Sleep Hygiene: Improving Sleep Quality and Fatigue for Patients Receiving Chemotherapy

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Abstract Sleep and fatigue disturbance are the foremost frequent aspect experienced by patients with cancer. It has been a neglected problem as a result of the normal and transient reaction to cancer and its treatment, in addition to the underreporting of these disturbances by patients receiving chemotherapy. **Aim:** The study aimed to evaluate the effect of sleep hygiene instructions on sleep quality and fatigue for patients receiving chemotherapy. **Design:** A quasi-experimental research design was utilized. **Setting:** The study was conducted at inpatient department at oncology center Mansoura University, and follows those patients at outpatient clinics. **Subjects:** Purposive sample of 100 adult patient receiving chemotherapy were recruited in this study. **Tools:** Three tools were used. Tool I: Assessment interview questionnaire sheet includes demographic and health relevant data, Tool II: Pittsburgh Sleep Quality Index and Tool III: Arabic version of Fatigue Severity Scale (FSS-Ar). **Results:** There was a statistically significant difference in sleep and fatigue total scores pre and post intervention. Also there was a statistically significant positive correlation between sleep problems and fatigue. **Conclusion:** The study concluded that, majority of participants had poor sleep quality and nearly two thirds of them suffer from some degree of fatigue before applying sleep hygiene instructions. While there was a highly statistically significant improvement of PSQI status and FSS grads total score after applying these instructions. **Recommendation:** This study recommended that, applying sleep hygiene as a routine of nursing care provided for patients receiving chemotherapy and performing additional research to understand the relationship of fatigue and sleep disturbance.

Keywords: chemotherapy, fatigue, sleep hygiene, sleep quality

1. Introduction

Cancer is a major pathological state that causes high rates of morbidity and mortality, which can affect all ages [1]. Chemotherapy considered the primary line of treatment for cancer patients to prolong their lives and improve quality of life by reducing or preventing symptoms. There are different side effects may arise as a result of chemotherapy such as pain, nausea, vomiting, loss of appetite, anxiety, depression, fatigue, insomnia, diarrhea, constipation and alopecia [2,3]. Sleep is important to maintain the natural rhythm of the body and it was considered the second most trouble symptom based on cancer and its treatment. Insufficient or reduced quality of sleep will impact the different biological clocks and they may suddenly stop working as supposed. It will also have a broad, negative impact on cognitive and physiological functions. Patients' quality of life may therefore be severely affected [4,5].

Sleep disorder accounted in 30% - 88% of cancer patients receiving chemotherapy [6]. It appears in a form of poor sleep efficiency, difficult falling sleep, early awakening, and excessive daytime sleepiness. It can become chronic and may persist for several months or years after completion of cancer treatment. Sleep disorder caused by many different factors such as psychological, intellectual and motivational deterioration, fatigue, anxiety and pain [7,8,9]. Fatigue observed in distinct from of "normal" drowsiness experienced by healthy individuals in that it is not relieved by rest or sleep. It characterized by feelings of tiredness, weakness, and lack of energy. Fatigue is a common symptoms experienced in 30% to 60% as a consequence of cancer itself or due to the side effect of cancer treatment [10,11].

The American Academy of Sleep Medicine recommended sleep hygiene as a part of treatment of insomnia. It is one of the non-pharmacological strategies used for improving sleep quality and decrease level of fatigue among patients receiving chemotherapy. Sleep hygiene defined as a set of

behaviors recommended for the development of healthy sleep habits as; maintaining consistent bed and wake times, quiet activities before going to sleep, dark, quiet and cool environment, avoiding stimulated substance, and perform daily light exercise. It helps to decrease anxiety level, promote feelings of calmness, and minimize distressing thoughts that may interfere with the sleep throughout the day [12].

