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The Effect of Sleep Habits and Bedroom Environment on Breast Cancer Prevalence among Jordanian Women

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Abstract: *Melatonin is an important hormone that mediates circadian rhythm which is the day – dark cycle of the body based on 24-hr period. Patients who are subjected to light at night, night shift work or bad sleep habits may suppress this normal nocturnal production of melatonin and increase the release of estrogen by the ovaries which may finally lead to breast cancer. 95 patients were interviewed and asked to fulfill a questionnaire from King Abdullah University Hospital. The socio-demographic data was clearly associated in a positive way with breast cancer. The bedroom environment negatively influenced the probability of breast cancer occurrence. In conclusion further studies of sleep habits and electrical light intensity at night should be done to clarify their effect on breast cancer occurrence in Jordanian females.*

Key words: *Breast cancer, Melatonin, Night-shift, Smoking*

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I. Introduction

Melatonin:

Pineal gland is an endocrine gland that produces melatonin hormone which regulates the circadian rhythm [1]. Melatonin or N-acetyl- 5-methoxytryptamine production is controlled via several enzymes. First of all tryptophan is taken from the blood and metabolized to 5-hydroxytrophan then decarboxylated to 5-hydroxytryptamine or serotonin, in turn serotonin will be N-acetylated by enzyme serotonin N-acetyl transferase to form N-acetyl serotonin which later on will be converted into melatonin in the presence of hydroxyindole-O-methyltransferase [1-3]. Melatonin is produced at night and reaches the peak level at midnight and this shows how it can control the circadian rhythm and encourage the need to sleep[4].

Circadian rhythm is the day-dark cycle of the body which is based on 24-hr period[5]. This cycle is controlled by melatonin production and any disruption in this cycle will lead to low daily rise in blood melatonin levels which will affect many functions of the individual such as sleep pattern, mood, sexual maturation and reproduction, tumor growth, aging and immune response[5-7].

Cancer:

The national cancer institute defined cancer as "The name given to a collection of related diseases. In all types of cancer, some of the body's cell begins to divide without stopping and spread into surrounding tissues"[8].There are many types of cancer each with different risk factors and mechanism of action[8-10]. Breast cancer is the most common cancer among women[9] and according to the 15th national cancer registry report of Jordan it was found that breast cancer accounts for 19.6% of newly diagnosed cancers among both males and females with a ratio of 94:1 female to male in 2010[11].

Risk factors of breast cancer vary and some of these factors can't be changes while others can be changed according to each individual decision[12]. Some of these risk factors are the age, female gender, family history of breast cancer, genetics, pregnancy history, breastfeeding history, and menstrual history, drinking alcohol, smoking and many others[12-13].

Melatonin and breast cancer:

In previous studies it was found that melatonin level and circadian rhythm may increase the risk of having breast cancer[13-14].When melatonin production is disrupted then estrogen release will increase which in turn increases the risk of breast cancer[15-16]. On the other hand several studies[17-18] show that night shift workers will be with higher risk of having breast cancer compared to day-time workers[19].

In this study we are looking forward to investigate the impact of bad sleep habits, turning on light at night and night shift work among the previous 10 years before diagnosis and breast cancer prevalence among Jordanian female patients.

II. Method and study design

Study design:

We met about 102 breast cancer women from both outpatient and inpatient clinics in King Abdullah University Hospital and asked them to fulfill our questionnaire after explaining them the purpose of our study and having their approval to participate in the study. Our patients should be females above 18 years old with breast cancer of any stage, and our exclusion criteria include: 1. Pediatrics < 18year, 2. Male patients, 3.Any type of cancer other than breast cancer.

The questionnaire:

Our questionnaire contains four sections with several questions that reflects Jordanian culture, the first section consists socio-demographic questions about patients (age, educational level, monthly income, marital status, use of oral contraceptives, number of pregnancies, breast feeding history, family history of breast cancer and smoking). The second section is about the patient's medical records (when she was diagnosed, the stage of the cancer). The third section is about sleep habits and bedroom environment of the patient for the past 10 years, the questions on sleep habits are:

1. The time the patient usually goes to sleep and turn light off.
2. The time she wakeup normally.
3. If the patient has continuous or interrupted sleep pattern.
4. Wither the subject turn the light on if her sleep is interrupted or not.
5. Bed room light level.

