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The Relationship Between Breast Cancer Risk and Sleep Quality Among Night Shift Nurses: Descriptive Cross-Sectional Study

Gece Vardiyasında Çalışan Hemşirelerde Meme Kanseri Riski ve Uyku Kalitesi Arasındaki İlişki: Tanımlayıcı Kesitsel Çalışma

Meryem YILMAZ[a], İmran AKGÜL ÇETİN[b]

[a]Sivas Cumhuriyet University Faculty of Health Sciences, Department of Nursing, Department of Surgical Nursing, Sivas, Türkiye
[b]Private, Sivas, Türkiye

ABSTRACT Objective: The aim of this study was to investigate the relationship between breast cancer (BC) risk level and sleep quality among nurses working night shifts. **Material and Methods:** This descriptive, cross-sectional study was conducted between January 30-July 30, 2018, at a university hospital and a government hospital in the province of XXX. Nurses who had worked night shifts for at least 3 years were included in the study. Three assessment tools were used: a questionnaire form, the Ministry of Health Breast Cancer Risk Assessment Form, and the Pittsburgh Sleep Quality Index. Descriptive statistics, non-parametric tests, and Spearman correlation analysis were used for statistical analysis of the data. A significance level of $p<0.05$ was accepted. **Results:** A total of 110 nurses participated in the study. It was found that nurses who had been working night shifts for 11 years or more had a high mean BC risk score (121.25±29.35) and a low mean sleep quality score (8.94±2.42); however, the differences in mean BC risk scores and overall sleep quality scores according to years of night shift work were not statistically significant ($p>0.05$). Correlation analysis revealed that working night shifts 1-3 times per week increased BC risk, while working night shifts three or more times per week was associated with lower sleep quality. A significant correlation was found between nurses' age ($r=0.500$, $p<0.000$), body mass index ($r=0.416$, $p<0.000$), family history of BC ($r=-0.535$, $p<0.000$), having children ($r=-0.366$, $p<0.000$), breastfeeding ($r=-0.470$, $p<0.000$), total years of work experience ($r=0.341$, $p=0.000$), and years of night shift work ($r=0.348$, $p<0.000$). No significant relationship was found between sleep quality and BC risk ($r=-0.147$, $p>0.125$). **Conclusion:** The results of this study indicate that night shift work is associated with an increased risk of BC and poor sleep quality among nurses. Although the association between sleep quality and BC risk was not statistically significant, both total years of employment and cumulative years of night shift work were significantly associated with increased BC risk.