1.1. Significance of the Study

Poor sleep is known to affect up to 75% of patient under chemotherapy treatment. It's worthy mentioned that higher reporting rates of sleep disturbances found within cancer patients than the overall population. Some studies done on newly diagnosed or recently treated cancer patients, suggest that 30-75% of them had sleep problems, which is measure about two times as high as within the overall population [13]. On the other hand, fatigue can produced from insomnia, mainly in patients' receiving chemotherapy, and affect daily living activities negatively. Fatigue is one of the most frequent symptoms among cancer patients, as a result of the disease and its treatment which reflected that approximately 75% of receiving radiotherapy and chemotherapy patients experience fatigue [6,14].

Those patients' are informed about the symptoms they could experience. However, information regarding sleeplessness is usually neglected and life of patients are affected negatively as a result of chemotherapy. Thus, it's essential to design and apply measures to minimize sleeplessness and fatigue severity. Therefore, the present study was designed to evaluate effect of sleep hygiene instructions on sleep quality and fatigue for patients receiving chemotherapy.

2. Aim of the Study

To evaluate the effect of sleep hygiene instructions on sleep quality and fatigue for patients receiving chemotherapy.

2.1. Research Hypothesis

H1. Sleep quality will be improved among cancer patients receiving chemotherapy after applying sleep hygiene instructions.

H2. Fatigue severity level will be improved among cancer patients receiving chemotherapy after applying sleep hygiene instructions.

3. Methods

3.1. Study Design

A quasi-experimental research design was utilized to conduct this study.

3.2. Setting

The study was carried out at inpatient department at oncology center Mansoura University, and follow those patients at outpatient clinics.

3.3. Subjects

A purposive sample of 100 patients receiving chemotherapy was enrolled in this study using pre and posttest based on the following criteria**:**

*Inclusion criteria***:** Adult patients of both sexes, ranged from 20 to 60 years and patients receiving Chemotherapy.

*Exclusion criteria***:** Have already attended formal teaching program about sleep hygiene, patients with dementia, mental retardation, obvious physical problems, and history of major psychological disorder.

Sample size: Was calculated based on information obtained from literature [15], considering level of significance of 5%, and power of study of 80%, the sample size can be calculated through the following formula:

n = [($Z_{\alpha/2}$ + Z_β)^2 × {2(SD)^2}]/ (mean the difference between two groups)^2

Where: SD = standard deviation

$Z_{\alpha/2}$: This based on level of significance, for 5% this is 1.96

Z_β: This based on power, for 80% this is 0.84

Therefore, n= [(1.96 + 0.84)^2 × {2(2.4)^2}]/ (0.95)^2=100.08.

3.4. Tools of Data Collection

Three tools were used for collection of data and achieve the aim of the study as the following:

3.4.1. Tool I: Structured Interview Questionnaire

This tool was developed by researchers after extensive literature review to collect baseline and personal data. It consisted of two parts as follow:

Part I: Demographic data: such as name, age, sex, level of education, occupation, marital status, residence and BMI.

Part II: Health relevant data: such as patients' present complain, disease stage, diagnosis time, chemotherapy cession numbers and comorbid diseases.

3.4.2. Tool II: Pittsburgh Sleep Quality Index (PSQI):

It was developed by Buysse, et al., 1989 [16], to measure the quality and patterns of sleep in the adult, this questionnaire consists of a combination of Likert type and open-ended questions. In this study the researchers used the Arabic translated PSQI that developed by Suleiman, et al., 2009 [17], to distinguishes "poor sleep" from "good sleep" through assess 7 domains: daytime dysfunction over the last month, use of sleep medication, sleep disturbances, habitual sleep efficiency, sleep duration, sleep latency and subjective sleep quality.

Scoring system: Patient's self-rates each of these 7 areas of sleep. Answer scores based on a 0 to 3 scale, in this scale, 3 reflect the negative extreme on the Likert Scale. The element's scores were summed and produce world score which range (0 to 21). High scores means worse sleep quality. A global sum of "5" or higher indicates a "poor" sleeper.

