EFFECTS OF NON-THERAPEUTIC MEASURES ON SLEEP QUALITY AMONG CRITICALLY ILL PATIENTS, EGYPT

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ABSTRACT

Background: Intensive care unit (ICU) patients are vulnerable to sleep deprivation. Disrupted sleep in critically ill settings is accompanied by increased morbidity and mortality. Many factors can cause sleep disruption. Non- therapeutic measures such as earplugs and eye masks could be beneficial in improving the quality of sleep by creating relaxing effects. **Aim of this Study:** was to evaluate the effects of non-therapeutic measures such as eye masks and earplugs on sleep quality among critically ill patients. **Material and Methods:** A quasi-experimental research design was utilized to carry out the research study. A convenient sample of 66 critically ill patients divided equally into the study and control groups; the control group included patients who didn't wear the earplugs or the eye masks at night during sleep, while the study group included patients who wore them at nights. The two groups continued participation in the study for at least 3 nights. Patients' demographics, factors affecting sleep quality observational checklist and Richard Campbell Sleeping Questionnaire were utilized for data collection. **Results:** More than two thirds of the study group patients experienced deep sleep (69.7%) versus (45. 5%) in the control group on the first night. high significant improvement in the total sleep quality among the study group compared to patients in the control group on the second and third night **Conclusion:** Non-therapeutic measures such as earplugs and eye masks significantly reduced the environmental stressors at night and improved the quality of sleep among critically ill patients. **Recommendation:** Replication of the study on a larger sample from different geographical regions of Egypt and in general ICUs is recommended. Furthermore, evidence-based care protocols or bundles for promoting sleep should be integrated to improve patients' quality of life.

Key Words: *non-therapeutic measures, sleep quality, critically ill patients*

INTRODUCTION

Sleep deprivation is a major concern in intensive care unit (ICU) critically ill patients and is characterized by low subjective quality of sleep and lack of circadian rhythms (Huang et al., 2015). Up to 40% of hospitalized patients suffer from impaired quality of sleep and in adequate sleep duration, in neurological patients it is associated with higher dependency rates at the time of initiation and may be at six months (Sweity et al., 2019).

The adverse outcomes of impaired sleep quality in ICU patients are seemly clear. They include decreased inspiratory muscle endurance, and thus a negatively affected weaning from mechanical ventilation, diminished immune function, and may have related to incidence of delirium (Hu, Jiang, Zeng, Chen & Zhang, 2010). Also, the impact of poor sleep on the duration of mechanical ventilation, immune function, metabolism, and quality of life after admission to ICU setting is also questionable but wasn't definitely proven (Demoule et al., 2017).

Several physiological, psychological and environmental factors can contribute to sleep disruption for the NICU patients. The key physiological causes include pain, medicine, and illness, as well as stress and worry (Dave, Qureshi, Gopichandran& Kiran, 2015). While patient-related factors are likely to play a major role in sleep disruption, it is not possible to neglect the impact of the ICU environment. ICU noise comes from multiple sources, including alarms, mechanical ventilators, conversations with staff, visitors and television (Pisani et al., 2015).

Moreover, interventions for sleep promotion include both the therapeutic and non-therapeutic interventions (Kanji et al., 2016). Despite widespread use of medications, they may produce adverse effects, such as negative effects on breathing, a reduced ability to think clearly, and they can also affect normal sleeping patterns and lead to a risk of tolerance or drug dependency (Morin, Beaulieu-Bonneau & Cheung, 2019). However, the minimizing the voices and light during the night is difficult to reach in the ICU settings due to increased human movements during night such as admission of new patients. Moreover, the voice of alarms cannot always be lowered or turned off. Another way to keep patients safe from noise and light is earplugs and eye masks. Earlier studies have recommended that this alternative strategy could improve the quality of sleep in patients who exposed to a high level of noise and light that unexpectedly be faced in an ICU (Hu et al ., 2010).