Keywords: Breast cancer; sleep quality; melatonin; night shift; nursing

ÖZET Amaç: Bu çalışmanın amacı, gece vardiyasında çalışan hemşirelerde meme kanseri (MK) risk düzeyi ve uyku kalitesi arasındaki ilişkiyi araştırmaktı. **Gereç ve Yöntemler:** Tanımlayıcı, kesitsel tipteki bu çalışma, XXX ilindeki bir üniversite ve bir devlet hastanesinde 30 Ocak-30 Temmuz 2018 tarihleri arasında yürütüldü. Araştırmaya en az 3 yıl gece vardiyasında çalışan hemşireler dâhil edildi. Çalışmada, 3 değerlendirme aracı kullanıldı: anket formu, Sağlık Bakanlığı Meme Kanseri Risk Değerlendirme Formu ve Pittsburg Uyku Kalitesi İndeksi. Verilerin istatistiksel analizinde, tanımlayıcı istatistikler, parametrik olmayan testler ve Spearman korelasyonu kullanıldı. Anlamlılık düzeyi $p<0,05$ olarak kabul edildi. **Bulgular:** Bu çalışmaya toplam 110 hemşire katıldı. Gece vardiyasında 11 yıl ve üzeri çalışan hemşirelerin MK riski puan ortalamasının yüksek (121,25±29,35) ve uyku kalitesi puan ortalamasının düşük (8,94±2,42) olduğu; ancak gece vardiyasında çalışma yılına göre MK riski ve toplam uyku kalitesi puan ortalamaları arasındaki farkın istatistiksel olarak anlamlı olmadığı bulundu ($p>0,05$). Korelasyon analizi sonucu, her hafta 1-3 kez gece vardiyasının MK riskini artırdığı, 3 ya da daha fazla gece vardiyasında çalışmanın uyku kalitesini düşürdüğü belirlendi. Hemşirelerin yaşı ($r=0,500$, $p<0,000$), beden kitle indeksi ($r=0,416$, $p<0,000$), ailede MK öyküsünün bulunması ($r=-0,535$, $p<0,000$), çocuk varlığı ($r=-0,366$, $p<0,000$), emzirme ($r=-0,470$, $p<0,000$), toplam çalışma yılı ve gece çalışma yılı ($r=0.341$, $p=0.000$ ve $r=0.348$, $p<0.000$) arasında anlamlı ilişki olduğu belirlendi. Uyku kalitesi ile MK riski arasındaki ilişkinin anlamlı olmadığı saptandı ($r=-0,147$, $p>0,125$). **Sonuç:** Bu çalışmanın sonuçları, gece vardiyasında çalışmanın hemşirelerde MK riskini artırdığını ve uyku kalitesini düşürdüğünü gösterdi. Uyku kalitesi ile MK riski arasındaki ilişki istatistiksel olarak anlamlı bulunmamakla birlikte, toplam çalışma süresi ve gece vardiyasında kümülatif çalışma yılı ile MK riski arasında anlamlı bir ilişki saptandı.

Anahtar Kelimeler: Meme kanseri; uyku kalitesi; melatonin; gece vardiyası; hemşirelik

Correspondence: Meryem YILMAZ
Sivas Cumhuriyet University Faculty of Health Sciences, Department of Nursing, Department of Surgical Nursing, Sivas, Türkiye
E-mail: yilmazmm01@hotmail.com

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Many risk factors for breast cancer (BC) have been identified; however, more than 50% of BC cases cannot be solely attributed to these known factors. In 2007, the International Agency for Research on Cancer (IARC) classified "shift work involving circadian disruption" as a probable human carcinogen.[1] This classification was based on strong evidence from animal studies and limited evidence from human studies, suggesting potential carcinogenicity in humans.[2,3] Furthermore, the IARC reaffirmed this classification by identifying night shift work as a possible breast carcinogen in subsequent evaluations, most recently in June 2019.[4] The proposed mechanism linking night shift work to cancer centers on the disruption of circadian rhythms and suppression of melatonin levels caused by exposure to artificial light at night (ALAN).[4] Circadian disruption resulting from shift work and exposure to ALAN adversely affects melatonin production, which plays a crucial role in regulating sleep quality.[5]

Life on Earth has evolved in accordance with the natural light-dark cycle caused by the Earth's axial rotation. Circadian rhythms are regulated by endogenous mechanisms that work in synchronization with this cycle and follow an approximately 24-hour period.[6] In mammals, the suprachiasmatic nucleus (SCN), located in the hypothalamus above the optic chiasm, functions as the central circadian pacemaker.[7] This center plays a critical role in synchronizing and regulating circadian rhythms in the human body in response to environmental light.[8] However, exposure to environmental stressors -especially artificial light (ALAN) at night and irregular work schedules- can disrupt these rhythms, potentially affecting the regulation of sleep, metabolism, and mood.[5] This rhythm also plays a key role in regulating DNA repair mechanisms and increasing the body's resistance to DNA damage.[9] Disruptions in circadian rhythms can lead to sleep deprivation. Sleep deprivation is classified as a probable carcinogen for cancer development in the literature.[10] The advent of ALAN has dramatically changed human temporal organization, enabling continuous health care and expanding social and professional activities around the clock.[7] However, modern lifestyle factors that have resulted from these advances-including exposure to ALAN, irregular work schedules, and poor eating habits-can disrupt the body's internal clock, which evolved in harmony with natural light-dark cycles and regulates circadian rhythms.[6] These disruptions are particularly pronounced in night shift workers, who are frequently exposed to ALAN, experience irregular sleep patterns, and follow altered meal schedules-factors that may increase their risk cancer.[11] Scholarly studies have identified a bidirectional relationship between circadian rhythms and cell division.[12] Circadian disruption -often caused by factors such as shift work or exposure to ALAN- has been associated with several adverse health outcomes, including an increased risk of BC.[13] Experimental studies indicate that circadian misalignment promotes mammary epithelial proliferation and tumor development.[14-16] First identified in the 1960s, the link between disrupted circadian rhythms and BC has become a focus of growing research interest.[17]