Patients will be asked to classify their bedroom light level according to the levels of darkness we mention:

1. The patient wore mask when sleep.
2. Couldn't see her hand because of darkness.
3. Could see the end of her bed.
4. Could see across her bedroom.
5. Could barely read.
6. Could read comfortably.

The final section of the questionnaire is about the patients previuous job history among the past 10 years (job title, full time or part-time status, time of work day-shift or night-shift).

Statistical analysis:

Data that will be obtained from the questionnaire will be studied and analyzed using the SPSS software. Chi-square will be used to compare between patients with bad sleep habits and those who are have good sleep habits and using good bedroom environment, also the relationship between sleep habits, bedroom environment and job history and socio-demographic data will be studied.

III. Results

The response rate of cancer patients to complete the questionnaire was high. A total of 102 patients were collected from King Abdullah University Hospital 95 patients accepted to participate in this study while 7 patients refused to.

Patient's characteristics:

Demographic characteristics of participated patient with breast cancer revealed that the major population age interval was 49-58 years with a major educational level of secondary school (Table 1). All patients are taking chemotherapy.

Table 1
Demographic data of breast cancer patients

Demographics	N (%)
Age	
29-38	**13(13.7)**
39-48	**24(25.3)**
49-58	**33(34.7)**
59-68	**7(7.4)**
≥ 69	**18(18.9)**
Educational level	
No education	**9(9.5)**
Primary school	**13(13.7)**
Secondary school	**41(43.2)**
Bachelor	**29(30.5)**
Higher education levels	**3(3.2)**

Marital status	
Married	**82(86.3)**
Single	**13(13.68)**

According to the history that is related to the disease more than the half of the patients was using oral contraceptive in a previous period of time for a long term.
About 36.8% are smokers and only two patients worked in night shift (table 2).

Table 2
History of women's with breast cancer

Characteristics	N(%)
Smoker	
Yes	**35(36.8)**
No	**60(63.2)**
Use of oral contraceptives	
Yes	**56(58.9)**
No	**39(41.1)**
History of breast cancer	
Yes	**30(31.6)**
No	**65(68.4)**
Number of pregnancies	
1-3	**19(20)**
4-7	**36(37.9)**
7-9	**16(16.8)**
≥ 10	**11(11.6)**
No pregnancies	**13(13.7)**
Night shift work	
Yes	**2(2.1)**
No	**93(97.9)**

Sleep related phenomena:

Most patients indicated good sleep habits; they were getting to sleep at 10-12pm and waking up at 7-9am. The percentage of patients having continuous pattern of sleep is 55.7% and discontinuous sleep of 44.2% among those patients about 53.7% of them sleep with good light inside the room (table 3).

Table 3
Prevalence of sleep related phenomena

	N (%)
Time of sleep	
7-9pm	**4(4.2)**
10-12pm	**65(68.4)**
1-3am	**24(25.3)**
4-6am	**2(2.1)**
Time of awakening up	
7-9am	**75(78.9)**
10-12am	**15(15.8**
12-2pm	**5(5.3)**
Pattern of sleep	
Continuous	**53(55.7)**
Disturbed (Not continuous)	**42(44.2)**
Light related phenomena	
Use of eye cover	**2(2.1)**
Very dark room	**16(16.8)**
Could see the end of the bed only	**20(21.1)**
Could see the whole room	**51(53.7)**
Difficult to read	**4(4.2)**
Can easily read	**2(2.1)**

Table 4
Relation between breast cancer occurrence and patient's history

	Df	Exact sig. (one-tailed)
Use of oral contraceptive		
Yes		
No	**1**	**0.124**
History of breast cancer		
Yes	**1**	**<0.001**

No		
Smoking Yes No	**1**	**0.010**
Habit of sleep Continuous Not continuous	**1**	**0.356**

Chi square test was applied to analyze the significance of the independent variables in patients with breast cancer.

According to the Chi square results, electrical light intensity at bedroom was positively correlated to breast cancer ($p<0.001$, df 5). Other correlations of night shift work; breast feeding and cancer stage couldn't be calculated because of lack of information's from patients.