Accordingly, non-therapeutic interventions such as noise and light reduction, social support, music therapy, and alternative therapies are recommended for improving sleeping quality in critically care settings (Hu et al., 2015). In addition, many non-therapeutic measures have also been tested to enhance the sleep quality of hospitalized patients, including earplugs and eye masks, although there is no evidence of their benefits or risks. (Sweity et al., 2019). Therefore, the current study was carried out to study the effectiveness of this therapeutic intervention that predicted that earplugs and eye masks can improve sleep quality in critically ill patients for three consecutive nights after the start of the intervention.

AIM OF THE STUDY

This study aimed to evaluate the effects of non-therapeutic measures such as earplugs and eye masks on sleep quality among critically ill patients.

RESEARCH HYPOTHESIS

H1: Use of non-therapeutic measures such as earplugs and eye masks during the three consecutive nights improves sleep quality among critically ill patients.

SUBJECTS AND METHODS

Research Design

Quasi-experimental study design was used to apply this study. So, the patients were assigned either study or control groups, that considered the gold standard for assessing causality and, were the first choice for most intervention research (Campbell & Stanley, 2015).

Study Setting

The study was done at the Neuro-Critical Care Unit (NCCU), Mansoura New General Hospital. That unit admits almost 40 patients monthly from Mansoura city and adjacent cities around Mansoura city.

Subjects

A convenient sample of 66 patients admitted to the previously mentioned setting was enrolled in this study. The exclusion criteria included who were less than 18 years old, their Glasgow Coma Scale less than 14, having ear / eye injuries on admission, complained of hearing or vision problems, having any type of delirium, confusion or sleeping problems on admission, as well as patients who were under sedation or narcotic drugs during the study.

Sample and Sampling Technique

The Sample size was calculated depending on the following measurements; Population size (80 patients, all patients admitted to Neuro Critical Care Unit (NCCU), Expected frequency (20%), Margin of error (5%), confidence coefficient (95%), and minimum sample size (61 patients). The sample was estimated according to Epi Info 7 sample size estimation program 2013 using the following parameter:

N = (Z1-a / 2 + Z1- b)2s1s 2 / d 2 Z1-a / 2 = 1.96

Z1- b = 0.842

Where: σ1 σ2 = SD for each group; δ = Expected difference to be detected between 2 groups α = Level of acceptability of a false positive result (level of significance=0. 05); β = Level of acceptability of a false negative result (0. 20) 1-β = power (0. 80)

The sample size was 66 patients. Those 66 patients were divided equally and equitably into the study and control groups. Each group included 33 patients; the control group included patients who didn't wear the earplugs or the eye masks at night during sleep, while the study group included patients who wore them at night. The two groups continued participation in the study for at least 3 nights.

Tools of Data Collection

Tool I: Patients' demographics and clinical Characteristics

This tool was elaborated by the researchers: it included demographic, health-relevant data.

Tool II: Factors affecting sleep quality observational checklist

It was adopted partially from ICU sleep questionnaire that was developed by Freedman et al., 1999. That tool collected data concerning various factors that affect sleep quality. This tool allows the Patients to self-evaluate their quality of sleep on a 1 to 10 scale (1 means poor, 10 means excellent) during their stay in the ICU setting. Patients were asked to illustrate their daytime sleepiness degree over the duration of their ICU stay on a scale of 1 to 10 (1 means cant able to remain awake, 10 means fully awake and alert). The effects of environmental factors and ICU noises on sleep disruption were measured on a scale of 1 to 10; (1 means no disruption, 10 means significant disruption). These stimuli contained; pain, noise, light, nursing interventions (giving care or exercises, bathing, etc.), diagnostic tests as chest radiographs, vital signs evaluation, blood sampling, and medications administration.

Tool III: Richard Campbell Sleeping Questionnaire (RCSQ):

It was adopted from Kamdar& Needham, (2012). It included 5 items that were used to assess the effectiveness and quality of sleep. It uses a Visual Analog Scale (VAS) which rates the perceived depth, efficiency, and perceived sleep quality. That tool is a patient self-report measure, the use of this tool in ICU may be limited when the patient is cognitively impaired or having delirium. It is a brief scale that involves five items including perceived sleep depth, sleep onset latency (time to fall asleep), awakenings frequencies, quality of sleeping, and efficiency, in addition to one item related to perceived night-time noise. The 5 items are filled out utilizing a 100- millimeter VAS. The mean of all five item scores ranges from 0 to 100 and displays the total score of sleep quality. Higher scores signify higher sleeping qualities (Simons et al., 2018).