One of the key biological mediators affected by circadian disruption is melatonin, a hormone synthesized primarily by the pineal gland during the dark phase.[6] Pineal hormone melatonin, derived from tryptophan, regulates the sleep-wake cycle and is metabolized mainly by cytochrome P450 enzymes in the liver.[18,19] Its production is highly sensitive to light exposure, with short-wavelength blue light (460-480 nm) notably suppressing secretion by activating retinal ganglion cells.[20] Beyond its role in circadian regulation, melatonin exhibits significant anti-cancer properties.[18] It modulates estrogen signaling, displays antioxidant and anti-inflammatory activities, and helps maintain cellular homeostasis.[21] Chronic suppression of melatonin, as seen with prolonged ALAN exposure, may weaken these protective effects and increase BC susceptibility, partly by reducing melatonin's ability to inhibit BC cell proliferation and induce apoptosis.[5,22]

The SCN, the master clock within the hypothalamus, coordinates neuroendocrine and reproductive rhythms via the gonadotropin-releasing hormone system and the hypothalamic-pituitary-gonadal axis.[6] Disruption of SCN signaling by irregular light-dark exposure further disturbs hormonal balance, supporting the hypothesis that circadian misalignment contributes to BC pathogenesis.[23] The aim of this study

was to investigate the relationship between BC risk and sleep quality in nurses working night shifts (16:00 to 08:00).

MATERIAL AND METHODS

DESIGN AND SETTING

A descriptive cross-sectional design was used in the study, which was conducted between January 30-July 30, 2018, at a university hospital clinic and a government hospital.

ETHICAL CONSIDERATIONS

The study was approved by the Cumhuriyet University Non-Interventional Clinical Research Ethics Committee (date: January 1, 2018; no: 2018-01/09). Prior to data collection, written informed consent was obtained from all study participants. The study consistently adhered to the principles of the Declaration of Helsinki and ethical guidelines, ensuring an unwavering commitment to ethical conduct throughout the research.

Population and Sample

The target population of the study consisted of 662 registered nurses, of whom 335 were employed in a university hospital and 327 in a government hospital. Of these, 270 nurses from the university hospital and 282 nurses from the government hospital, all working night shifts, declined to participate. This resulted in a sample of 110 actively participating nurses (50 university hospital nurses, 60 government hospital nurses) who had at least 3 years of experience working the night shift (16:00-08:00). Data collection took place between January 30-July 30, 2018. No specific sampling method was used, as the aim was to reach the entire target population.

DATA COLLECTION TOOLS

This study used three instruments to collect data.

The Questionnaire Form

A 51-item questionnaire was used that included questions on sociodemographic characteristics, BC risk factors, knowledge, attitudes, behaviors, and screening techniques. The first section focused on collecting sociodemographic information and included 28 questions covering variables such as education, age, marital status, children, work history night, menstrual history, menopausal status, family history of BC, and more.[24]

BC Risk Assessment Form Endorsed by the Ministry of Health, Republic of Xxx

Developed by the American Cancer Society and endorsed by the XXX Ministry of Health, the form includes six sections with 20 items that address factors such as family history of BC, personal history of BC, childbearing age, menstrual history, and body structure. In the form, risk levels are categorized as follows: 200 points and below are considered "low risk", 201-300 points are considered "moderate risk", 301-400 points are considered "high risk", and scores above 400 points are considered "highest risk".[25]