3.4.3. Tool III: Arabic Version of Fatigue Severity Scale (FSS-Ar)

It is a simple self-reported questionnaire adopted from Al-Sobayel et al, 2016 [18], to measure the prevalence and

severity of fatigue experienced by Arabic patients as a major symptom. It involves of nine items that evaluate the severity of patients fatigue symptoms in terms of how these symptoms affect activities of daily living, physical function, exercise, and motivation [19].

Scoring system: The total scores of the fatigue severity scale is the score of the 9 items which ranged from 1-7, based on the extent, to which they agree or disagree with each statement (1 = strong disagreement, 7 = strong agreement) [20]. It was categorized into three levels as follows:

- Non- fatigue (FFS ≤ 4.0)
- Borderline fatigue (4.0‹FSS‹5.0)
- Fatigue (FSS ≥ 5.0).

3.5. Content Validity and Reliability

- Tool I, was designed by the researchers and revised by five experts in the field of medical-surgical nursing in the Faculty of Nursing of Mansoura and Alexandria Universities (for content validity).
- The PSQI (Tool II) had internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83 for its seven components. Numerous studies using the PSQI in a variety of older adult populations internationally have supported high validity and reliability.
- Arabic Version of Fatigue Severity Scale (Tool III) validity and reliability was calculated in speaking Arabic people. The test-retest reliability and internal consistency of the FSS-Ar were acceptable with the reliability coefficient (Cronbach's alpha) of 0.84.

3.6. Pilot Study

A pilot study was carried out on 10 % (10 patients) of patients representing the study sample to test the feasibility and clarity of the used tools; modifications were done based on the results. The sample included in the pilot study was excluded from the final study sample only minor modifications were done.

3.7. Field Work

Data collection was extended over a period of 4 months starting from 1 September 2018 to 31 December 20018; the researchers were attended to the previously mentioned settings three days/ week from 9:00 Am to 1:30 Pm. The study was conducted in three phases namely: assessment, implementation and evaluation:

3.7.1. Assessment Phase

During this phase, the researchers explained the purpose of the study, tools components, and steps of sleep hygiene instructions. The time needed for completing the questionnaire was ranged from 15 - 20 minutes for each patient.

3.7.2. Implementation Phase

- Based on the findings of assessment phase, goals and expected outcomes were formulated.

- In this phase a sleep hygiene instructions for patients who undergoing chemotherapy was provided and their relatives by an oral instructions as a method of teaching supported by data show presentation and simulated brochure contains diagrams and pictures which designed by researchers in simple Arabic language.
- The selected patients who were recruited were interviewed individually by the researchers two times throughout the study.
- The first time for pretest, which implemented through two sections:
  - 1st section was carried out by the researchers for each participant at inpatient departments for collecting baseline data about their demographic, clinical finding, measurement the quality and patterns of sleep, and measure severity level of fatigue. The interview carried out at the previously mentioned departments in the hospital during the morning and afternoon shifts. It took about 15 - 20 minute using tool (I, II, and III).
  - 2ed section was carried out individually within 20 minutes and addressed sleep health-related behaviors (Sleep Hygiene Instruction). Audiovisual and written instructions about the importance of good sleep hygiene, effect on daily activities were used, and the consequences of poor sleep quality. These materials were introduced to the patients within 30 minute, then researchers allowed 10 minutes to participants to ask their enquiries. Sleep hygiene instructions as the following:
    - Make a schedule for weak up at the same time every day.
    - Avoid sleeping during the day after 3 pm.
    - Avoid taking caffeinated products and nicotine particularly at end day.
    - Avoid heavy meals before bedtime for at least two hours.
    - Have the right sunlight exposure.
    - Perform regular physical activity.
    - Avoid stressfully exercise before going to sleep for a few hours.
    - Have appropriate, good, comfortable, dark and quiet environment.
    - Get rid of anything in the bed room that might distract the sleep.
    - Adopt a good sleeping posture.
    - Taking worm shower to promote relaxation.
    - Not to lie in bed awake, if you find yourself still awake after staying in bed for more than 20 minutes, get up and do a relaxing activity until feeling sleepy.
    - Use the bed only for sleep not for doing any activities.
- The second interview time was carried out by the researchers for each patient in outpatient clinic after implementing the sleep hygiene instructions by one month using the tool II and III as a posttest, the researchers were interviewed each patient individually.