Tools Validity and Reliability

The study tools were examined for content validity by five experts in the fields of neurosurgery and critical care nursing. The experts' modifications and recommendations were editing of some sentences. Next, the adopted tools were tested for reliability using Cronbach's Alpha test, to appreciate the internal consistency of tools that included Richard Campbell Sleeping Questionnaire and Freedman Sleep Questionnaire (r = 0. 77 & 0.79 respectively).

Protection of Human Rights

Ethical approval was attained from the Research Ethical Committee at the Faculty of nursing-Mansoura University. As well, an official letter to apply this study was attained from the hospital administration. Furthermore, oral consent was attained from the patients themselves.

Procedure

The current study was conducted through three phases; assessment, implementation, and finally evaluation phase.

Assessment

A primary assessment was carried out by the researchers on the first day for all neuro-critical ill patients through collecting data related to patients' characteristics and environmental factors.

Implementation

The researchers carried out the intervention of wearing earplugs and eye masks among the study groups for three consecutive nights as follows; the eye masks and earplugs were worn at the same time each night from 10 p. m. to 7 a. m. In wearing earplugs, the nurse rolled earplugs up into thin, small "snakes" using fingers utilizing one of the two hands. Later, the nurse pulled the top of the patient's ear up and backward with the opposite hand to straighten out the ear canal and the rolled earplug was slide in. Next, the earplug was held in using finger and counted till 20 or 30 loudly waiting for the earplug to expand again and fill in the patient's ear canal during which, the voice sounded inaudible when the plug sealed well. Mostly, the foam body of the earplug must be inside the ear canal. Moreover, the nurse cupped her hands firmly over the patient's ears properly. If sounds were much more audible with hands in place, the earplug may have not been sealing well and the nurse removed the earplug and tried again. Finally, the nurse removed the earplug slowly with a twisting motion to gradually break the seal to avoid damage to the eardrum. That earplug was disposable. Earplugs were maintained clean by removing the earwax and discharges before re-insertion. As well, solutions, disinfectants, and chemicals were never used (Delfino & Dowd, 2018).