Pittsburg Sleep Quality Index

The Pittsburg Sleep Quality Index, a self-report measure of sleep quality and disturbance, was developed by Buysse et al.[26] Subsequently, the validity and reliability of the Turkish version was established by Agargün et al.[27] It consists of 24 items, including 19 self-report and 5 partner-report questions. The scale measures various sleep-related variables and is divided into 7 components for scoring. Higher scores indicate poorer sleep quality, with a total score ranging from 0 to 21. The scale also assesses the impact of hospitalization and medical conditions on sleep quality.

DATA COLLECTION

Nurses who participated in the study provided written informed consent and completed the questionnaires during face-to-face interviews at their workplaces, with no reported withdrawals. The administration of the questionnaire took 25 minutes; notably, no nurses withdrew from the study. Data were collected by the assistant researcher.

STATISTICAL ANALYSIS

Data were analyzed using IBM SPSS (version 20.0), with the Shapiro-Wilk test confirming a non-normal distribution, requiring non-parametric tests (Kruskal-Wallis, Mann-Whitney U, Pearson correlation) using counts, percentages, means, and standard deviations, with significance set at $p<0.05$.

TABLE 1: Sociodemographic characteristics, reproductive and genetic risk factors, and lifestyle risk factors for BC of nurses

Sociodemographic characteristics		n	%
Age (years), $\bar{X}$(SD)	30.9 (10.8)		
Education	Master's degree	12	10.9
	Bachelor's degree	72	65.5
	Vocational high school	20	18.2
	Associate degree	5	4.5
BMI	0-18.4 (underweight)	9	8.1
	18.5-24.9 (normal)	60	54.1
	25-45 (overweight/obese)	41	36.9
Marital status	Married	64	58.2
	Single	44	40
	Divorce	2	1.8
Employment	3-5 years	29	26.4
	6-10 years	49	44.5
	More than 10 years	32	29.1
Years of shift work	3-5 years	27	24.3
	6-10 years	57	51.4
	More than 10 years	26	23.6
Number of shifts in a week	1-3	104	94.5
	More than 3	6	5.5

Reproductive and genetic risk factors		n	%
Age of first menstruation	7-11 age	7	6.3
	12-13 age	57	51.3
	14 and ↑	46	41.4
Family history of BC	Yes	15	13.6
	No	95	86.4
Family member with BC	Mother	3	2.7
	Aunt (mother)	5	4.5
	Aunt (father)	2	1.8
	Grandparents	5	4.5
OCPs	Using	28	25.5
	Not using	82	74.5
Child	Yes	55	50
	No	55	50
Number of children	1	25	22.7
	2	26	23.6
	3 and ↑	5	4.5
First birth age	20-24 age	17	15.4
	25-29 age	34	30.9
	30 age and ↑	4	3.6
Breastfeeding infants	Yes	54	48.6
	No	38	34.2
Breastfeeding duration	3 month	3	2.7
	6-12 month	15	13.6
	12- 24 month	17	15.5
	24 months and over	19	17.3

Lifestyle risk factors		n	%
Alcohol	Yes	2	1.8
	No	108	98.2
Exercise	Yes	20	17.4
	No	90	82.7
Number of exercises weekly	1-3	5	4.5
	3 and ↑	15	13.6
Exercise time	30 min↓	4	3.6
	30-60 min	14	12.7
	60 min and ↑	1	0.9
Biopsy	Yes	1	0.9
	No	109	99.1
Mammography	Yes	12	10.9
	No	98	89.1
Cigarette	Yes	13	11.7
	No	97	87.4

SD: Standard deviation; BC: Breast cancer; BMI: Body mass index; OCPs:

RESULTS

Table 1 shows the sociodemographic, reproductive, genetic, and lifestyle characteristics of the nurses. A significant proportion of the nurses had a bachelor's degree, were of normal weight, were married, had 6-10 years of experience, and had experience with rotating shifts (6-10 years) and night shifts (1-3 times/week). The majority had experienced menarche at 12-13 years of age, none had reached menopause, none had a family history of BC, and none were using oral contraceptives. About half had given birth, with 30.9% giving birth between the ages of 25-29, and 48.6% had breastfed, with 17.3% breastfeeding for 24 months. Most reported abstaining from alcohol and cigarette, not exercising regularly, and not having had a biopsy or mammogram.