3.7.3. Evaluation Phase

This phase was emphasized on estimating the effect of the intervention to determine the aim of the study has been fulfilled or not, through a comparison between pre and post implementation of sleep hygiene instructions on sleep quality and fatigue.

3.8. Ethical Considerations and Human Rights:

- An official approval for conducting the study was obtained from the responsible administrative personal after explaining the aim of the study.
- Participants were informed that participation in the study is voluntary and they have the right to withdraw at any time freely without any responsibilities.
- Informed oral consent was obtained from each patient for participation after explaining the aim, benefits, and procedure of the study.
- Anonymity and confidentiality of data was assured and was used only for research purposes.

3.9. Statistical Analysis

Statistical analysis was done according to the most currently reliable and valid statistical methods. Collected raw data was revised, coded and transferred into specially designed format to be suitable for computer feeding and entered into SPSS system files (SPSS package version 23). Following data entry, checking and verification processes was carried out to avoid any error during data entry. Analysis and interpretation of data was conducted using proper statistical analysis methods as Chi square test, Student's t test. Qualitative data was presented as number and percent. The level of significance was set at $p < 0.05$ and highly significance at $p < 0.001$.

4. Result

Table 1; Showed that, there was highly statistically significant improvement of total PSQI status after applied sleep hygiene instructions with P value <0.001. In addition to there was highly statistically significant decreased the total FSS grads post intervention with P value <0.001.

Table 2; Revealed that there was a positive correlation between PSQI status and FSS status pre and post intervention.

Table 3; Illustrated that stage of disease, and comorbid disease as diabetes mellitus and hypertension were statistically significant positive predictors of sleep problems pre and post intervention. On the other hand, sex was a negative predictor of sleep problems post intervention.

Table 4; Demonstrated that disease stage, and comorbid disease as diabetes mellitus and hypertension were statistically significant positive predictors of fatigue pre and post intervention. Also this table showed that age was a statistically significant a negative predictor of fatigue.

Figure 1; Showed that there was a statistically significant effect of patients gender on total PSQI status pre and post intervention at p value 0.033 and 0.016 respectively. On the other hand the same fig. reflected a statistically significant improvement in sleep quality after intervention especially for male patients, which cleared in, the good sleep for men before intervention was 8.0% while after intervention increased to reach 21.0%.

Figure 2; Found that there was a statistically significant effect of patient's age on total FSSQ status pre and post intervention at p value 0.027 and 0.007 respectively. Additionally this fig. revealed a significant improvement in fatigue level status after intervention, which showed through disappear of fatigue level (0%) after intervention plus increased percentage of (no fatigue) post- intervention for different age groups.

Table 1. Comparison between PSQI status and FSSQ grades pre versus post-intervention

	Pre-intervention		Post-intervention		Chi square test	
	n	%	n	%	X2	p
PSQI status						
Good sleep	10	10.0	32	32.0	14.587	<0.001**
Poor sleep	90	90.0	68	68.0		
Total score (mean ±SD)	8.60 ±3.4		5.3 ±1.8		8.675*	<0.001**
FSS grades						
No Fatigue	36	36.0	93	93.0		
Borderline	44	44.0	7	7.0	72.029	<0.001**
Fatigue	20	20.0	0	0.0		
Total score (mean ±SD)	4.3 ±0.9		3.3 ±0.6		8.577*	<0.001**

* t value, Student's t test.
** Highly statistically significant at $p \leq 0.001$.

Table 2. Correlation between PSQI status and FSSQ grads pre- and post-intervention

	R	P
Pre-intervention	0.411	<0.00**
Post-intervention	0.215	0.032*

* Statistically significant at $p \leq 0.05$, ** highly statistically significant at $p \leq 0.001$.

