characteristics of the nurses. Obtaining blood from nurses only once in 24 hours was another limitation. Taking a single blood sample can cause changes in the parameters, such as stress hormones to be undetected. To conduct this study with a larger sample size, including more than 1 center and obtaining blood samples at the beginning and the end of a working day may be recommended. The study results may be generalized to nurses having similar conditions.

Ethical Considerations

This study was conducted by obtaining ethical consent from the Antalya Atatürk Education and Research Hospital's Medical Ethics Board (Date: 05.06.2014; Number: 43/2) and written permission from directorate of the Afyon Kocatepe University, Faculty of Medicine. Voluntary nurses were included in the study, and written informed consent was obtained.

Results

The sociodemographic characteristics of the nurses included in the study group are given in Table 1. Accordingly, 46.7% of the nurses were married and 38.3% had at least 1 child. Moreover, 76.7% were undergraduates or postgraduates, whereas 23.3% were high-school or associate graduates. Half of the nurses worked in night shifts, and the other half worked in day shifts, 36.7% worked in internal units, 28.3% worked in surgical units, 23.3% worked in intensive care units, and 11.7% worked in polyclinics.

The descriptive statistics related to demographic facilities of the participants, blood parameters, and scales and sub-scales are demonstrated in Table 2. Mean age of the nurses was 28.6 years; mean duration of employment was 6.2 years. Mean scale points were calculated as 14.38 for PSS, 18.13 for SWLS, and 18.13 for ASI-3 (Table 2).

ANOVA results related to the comparison of mean scale points and the employed clinics of the nurses are given in Table 3. Accordingly, while the stress and life satisfaction scores did not show a statistically significant difference according to the clinic studied ($p>0.05$), the quality of life and anxiety sensitivity showed a significant difference according to the clinic studied ($p<0.05$). For the nurses employed in surgical clinics, the mean point ($\overline{X}=93.00$) indicated a lower quality of physical

health and a higher anxiety sensitivity ($\bar{X}$=24.58). In addition, nurses with the highest points related to the quality of life ($\bar{X}$=115.42) were employed in polyclinics.

Table 1
Demographic Characteristics of the Participants (n=60)

Variables	Groups	N	%
Marital status	Married	28	46.7
	Single	32	53.3
Children	Yes	23	38.3
	No	37	61.7
Educational status	High school and associate degree	14	23.3
	Undergraduate and postgraduate	46	76.7
Shift	Night	30	50.0
	Day	30	50.0
Unit of employment	Internal units	22	36.7
	Surgical units	17	28.3
	Intensive care units	14	23.3
	Polyclinics	7	11.7

The comparison of mean scale points with educational status according to the t test results are given in Table 4. There was no correlation between PSS, quality of life, and SWLS and educational status ($p>0.05$), whereas ASI varied according to the educational status ($p<0.05$). Nurses with undergraduate and postgraduate degrees had higher ASI ($\bar{X}$=20.32) than those with high-school and associate degrees ($\bar{X}$=10.92).

The results of the Pearson correlation analyses related to some blood parameters and scales are given in Table 5. There was no significant relationship between epinephrine and norepinephrine levels and the scales ($p>0.05$). In contrast, there were significant relationships between TOS, TAS, and cortisol levels and the scales (and also within the scales themselves) ($p<0.05$). There were positive to moderate correlations between blood TOS and cortisol levels and PSS and ASI-3, whereas there were negative-mild correlations between TOS and cortisol levels and MCS. There were negative-mild correlations between PCS and TOS and cortisol levels; there was a positive-mild correlation between PCS and TAS. In addition, TAS showed negative

Table 2
Descriptive Statistics Related to Personal Characteristics, Blood Parameters, and Scales and Sub-Scales of the Participants