The study showed that the nurses had a predominantly low susceptibility to BC, with no individuals identified as high or very high risk; in addition, the scientific analysis determined a mean BC risk score of 97.682 (SD=38.811), ranging from 50.00 to 260.00. The average sleep quality of nurses (X=9.164) was found to be moderate to low (Table 2).

Nurses with an associate degree had a higher mean BC risk score, while those with a baccalaureate degree had lower sleep quality. Statistical analysis revealed a significant difference in BC risk scores based on education level ($p<0.05$), but no significant difference in sleep quality scores ($p>0.05$). Married nurses had higher BC risk scores, while single nurses had lower sleep quality; differences in marital status were statistically significant for BC risk ($p<0.05$) but not for sleep quality ($p>0.05$). Nurses who worked night shifts for 10-15 years had higher BC risk scores, and those who worked night shifts for 5-10 years reported lower sleep quality. BC risk was significantly associated with duration of night shift work ($p<0.05$), whereas sleep quality was not ($p>0.05$). Although nurses working night shifts 1-3 times per week had higher BC risk scores and those working 3 or more night shifts had lower sleep quality, these differences were not statistically significant ($p>0.05$). Nurses who reported engaging in physical exercise had

TABLE 2: BC risk levels and sleep quality score of nurses

Risk levels (Ministry)	**n**	**%**
Below 200 (low-risk)	107	97.3
201-300 (moderate risk)	3	2.7
301-400 (high risk)	0	0
400 and above very high risk	0	0
Minimum-Maximum	50.00-260.00	
X̄±SD	97.7±38.8	
Sleep quality (PSQI)	**X̄±SD**	
Subjective sleep quality	1.418±0.682	
Sleep latency	2.355±0.773	
Sleep time	2.182±0.693	
Sleep efficiency	0.373±0.752	
Sleeping disorder	1.364±0.646	
Sleeping pill	0.109±0.494	
Daytime dysfunction	1.336±1.025	
Total	9.164±2.257	

BC: Breast cancer; SD: Standard deviation; PSQI: Pittsburgh Sleep Quality Index

TABLE 3: Breast cancer risk level and sleep quality mean scores of nurses according to some characteristics

	BC risk		**Total sleep quality**	
Characteristics	**X̄±SD**	**Test**	**X̄±SD**	**Test/p value**
Education				
Master's degree	102.18±2	KW=9.377	9.25±2.4	KW=6.227
Bachelor's degree	101.9±4	**p=0.025**	8.85±2.3	>0.101
Vocational high school	109.0±3		9.60±1.8	
Associate degree	76.8±3		10.15±2	
Marital status				
Married	106.6±4	Z=-3.674	8.91±2.2	Z=-1.559
Single	82.7±4	**p=0.000**	9.55±2.3	>0.119
Night work year				
3-5	86.56±36.9	KW=21.281	9.31±2.2	KW=1.008
6-10	88.88±39.3	**p=0.000**	9.22±2.2	>0.604
11 and over	121.25±29.4		8.94±2.4	
Number of nights worked per week				
1-3	97.88±39.1	Z=-0.245	9.20±2.3	Z=0.478
3 and over	94.16±36.9	p=0.806	8.50±2.4	>-0.632
Exercises				
Yes	106.57±41.7	Z=-1.098	9.31±2.82	Z=-0.231
No	95.94±38.4	p=0.282	9.11±2.13	>0.817
BMI				
Weak	87.22±47.3	KW=2.691	9.67±3.46	KW=1.473
Normal	100.08±34.3	p=0.260	9.27±2.08	>0.479
Obese	96.46±43.4		8.90±2.22	
Breastfed their children				
Yes	111.02±38.3	Z=5.100	8.93±2.3	Z= 1.711
No	74.21±27.8	**p=0.000**	9.66±2.2	>0.087