Table 3. Regression analysis for factors associated with PSQI pre and post intervention

	PSQI pre-intervention					PSQI post-intervention				
	Unstandardized Coefficients		Standardized Coefficients			Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	p	B	Std. Error	Beta	t	p
(Constant)	8.057	1.970		4.090	<0.001	5.336	1.165		4.579	<0.001**
Age	-0.558	1.058	-0.129	-0.527	0.599	-0.356	0.216	-0.157	-1.653	0.102
Sex	-0.040	0.075	-0.131	-0.538	0.592	-0.682	0.324	-0.193	-2.107	0.038*
Level of education	0.112	0.655	0.016	0.171	0.864	-0.016	0.173	-0.008	-.090	0.928
Disease stage	1.230	0.560	0.201	2.194	0.031*	0.664	0.299	0.208	2.223	0.029*
DM	1.722	0.769	0.215	2.239	0.028*	1.097	0.385	0.262	2.847	0.005*
HTN	2.176	0.780	0.263	2.792	0.006*	1.343	0.411	0.310	3.269	0.002*

* Statistically significant at $p \leq 0.05$,** highly statistically significant at $p \leq 0.001$.

Table 4. Regression analysis for factors associated with FSSQ pre-intervention

	FSSQ pre-intervention					FSSQ post-intervention				
	Unstandardized Coefficients		Standardized Coefficients			Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	p	B	Std. Error	Beta	t	p
(Constant)	4.043	0.512		7.890	<0.001	3.312	0.421		7.868	<0.001**
Age	-0.158	0.275	-0.139	-0.573	0.568	-0.179	0.078	-0.217	-2.303	0.023*
Sex	-0.011	0.019	-0.133	-0.553	0.582	-0.170	0.117	-0.132	-1.455	0.149
Level of education	0.022	0.170	0.012	0.130	0.896	-0.012	0.063	-0.017	-0.184	0.854
Disease stage	0.405	0.146	0.253	2.778	0.007*	0.268	0.108	0.230	2.481	0.015*
DM	0.477	0.200	0.227	2.386	0.019*	0.410	0.139	0.268	2.942	0.004*
HTN	0.436	0.203	0.201	2.148	0.034*	0.484	0.148	0.306	3.263	0.002*

* Statistically significant at $p \leq 0.05$, ** highly statistically significant at $p \leq 0.001$.
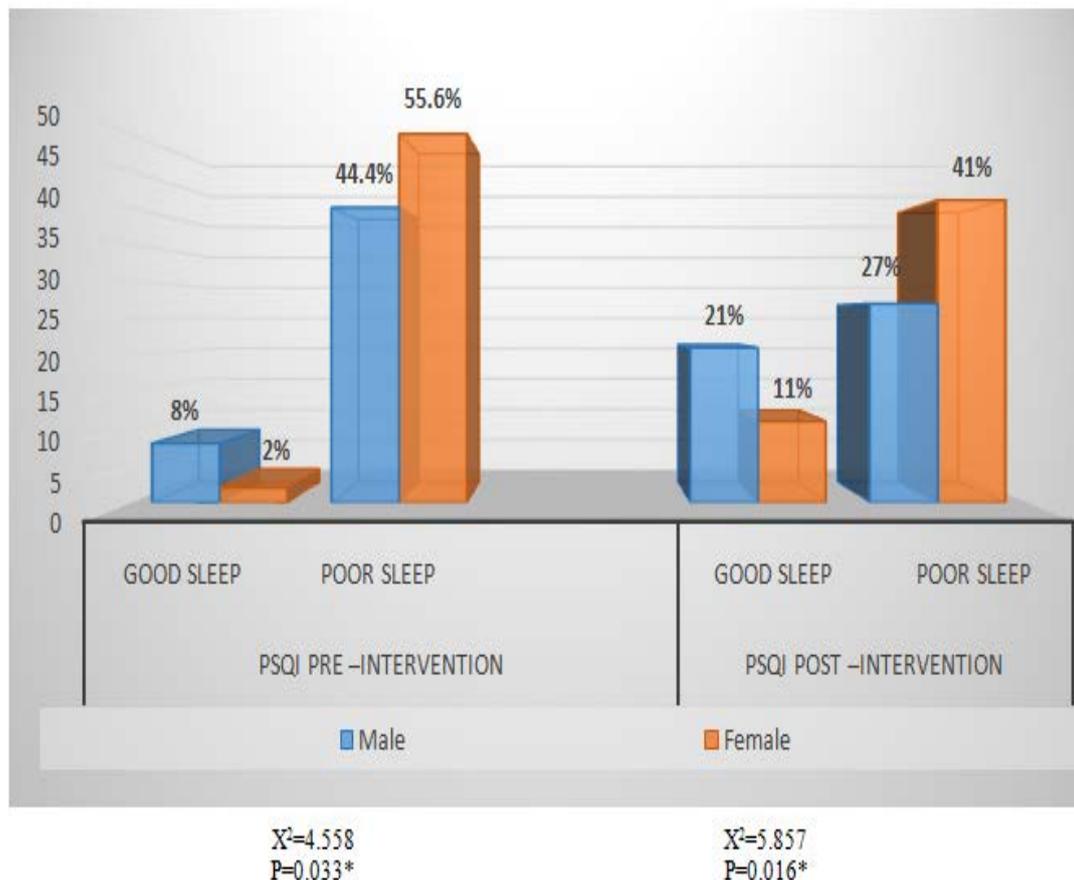