IV. Discussion

According to the risk factors that may contribute to breast cancer, smoking was positively associated with breast cancer ($p = 0.010$, 95% CI), this agrees with the results obtained in a study that was conducted in California[20] which revealed that breast cancer risk is increasing significantly among those defined as active smokers. On the other hand there was no significant association when studying an age – adjusted analysis ($p = 0.059$, 95% CI) oppositely to the study conducted in Netherland that stated the positive correlation between breast cancer and smoking in age adjusted analysis[21].

Oral contraceptives are widely used among women and it is suggested that the use of them may increase the risk of having breast cancer[22] because of the carcinogenic effect of estrogen and progesterone on cell proliferation, but in our study there was no significant association between the use of oral contraceptives and the prevalence of breast cancer ($p = 0.124$, 95% CI).

Another risk factor that may increase the possibility of having breast cancer is the family history, there was a strong association in our study between family history and breast cancer ($p < 0.001$, 95% CI) this may be due to the inherited genes that may lead to a mutation leading to breast, ovarian or colorectal cancer. K McPherson et al, showed that the risk of breast cancer may increase two or three times in women whose first relatives (mother, sister or daughter) developed the disease at age less than 50 years and this risk increases when the relatives developed the disease at age less than 50 years[23].

The majority of the patients were confused about the exact time of lactation with each pregnancy, so it was difficult to analyze the results, but depending on the previous studies it's clear that breast feeding may be protective against breast cancer especially in premenopausal women[24].

The aim of this study was to see how night shift-work and sleep disturbance may contribute to the occurrence of breast cancer. In previous studies strong evidence was found that night shift work will disturb the circadian cycle leading to disturbance in melatonin level[24]. This may lead to low levels of melatonin which will consequently increase the probability of having breast cancer[25].

This knowledge further on lead to the hypothesis that melatonin administration may had an effect on the inhibition of tumor growth and cell invasion[26-27].

Unfortunately only two patients of the study population worked at night shift thus it was difficult to study the relation between night-shift workers and its effect on breast cancer.

According to sleep habits of this study population, the majority was sleeping in a continuous pattern with a good amount of electrical light in the bedroom (fig 1).

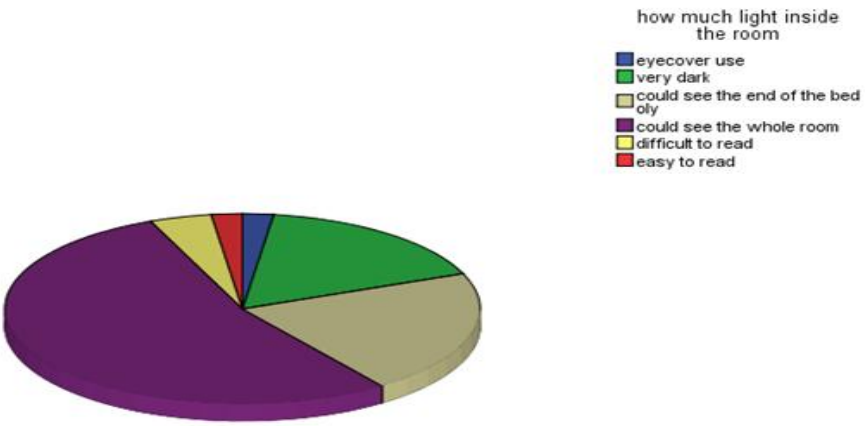

Fig 1: sleep habits and bedroom environment.

A previous study revealed that electrical light use at night may lead to circadian disruption which may lead further on to endocrine disruption which may increase the risk of having breast cancer[28-29], and in this study the results showed that patients who are subjected to more electrical light at night may be positively correlated with breast cancer occurrence ($p<0.001$, 95% CI).

V. Conclusion

This study approved that there are many factors that may increase the possibility of breast cancer occurrence in females.

The factor of sleep -awake pattern couldn't be correlated to breast cancer because the majority of patients confirmed that they didn't work at night, so we need to increase the population.

Further studies with larger number of patient should be conducted to see how circadian cycle, night-shift work and melatonin levels may have a direct effect on the occurrence and progression of breast cancer in females. On the other hand levels of melatonin could be measured for patients with breast cancer and compare the results to patients without breast cancer to see how melatonin may affect the occurrence and progression of tumor.

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