BC: Breast cancer; SD: Standard deviation; KW=Kruskal Wallis test; Z=Mann-Whitney U test; BMI: Body mass index

TABLE 4: Spearman correlation between some breast cancer risk factors, breast cancer risk and sleep quality of nurses

		Risk BC	Total PSQI	Age (years)	BMI	First menarche age	Family history of BC	Child	First birth age	Breast-feeding	Exercises	Work years	Night work year	Night shifts in one week
Risk BC*	r value	1												
	p value													
Total PSQI	r value	-0.147	1											
	p value	0.125												
Age (years)	r value	**0.500****	-0.077	1										
	p value	**0.000**	0.423											
BMI	r value	**0.416****	-0.004	**0.476****	1									
	p value	**0.000**	0.969	**0.000**										
First menarche age	r value	-0.181	0.005	0.044	-0.097	1								
	p value	0.059	0.960	0.645	0.315									
Family history of BC	r value	**-0.535****	0.182	-0.016	-0.007	0.158	1							
	p value	**0.000**	0.057	0.868	0.942	0.099								
Child	r value	**-0.366****	0.089	**-0.484****	**-0.344****	0.096	0.185	1						
	p value	**0.000**	0.355	**0.000**	**0.000**	0.316	0.052							
First birth age	r value	0.141	0.179	0.125	-0.166	0.113	-0.023	.c	1					
	p value	0.305	0.191	0.363	0.227	0.410	0.866	0.000						
Breast-feeding	r value	**-0.470****	0.161	**-0.498****	**-0.314****	0.129	0.110	0.978**	0.054	1				
	p value	**0.000**	0.125	**0.000**	**0.002**	0.220	0.299	0.000	0.697					
Exercises	r value	-0.105	-0.031	-0.181	-0.064	-0.022	0.029	-0.024	0.202	-0.023	1			
	p value	0.274	0.748	0.059	0.506	0.817	0.766	0.803	0.139	0.829				
Work years	r value	**0.341****	-0.062	**0.809****	**0.424****	0.112	0.015	**-0.403****	0.143	**-0.414****	-0.048	1		
	p value	**0.000**	0.517	**0.000**	**0.000**	0.245	0.880	**0.000**	0.297	**0.000**	0.619			
Night work year	r value	**0.348****	-0.081	**0.758****	**0.343****	0.142	-0.005	-0.380**	0.064	-0.381**	-0.041	0.828**	1	
	p value	**0.000**	0.402	**0.000**	**0.000**	0.138	0.957	0.000	0.644	0.000	0.673	0.000		
Night shifts in one week	r value	-0.022	-0.071	0.054	0.012	-0.011	0.095	-0.080	0.021	-0.179	0.004	0.099	0.176	1
	p value	0.821	0.461	0.573	0.903	0.912	0.321	0.406	0.878	0.088	0.968	0.305	0.066	

*BC risk: Risk of the TC Ministry; BC: Breast cancer; PSQI: Pittsburgh Sleep Quality Index; BMI: Body mass index

higher BC risk scores, whereas those who did not exercise exhibited lower sleep quality. However, exercise status did not have a statistically significant effect on either score ($p>0.05$). Similarly, normal-weight nurses had higher BC risk scores, while obese nurses showed lower sleep quality scores; yet, body mass index was not significantly associated with either BC risk or sleep quality ($p>0.05$) (Table 3).

The Spearman correlation results, show significant positive associations between nurses' BC risk factors, BC risk, and sleep quality. Nurses' age showed a moderate positive correlation with BC risk ($r=0.500$, $p<0.000$), while a negative correlation was observed with family history of BC ($r=-0.535$, $p<0.000$), having children ($r=-0.366$, $p<0.000$), and breastfeeding ($r=-0.470$, $p<0.000$). No significant associations were found between the number of weekly nursing shifts and BC risk ($r=-0.022$, $p>0.821$), nor between sleep quality and BC risk ($r=-0.147$, $p>0.125$) (Table 4).