Variables	Min	Max	$\bar{X}$	SD	Variables	Min	Max	$\bar{X}$	SD
Age (years)	19	42	28.61	6.10	General Health	10	30	44.77	9.70
Total duration of employment (years)	1	19	6.20	4.73	Physical Function	15	30	48.10	6.87
Total duration of employment in the current unit (years)	1	15	3.35	3.01	Role-Physical	4	8	23.50	6.31
Systolic blood pressure (mmHg)	60	130	103.58	12.41	Pain	3	11	50.55	12.03
Diastolic blood pressure (mmHg)	50	90	63.35	11.44	Vitality	6	21	38.33	9.99
Epinephrine (pg/mL)	12.2	115	36.75	16.04	Mental Health	14	30	52.87	9.17
Norepinephrine (pg/mL)	90.8	620	329.56	108.81	Social Functioning	3	10	40.10	13.14
TOS (μmol/H_2O_2 equiv/L)	0.24	47.64	8.17	6.38	Role-Emotional	3	6	57.67	15.77
TAS (mmol/trolox equiv/L)	0.56	2.14	1.20	0.31	PCS	20.7	61.6	40.47	9.99
Cortisol (ug/dL)	3.05	17.26	6.98	2.83	MCS	19.7	63.6	43.70	8.62
Total PSS	3	25	14.38	4.43	Total ASI-3	0	50	18.13	12.98
RPH	2	19	9.93	3.59	ASI-physical	0	20	6.63	5.51
SE	1	8	4.45	1.70	ASI-cognitive	0	19	4.35	4.33
SWLS	5	35	18.13	7.58	ASI-social	0	24	7.15	6.52

Note. PSS: Perceived Stress Scale; RPH: Representing Perceived Helplessness; SE: Self-Efficacy; PCS: Physical Health Component Summary Scale; MCS: Mental Health Component Summary Scal; SWLS: Satisfaction with Life Scale; ASI-3: Anxiety Sensitivity Index-3; SD: Standard deviation

Table 3
Comparison of Total Mean Scale Points according to the Unit Employed

Scales	Clinics	$\bar{X}$	SD	F	p
PSS	Internal units	13.90	4.04	0.663	0.579
	Surgical units	15.64	4.85		
	Intensive care units	14.07	3.95		
	Policlinics	13.42	5.74		
SF-36-PCS	Internal units	44.40[b]	7.65	6.365	0.001*
	Surgical units	37.34[c]	7.32		
	Intensive care units	47.60[b]	8.54		
	Polyclinics	49.10[a]	6.22		
SF-36-MCS	Internal units	40.50	9.45	2.20	0.098
	Surgical units	42.18	10.75		
	Intensive care units	35.51	7.84		
	Polyclinics	46.17	11.10		
SWLS	Internal units	16.86	7.35	1.813	0.155
	Surgical units	16.11	7.42		
	Intensive care units	20.57	6.07		
	Polyclinics	22.14	9.95		
ASI-3	Internal units	13.90[b]	8.29	2.947	0.045*
	Surgical units	24.58[a]	14.47		
	Intensive care units	18.71[b]	15.93		
	Polyclinics	14.57[b]	10.46		

*p<0.05. [a,b,c d] different letters refer to significance between the groups (p<0.05)
Note. PSS: Perceived Stress Scale; PCS: Physical Health Component Summary Scale; MCS: Mental Health Component Summary Scale; SWLS: Satisfaction with Life Scale; ASI-3: Anxiety Sensitivity Index-3; SF-36: Short Form Of Quality Of Life; SD: Standard Deviation

correlations with PSS and ASI-3 and positive-mild correlations with MCS, PCS, and SWLS. There were negative-good correlations between PSS and MCS, negative-moderate correlations between PSS and SWLS, and positive-moderate correlations between PSS and ASI-3. There were positive-moderate correlations between SWLS and MCS, negative-moderate correlations between SWLS and ASI-3, and negative-moderate correlations between MCS and ASI-3. There were positive-moderate correlations between MCS and PCS, positive-moderate correlations between PCS and SWLS, and negative-moderate correlations between PCS and ASI-3. There was a negative-moderate correlation between PCS and PSS.