Figure 1. The association between patients gender and total PSQI status pre- and post-intervention
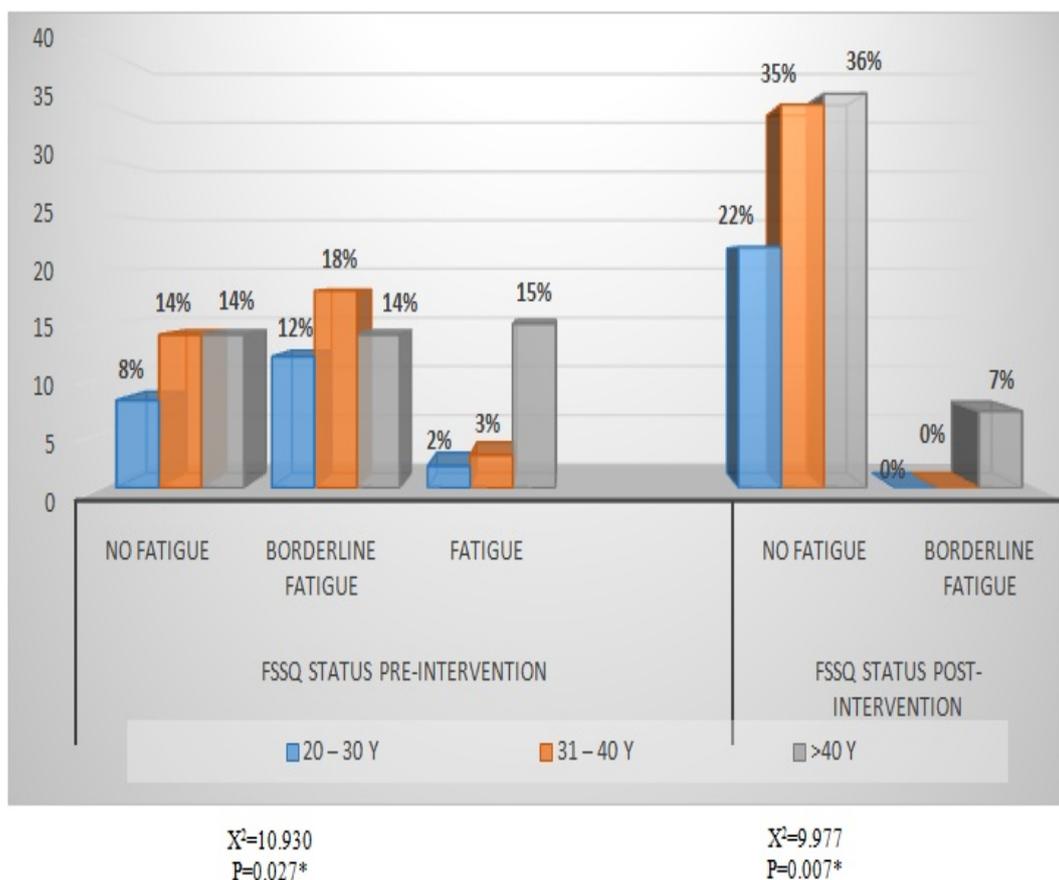
Figure 2. The association between patients age characteristics and total FSSQ status pre- and post-intervention