DISCUSSION

While shift work is fundamental to ensuring uninterrupted patient care, its long-term effects on healthcare providers are of increasing concern. In this study, despite a relatively low mean age, nurses working night shifts had an increased risk of BC and a significant decrease in sleep quality. These findings highlight the need to re-evaluate shift work practices to mitigate potential health risks. Accordingly, this descriptive study was conducted to examine the association between sleep quality and BC risk in nurses working night shifts.

Women who work at night, such as nurses on a night shift, might have an increased risk of BC. This study revealed a statistically significant positive relationship between years of shift work and weekly shift frequency with BC risk ($r=0.405$; $p<0.000$ and $r=0.391$; $p<0.000$), as well as an observed correlation between sleep quality and BC risk. The correlation between cancer risk and daytime dysfunction is weak and statistically non-significant, except in the case of daytime dysfunction. A study involving 494 BC patients and 515 healthy controls found that night work increased the risk of BC by 2.34 times, while high-intensity night work increased it by 2.66 times.[28] In a meta-analysis, found a positive statistical relationship between night work and BC risk in short-term night-shift workers but no increase was observed in the long-term night-shift workers.[29] In a Swedish study, 8 or more years of night work was associated with an increased risk of postmenopausal BC.[30] Numerous scientific studies have linked prolonged exposure to ALAN among nurses to an increased risk of BC. For instance, a study in 2021 by Gómez-Salgado et al. demonstrated an elevated risk in nurses exposed to ALAN for eight or more years.[31] Another study conducted by Lie also revealed that 6 consecutive night shifts increased the risk in nurses with 5 years of experience.[32] In a cohort study involving of 3,404 participants by Åkerstedt et al., the risk of BC was found to be higher in women exposed to night work for more than 20 years.[16] This collective evidence underscores the propensity for increased BC risk, whether due to extended periods of night shift work exceeding 20 years or shorter periods of consecutive shifts.[33] A study reveal a significant association between occupation and cancer incidence.[4] The hypothesized association between night shift work, exposure to ALAN, and BC risk is based on the notion that exposure to nighttime light suppresses the production of melatonin, a hormone known to regulate sleep-wake cycles and to have potential anticancer properties, with empirical evidence suggesting reduced melatonin levels following intermittent nighttime light exposure in humans.[6] According to the results of the studies, it can be said that long and consecutive night shifts are harmful to health. Therefore, to protect nurses, it is recommended that the duration and frequency of such shifts be reduced. These regulations could reduce health risks, improve personal well-being and work productivity, and ultimately contribute to a more sustainable and healthy working environment in the healthcare sector.

In the present study, it was determined that the majority of nurses have a low risk of BC, there are no nurses at high or very high-risk levels, and the average sleep quality is above the moderate level. The result of this study suggests that the age of shift-working nurses falls within the age range ($X=32.11$) associated with a low risk of BC, and this could be attributed to the majority of them having worked in

shift schedules for 3-10 years. However, it can be said that with increasing age, due to changes in the circadian pacemaker, there may be an increase in the risk of BC due to a decrease in melatonin synthesis and secretion. The increasing prevalence of night shift work has raised significant concerns about its classification as an occupational carcinogen. Recent studies suggest that night work, rather than shift work in general, has a significant impact on BC risk.[4] Specifically, night shift work has been associated with a 1.58-fold increased risk of BC compared to daytime work, with the greatest susceptibility observed in younger women and those reporting more than 8 hours of sleep per night.[34] Several studies have reported a moderate association between the duration of rotating shift work and BC risk, with a higher risk observed in individuals who worked rotating shifts for more than 10 years.[3,4] A meta-analysis further confirmed a positive association between BC risk and the duration, frequency, and cumulative exposure to night shift work.[35] However, some systematic reviews have found a statistically significant association mainly among short-term night shift workers, while no clear increased risk was observed among those with longer night shift work.[31] In addition, evidence suggests that night shift work for more than 20 years may still correlate with an increased risk of BC, although the results of different studies remain somewhat inconsistent. For example, one meta-analysis found a positive association between night work and BC risk in short-term night shift workers but not in long-term night shift workers.[29] Another meta-analysis found no association in cohort studies, whereas case-control studies suggested an increased risk.[36] These inconsistencies may be due to differences in study design, exposure assessment, and participant characteristics. Based on the results of this study, it can be concluded that the long-term effects of night shift work may be detrimental to health, and therefore night shift schedules should be adjusted to mitigate these effects. In addition, further research is needed to better understand the long-term adverse health effects of night shift work.