In this study, there were no significant differences between blood parameters and mean points for scales and subscales according to shift status (day-shift work) (p>0.05) (Table 6).

Discussion

This study aimed to examine the effects of day and night shifts on stress, anxiety, quality of life, and oxidative stress parameters and the relationship between the nurses' blood parameters and stress, anxiety, and quality of life. The study results revealed that both scale scores and blood parameters did not change according to the shift, but there were relationship between blood parameters and scales. Our hypothesis was partially confirmed with this relationship.

In this study, the plasma adrenaline and noradrenaline levels, serum cortisol levels, and TAS and TOS of the nurses were between the normal reference limits (Erbil, 2007; Örkmez et al., 2013). The mean points for perceived stress were moderate among the nurses. The points were approximately 100 for SF-36, and 8 sub-scales refer to a good health and

Table 4
Comparison of Total Mean Points with Educational Status

Scales	Educational status	$\bar{X}$	SD	t	p
PSS	High school and associate degree	12.92	4.12	1.412	0.163
	Undergraduate and postgraduate	14.82	4.47		
SF36-PCS	Highschool and associate degree	45.47	6.38	0.927	0.358
	Undergraduate and postgraduate	43.13	9.17		
SF36-MCS	High school and associate degree	40.20	10.39	-0.11	0.909
	Undergraduate and postgraduate	49.56	9.98		
SWLS	Highschool and associate degree	17.85	7.18	0.154	0.878
	Undergraduate and postgraduate	18.21	7.77		
ASI-3	High-school and associate degree	10.92	8.31	2.472	0.016*
	Undergraduate and post-graduate	20.32	13.41		

*p<0.05
Note. PSS: Perceived Stress Scale; PCS: Physical Health Component Summary Scale; MCS: Mental Health Component Summary Scale; SWLS: Satisfaction with Life Scale; ASI-3: Anxiety Sensitivity Index-3; SF-36: Short Form of Quality of Life; SD: Standard deviation

Table 5
Correlation Coefficients for the Relationship between Some Blood Parameters and Scales

Variables	PSS	PCS	MCS	SWLS	ASI
Epinephrine	0.121	−0.015	−0.008	−0.162	0.096
Norepinephrine	0.058	−0,103	−0.003	−0.009	0.107
TOS	0.484*	−0.218*	−0.317*	−0.267*	0.370*
TAS	−0.211*	0.218*	0.240*	0.191*	−0.198*
Cortisol	0.346*	−0.201*	−0.258*	−0.225*	0.499*
PCS	−0.436*	-	0.494*	0.401*	−0.359*
MCS	−0.679*	0.494*	-	0.487*	−0.531*
SWLS	−0.471*	0.401*	0.487*	-	−0.329*
ASI-3	0.444*	−0.359*	−0.531*	−0.329*	-

Note. PSS: Perceived Stress Scale; PCS: Physical Health Component Summary Scale; MCS: Mental Health Component Summary Scale; SWLS: Satisfaction with Life Scale; ASI-3:Anxiety Sensitivity Index-3; TAS: Total Antioxidant Status; TOS: Total Oxidant Status; SD: Standard deviation

quality of life. In this study, the PCS score, the scale indicating health summary report of the nurses, was ±40.47, MCS score was ±43.70, and SWLS score was ±18.13. The quality of life and satisfaction with life scores of the nurses were not within the acceptable limits. All dimension scores for quality of life SF-36 scale were between 23.50 and 57.67, and the role-physical and vitality subscale scores were very low. Joslin et al. (2014) reported all dimension points for quality of life among the nurses to be between 56.8 and 74.9 (Joslin et al., 2014). In a systematic review and meta-Analysis by Dehvan et al., (2019), the SF-36 score of Iranian nurses was 60.5. In their study, among the SF-36, the subscale score was the highest at 69.52 with the physical functioning subscale, and the lowest mean score was on the vitality subscale at 52.90. In a study by İbrahim et al., (2016), it was reported that approximately 80% of nurses in Saudi Arabia have a good or very good quality of life. The mean SF-36 subscale scores among nurses in China varied between 60.5 and 90.3.