5. Discussion

Sleep disorders and their health consequences are often neglected, commonly multifactorial and likely comorbid for patients receiving chemotherapy [21]. Additionally, the cancer itself, cancer related symptoms and cancer treatment could all exacerbate sleep problems. Sleep hygiene considered the first treatment line for sleep disturbance and be a higher inquiry for global improvement of sleep quality, among patients receiving chemotherapy [22]. So, this study aimed to evaluate the effect of sleep hygiene instructions on sleep quality and fatigue in the patients receiving chemotherapy.

The results of the current study indicated that majority of participants had poor sleep quality; this may be attributable to the psychological impact of the disease, cytotoxic chemotherapy, and concurrent medications like corticosteroids. Also the newly diagnosed patients' perceive the disease as a life-threatening problem that increase the anxiety and stress level and leading to sleep disorders. In addition to, patients' sleep quality is affected by the side effects of therapy that includes pain, fatigue, anxiety, and depression. This was in accordance with Soleimani and colleagues (2016) in Iran, who found that more than third quarter of participants had poor sleep quality [23]. On contrary Davis et al., (2014) found that the minority of cancer patients had sleeping problems [24].

The present study findings also showed a statistically significant difference in sleep quality pre and post intervention, as near to entire of the study sample pre-intervention compared to about two third of them post-intervention were suffering from poor sleep. This

may be due to the influence of sleep hygiene instruction plus the commitment of participants with these instructions which provided by researchers. In accordance, Zupanec et al., 2017 found that there was a statistically significant improvement in sleep quality among children with leukemia after applying sleep hygiene [25].

Concerning fatigue, it is increasingly recognized as one of the most common and distressing side effects of chemotherapy. The current study findings revealed that nearly two thirds of participants suffer from some degree of fatigue (Borderline fatigue)**.** This may be explained by the Co-morbid conditions of organic and psychological nature of diseases. In the same line Kapoor et al., (2015) in India found that Seventy five percent of patients administrating chemotherapy and radiotherapy reporting fatigue [26]. Also Hickok et al., 2005 reported that more than eighty percent of patients under chemotherapy or radiotherapy protocol reported some degree of fatigue [27].

In this study, it was determined that there was statistically significant difference (P<0.001) between pre and post‑test total scores of FSS, which means that sleep hygiene had a statistically significant positive effect on reliving fatigue. This was proved by the findings showed in table one of this study as twenty percent pre-intervention compared to zero percent post-intervention had fatigue. This may be explained the fact that poor sleep cause fatigue, particularly among patients receiving chemotherapy, and the activities of daily living is negatively affected. So improving sleep quality can relieve fatigue [14]. In accordance with these findings Polat and Ergüney's study in Turkey (2016) found that sleep hygiene decrease fatigue level, which cleared in the presence of statistically

significant difference between the mean pre‐test and post-test scores [27].

The present study findings revealed a positive correlation between sleep and fatigue among patients receiving chemotherapy pre and post-intervention. This may be explained as patients with more fatigue have more nap and sleep disturbances which might related to a cytokine-based etiology, as reported in some studies [28]. In the same line, findings of Peoples and colleagues studies in USA supported the correlation between the two symptoms, which mean the sleep disorders may be cause fatigue and also fatigue can induce sleep disorder. This positive correlation suggests a common underlying etiology and treatments might cause either condition that positively affects the other [29]. On contrary, some studies, however, failed to show this relationship. In France, Savard and colleagues (2005) found that there was no relationship between fatigue and sleep disorder in men receiving chemotherapy [30].