This study found that nurses working 1-3 night shifts per week had a higher mean BC risk, and those with ≥3 years of night shift experience had poorer sleep quality. This finding suggests that ALAN exposure during night shifts may increase the risk of BC by disrupting circadian rhythms and reducing melatonin. One study found that the prevalence of poor sleep quality was 62.11% in nurses working consecutive night shifts and 55.75% in nurses who had previously worked night shifts.[37]A Chinese case-control study found that shorter sleep duration was significantly associated with increased risk of BC, while no association was found between shift work and BC.[38] However, other research suggests that the risk of BC increases with longer and more cumulative night shifts, especially with rotating schedules. Therefore, protective measures should be considered for nurses working night shifts.

To the best of our knowledge, this is the first study to explore the relationship between BC risk and sleep quality among nurses working night shifts in Türkiye. In this study, nurses who were of normal weight, held an associate's degree, were married, and engaged in regular physical activity had lower average sleep quality scores compared to those who were at higher risk for BC, held a bachelor's degree, were overweight, were married, and did not exercise. These findings may be attributed to factors such as the young age of the nurses and the relatively small sample size in this study.

LIMITATIONS

The study had several limitations. First, its scope was limited to a single province and 2 hospitals, which may limit the generalizability of the findings. Additionally, several nurses indicated that they had participated in numerous surveys prior to this study, leading to reluctance in completing the survey. Furthermore, the sample population had a low prevalence of BC risk factors, which resulted in the exclusion of factors such as alcohol consumption and smoking from the risk assessment. Finally, the data collected were based on the nurses' self-reported responses, which may introduce bias and limit the objectivity of the findings.

CONCLUSION

The results of this study indicate that night shift work is associated with an increased risk of BC among nurses. In particular, prolonged exposure to ALAN

appears to increase this risk. The association between sleep quality and BC risk, while not statistically significant in this study, shows trends of concern, particularly when the duration of night shift work is considered. Nurses who worked night shifts for longer periods had a higher risk of BC, with the highest risk found in those with more than 10 years of rotating shift experience. These findings underscore the significant health risks posed by long-term irregular work schedules, particularly among night shift workers. Furthermore, when comparing the effects of different shift schedules, alternating day and night shifts had a more detrimental effect than continuous night shifts. These findings are consistent with previous studies showing a positive association between the duration of night shift work and increased cancer risk. In addition, although the study sample had a low prevalence of BC risk factors, it is clear that further research into the long-term effects of night shift work, sleep deprivation and circadian disruption is needed to develop effective prevention strategies.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Meryem Yılmaz, İmran Akgül Çetin;* ***Design:*** *Meryem Yılmaz, İmran Akgül Çetin;* ***Control/Supervision:*** *Meryem Yılmaz;* ***Data Collection and/or Processing:*** *İmran Akgül Çetin;* ***Analysis and/or Interpretation:*** *Meryem Yılmaz, İmran Akgül Çetin;* ***Literature Review:*** *Meryem Yılmaz, İmran Akgül Çetin;* ***Writing the Article:*** *Meryem Yılmaz, İmran Akgül Çetin;* ***Critical Review:*** *Meryem Yılmaz.*

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