In a study by Ergün et al., (2005), the mean scores for quality of life among Turkish oncology nurses were found to be 14.52; for physical health and mental health 14.3 and 13.57, respectively. In a study by Akbolat et al., (2015), the PCS mean score and MCS score were 56.57 and 53.70, respectively. In another study by Çelebi & Sunal (2016) with nurses working in surgery units, the

Table 6
Comparison of Blood Parameters and Scales to Shift Status of the Nurses

Variables	Working Style	$\bar{X}$	SD	t	p
Epinephrine	Shift	34.01	14.08	1.334	0.187
	Daytime	39.50	17.59		
Norepinephrine	Shift	320.58	110.79	0.637	0.527
	Daytime	338.55	107.92		
TOS	Shift	8.92	8.40	0.905	0.369
	Daytime	7.42	3.35		
TAS	Shift	1.15	0.32	1.279	0.206
	Daytime	1.25	0.29		
Cortisol	Shift	7.54	3.13	1.530	0.131
	Daytime	6.43	2.42		
PSS	Shift	13.73	4.14	1.137	0.260
	Daytime	15.03	4.69		
SF-36-PCS	Shift	45.47	8.26	1.172	0.246
	Daytime	42.40	8.91		
SF-36-MCS	Shift	35.50	9.42	-1.549	0.127
	Daytime	42.45	10.30		
SWLS	Shift	16.40	7.66	1.804	0.076
	Daytime	19.86	7.63		
ASI-3	Shift	17.13	13.95	0.593	0.555
	Daytime	19.13	12.09		

Note. PSS: Perceived Stress Scale; PCS: Physical Health Component Summary Scale; MCS: Mental Health Component Summary Scale; SWLS: Satisfaction with Life Scale; ASI-3: Anxiety Sensitivity Index-3; TAS: Total Antioxidant Status; TOS: Total Oxidant Status; SD: Standard deviation

nurses obtained the highest scores in the physical function subscale (±85.91) and the lowest scores in the physical role subscale (±46.90). When the SF-36 dimension scores were compared with the available data from nurses in Turkey and nurses in other countries, the nurses in Turkey were found to have a low to moderate quality of life. Nearly all the nurses spend most time of their lives in the hospital. The studies indicated a relationship between the quality of life of nurses and their working conditions. The negative working conditions combined with the sedentary lifestyle of the nurses may have an impact on the quality of life and disease-health process (Freire et al., 2015). In this study, the mean SWLS score of nurses was ±18.13, which indicates that the nurses were slightly dissatisfied with their life. Lankau et al., (2017) found the SWLS score of nurses to be 20. In study by Pietraszek et al., (2016) the mean score of life satisfaction of nurses was 21.1. A comparable level of satisfaction was found among nurses in other studies (Nemcek & James, 2007; Wysokiński et al., 2009). In our study, ASI-3 score, the score indicating anxiety sensitivity of the nurses, was ±18.13; the physical point score was ±6.63, cognitive point score was ±4.35, and social point score was ±7.15. In a study by Shichen et al, the nurses had a mean ASI-3 score of 8.13, physical score of ±11.631, cognitive score of ±14.3, and social score of ±3.2. Although this total ASI-3 score was higher than that of nurses in the study by Li et al., (2016), subscale scores of the Turkish nurses were lower than those of Chinese nurses. These results indicate that Turkish nurses may be vulnerable to developing anxiety symptoms.