Regression analysis of current study revealed that stage of disease is statistically significant positive predictors of poor sleep quality and fatigue among cancer patients receiving chemotherapy (pre and post intervention). This may be a logical result as advanced disease stage means more deterioration of body systems and subsequently fatigue, discomfort and poor sleep. In accordance with the current study findings, Mansano-Schlosser and Ceolim, (2017) found that stage of disease is a positive predictor of poor sleep but not statistically significant (p=0.0822) [31]. Also Carter &Chang (2000) even found that advanced cancer was a positive predictor to severe sleep problems [32]. On contrary, Hoang and colleagues (2019) in Vietnam did not find a significant difference in sleep quality among different cancer stages [33].

The current study also identified presence of diabetes mellitus and hypertension as positive predictors for poor sleep and fatigue pre and post intervention. This may be explained by the fact that comorbidity with other chronic diseases may increase the burden of fatigue, pain and depression among those patients as well as diabetes mellitus and hypertension, it selves cause fatigue and sleep disturbances. Moreover, the strong correlation between sleep quality and fatigue may also explain the similarity of predictors.

This study revealed that age was another negative predictor for poor sleep among cancer patients but not a statistically significant one. This means that younger age had poorer sleep level. In accordance, Miaskowski et al. (2011) study results in California, San Francisco revealed that age was a negative predictor for poor sleep. They reported that younger men have had more sleep problems [34]. This may be due to higher level of anxiety and fear from disease condition and its effect on their future social and occupational life.

On the other hand, one study of Mo et al. (2014) found that age did not correlate with poor sleep quality [35]. These inconsistent results may be related to the cancer type, sample size or intervention type differences. Also, Ancoli-Israel, (2009) found that older patients were more likely to suffer from worse sleep [36]. This finding is consistent with a previous study that revealed a greater prevalence of poor sleep in older adults than in younger adults.

This study results showed that gender was a statistically significant predictor for sleep quality after intervention as near to the half of males participants had poor sleep pre-intervention compared to more than one third of participants post intervention and this was not the case among females. This may be explained as males were more responsive and applied sleep hygiene instructions than females. Also this may be due to the fact that women are more likely to have poor sleep quality [37]. On contrary, these findings contradict results of Romito et al. (2014) that indicated no significant difference in sleep quality rates between males and females and participants [38].

Finally, regression analysis also showed that age was a statistically negative predictor of fatigue after intervention, which mean that younger patients tends to had more fatigue post intervention. This may explained by the fact that younger patients may had more trouble adapting to the changes associated with cancer. In accordance with these findings Miaskowski and colleagues (2011) in California, found that younger men had higher level of fatigue [34].

In this study, the results showed that, a highly statistically significant improvement in sleep quality and fatigue level after applied sleep hygiene instructions, which pointed to, the hypothesis of the current study was fulfilled and accepted that, the sleep hygiene instructions had a positive effect on sleep quality and fatigue level among patients under chemotherapy protocol.

6. Conclusion

The current study concluded that majority of participants had poor sleep quality and nearly two thirds of them suffer from some degree of fatigue before applying sleep hygiene instructions. While there was a highly statistically significant improvement of PSQI and FSS level after applying these instructions. On the other side, there was a statistically significant positive correlation between sleep and fatigue among patients receiving chemotherapy pre and post-intervention. This means that sleep hygiene instructions had a positive effect on both sleep quality and fatigue level among patients under chemotherapy protocol.

7. Recommendations

The present study recommended:
- Applying sleep hygiene as a routine of nursing care provided for patients under chemotherapy.
- Additional research is needed to understand the relationship of fatigue and sleep disturbance.
- Further examination of predictors of poor sleep quality and fatigue among those patients.

Acknowledgments

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