When the perceived stress, quality of life, satisfaction with life, and anxiety levels were evaluated according to their working units, the nurses employed in polyclinics had the highest quality of life

and satisfaction with life, and they also had the lowest perceived stress and anxiety level when compared to the nurses in other units. The situation was the opposite for the nurses employed in surgical units. McCarthy et al., (2010) found higher perceived stress points for nurses in medical units (McCarthy et al., 2010). Ergün et al., (2011) have found higher perceived stress points for nurses working in surgical intensive care units (Ergün et al., 2011). Freire et al., (2015) have found SF-36 points of nearly 100 in only 1 surgery unit of a hospital (Freire et al., 2015). This difference may be owing to the workload in the hospitals where the studies were conducted; patient-nurse ratio; emergency and independence level of the patients; job definition; technological support; structure of the nursing care services; occupational autonomy; work overtime; and the knowledge, skill, and experience of the nursing staff (Yıldırım & Aycan, 2008). In this study, the workload of the nurses employed in the polyclinics was low and they did not work in night shifts, on weekends, and on official holidays. That's why they can have more life energy. Therefore, having social activities and not having a sedantary life may contribute to a better quality of life and satisfaction with life for nurses employed in polyclinics (Freire et al., 2015). In contrast, the presence of surgical patients who are not vitally stable and a high rate of circulation in surgical clinics induce an increase in the workload. The stressful nature and intensity of the surgical clinics may affect the stress and anxiety levels of the nurses. Owing to the life-threatening nature of constant anxiety both from physical and psychological aspects and being in a condition that can have a negative impact on the quality of life, the stress and anxiety levels may be higher (Durmuş & Günay, 2007).

There were no significant differences between the personal (age, marital status, and shift) characteristics and mean scale scores. There was only a positive relationship between educational status and mean ASI-3 scores ($p<0.05$). In the educational process of the nurses with undergraduate and postgraduate degrees, creative, independent, and multidimensional thinking behaviors are included to gain and improve critical thinking skills (Özgür et al., 2011). The inconvenient working conditions related to the expectation, education and, skills may increase the anxiety of the nurses with undergraduate degrees.

In this study, quality of life was inversely related to life satisfaction, anxiety sensitivity, and stress. Satisfaction with life is entirely the cognitive evaluation of an individual's life. Family, spare time, health, money, conceit, immediate environment, and work life may influence life satisfaction (Strine et al., 2008). Satisfaction with life is also closely related to mental health. Stein & Heimberg (2004) have found that those with generalized anxiety disorder had a lower life satisfaction score than the general population. However, in our study, we found a positive relationship between satisfaction with life and quality of life among nurses. This may be interpreted as the increment in quality of life of an individual equals to his/her satisfaction with life.

Positive-moderate correlations were found between TOS and cortisol levels and perceived stress and anxiety sensitivity in our study. This result may be supported by the statement that stress increases the secretion of oxidative stress products and cortisol from the adrenal cortex (Aschbacher et al., 2013). Moreover, from this viewpoint, the increase in stress levels and anxiety sensitivity may induce an increase in TOS and cortisol levels among the nurses. In addition, the negative correlation between "TOS cortisol levels" and "MCS, PCS, SWLS" may be interpreted as the satisfaction with life and quality of life decreases among nurses, TOS and cortisol levels may increase. This condition may be associated with the experienced stress of the nurses. The positive correlation between TOS and perceived stress and anxiety sensitivity and the negative correlation between TOS and MCS and SWLS seem to support all these results.

In this study, the stress markers epinephrine, norepinephrine, and cortisol levels were compared with the shift status of the nurses; no significant differences were found among the nurses working in night shifts or daytime. However, Yamasaki et al., (1998) determined 24-hour epinephrine and norepinephrine levels in the urine of nurses working in shifts and daytime (Yamasaki et al., 1998). The urine epinephrine and norepinephrine levels were higher in daytime; however, no significant difference was found in these levels in the evening and night shifts in their study. This difference was attributed to the endogenous circadian rythym. In addition, Yamauchi et al. (2001) measured urine norepinephrine levels during day and night and revealed higher levels during day-

time than during nighttime; however, no significant difference was found during evening and night shifts (Yamauchi et al., 2001). The urine norepinephrine levels were reported to be affected because of working in night shifts. Our study is different from these studies in terms of timing of sample collection. We obtained the blood samples of 2 groups at the end of the day shift. Therefore, the differences in the day and night shift epinephrine and norepinephrine levels may not be found.

In a study on cortisol levels (Kobayashi et al., 1997), no difference was found between day and night shifts. Copertaro et al., (2011) also found no effect of shifts on cortisol levels (Copertaro et al., 2011). Our results are consistent with the results of these studies.

No significant difference was found between TAS and TOS, reflecting the relationship between oxidative stress and shift status of the nurses in our study. Özdemir et al., (2013) obtained blood samples from nurses working in night shifts and daytime during 08.00–09.00 and measured TAS and TOS; they found no difference between the groups. However, Ulaş et al., (2012) determined TAS and TOS both in daytime and night shifts at the beginning and end of the shifts and found a significant decrease in TAS and a significant increase in TOS at the end of the shift compared with the beginning the shift (Ulaş et al., 2012).

In this study, we found no significant difference in the scale (PSS, SF-36, SWLS, and ASI-3) scores of nurses working in shifts and daytime. However, the perceived stress and anxiety levels were higher among the nurses working in daytime. Selvi et al., (2010) found no difference in quality of life of nurses working in night shifts and daytime (Selvi et al., 2010). However, the perceived stress and anxiety levels were higher among the nurses working in daytime. Similarly, in a study conducted to determine the effect of working in shifts on anxiety level, the state anxiety levels were found to be higher among the nurses constantly working in daytime than those working in night shifts (Demir, 2005). Therefore, high patient circulation, intense nurse-health staff relationship, and presence of noise and rush as well as the fact that surgeries are performed within regular working hours, unlike the night shift, increase the stress level. Similarly, although life satisfaction was found to be higher in nurses working in daytime, no significant difference was found between the groups. Changing sleep-wake cycle in shift work, sense of sleepiness, and fatigue at the end of night shift may negatively affect the nurses' normal biological, psychological, and social life pattern (Yüksel, 2004). In a previous study, it was found that working in the night shift negatively affects family life of the nurses who were married and with children; the nurses experienced difficulties related to child care and could not rest sufficiently owing to chores after the shift (Erel, 2005). It can be said that these problems affect the life balance, and health of nurses working in night shifts negatively affects their life satisfaction.

Conclusion and Recommendations

The results show that the quality of life of nurses in surgical clinics was lower than other units, and their anxiety sensitivity was higher. However, significant relationships were found between "TOS, TAS, cortisol levels" and "stress, quality of life, life satisfaction, anxiety sensitivity". In addition, it was determined that with increasing stress, quality of life and life satisfaction decreased, and anxiety sensitivity increased. TOS, TAS, epinephrine, norepinephrine and cortisol levels, stress, quality of life, satisfaction with life and anxiety sensitivity were found to be similar between day and shift workers. The results suggest that more studies are needed to resolve some of the questions regarding the effect of working in night shifts on the health of nurses.

Ethics Committee Approval: This study was approved by Ethics committee of Antalya Atatürk Education and Research Hospital's Medical Ethics Board (Approval No: 43/2).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Supervision – C.Ç., P.Ö.; Design – C.Ç., P.Ö., A.A.; Resources – C.Ç., P.Ö.; Materials – C.Ç., P.Ö., İ.K.; Data Collection and/or Processing – C.Ç., P.Ö.; Analysis and/or Interpretation – C.Ç., P.Ö., İ.K..; Writing Manuscript – C.Ç., P.Ö., İ.K.; Critical Review – İ.K., A.A.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: This study was supported by Scientific Research Projects Coordination Unit of Afyon Kocatepe University with project number 14.SAGLIK.YO.01.

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