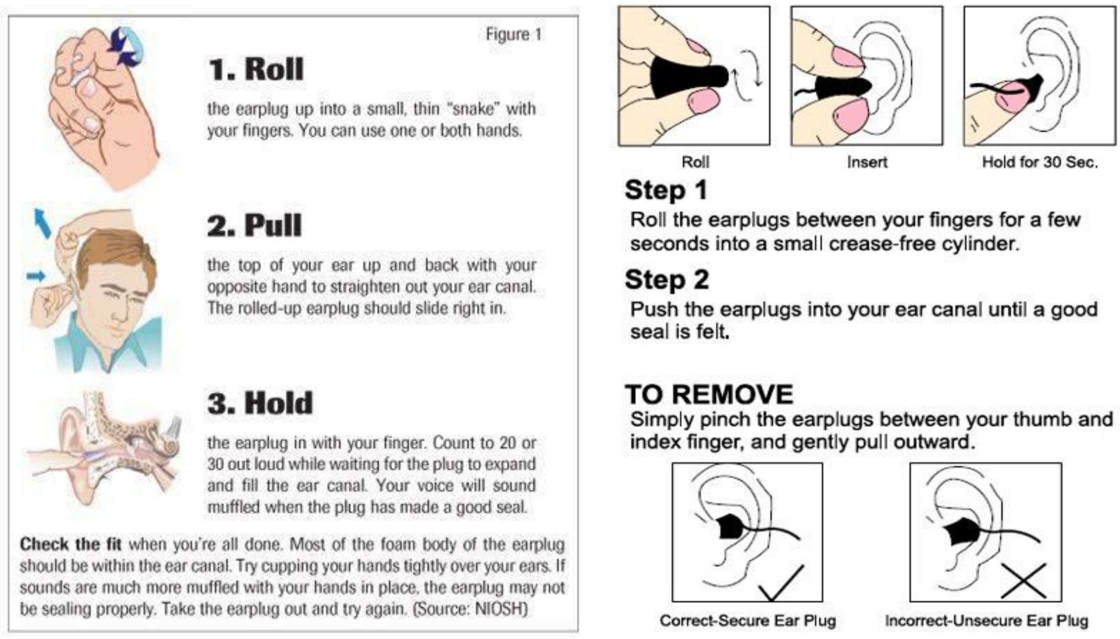

Figure 1: Earplugs wearing procedure

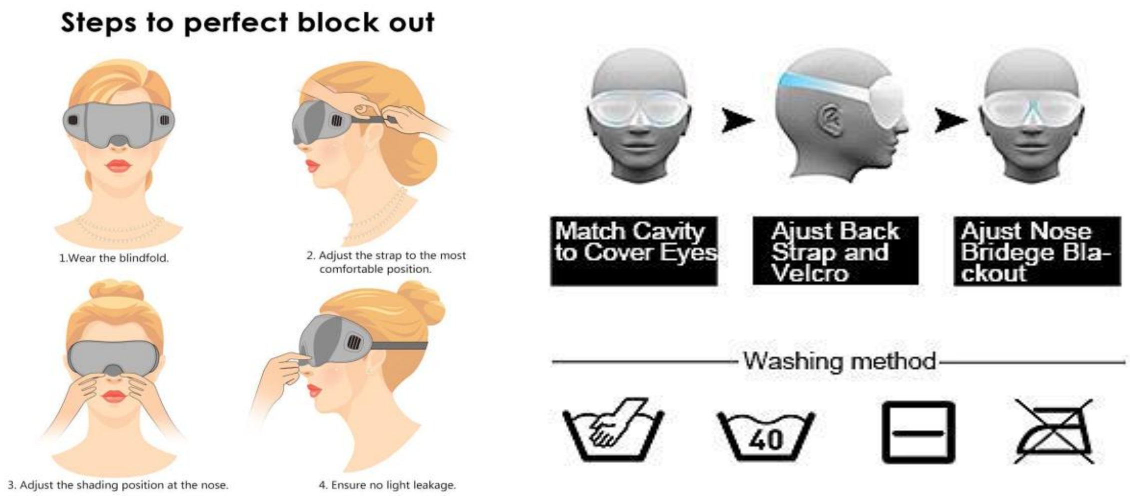

Figure 2: Eye masks wearing procedure

Concerning the wearing of eye masks, the patients wore the eye masks through the following steps: first; the nurse fitted the mask comfortably over the head, and the colored side of the mask faced outwards. Second; the elastic bands or strings were positioned appropriately to keep the mask definitely in place around the head. Third; the nurse wore his/her patient eye mask firmly, and not too tight or not too loose. Finally, the nurse ensured that no light penetrated the patient's eye (Bruder, 2017).

Regarding the implementation of the traditional procedure of the control group, the nurse performed the following actions as follows; the patients were left all the three nights of the study period without using earplugs or eye masks, and they were observed by the nurse researchers throughout the study period utilizing sleep assessment tools.

Evaluation

After completion of both interventions in the study and control groups, the researcher carried out a comparison between both groups to ascertain that the combined use of earplugs and eye masks have an impact on the quality of sleep.

Data Analysis

Data were analyzed utilizing SPSS version 22. Data were represented in the form of means, frequencies, and percentages. Chi-square was used for comparison and correlation between quantitative data. Moreover, t-test was calculated to compare the quantitative data between groups.

RESULTS

Table 1 revealed the mean age of both study and control groups were 35.42 ±14.02 & 34.48 ±14.04 respectively. Almost half of the study group (51. 5%) was male and (48.5%) were female in the control group. However, no significant differences were found between them

Table 1: Frequency distribution of the studied sample according to their patients' characteristics (n= 66)

Variables	**Study group (n= 33)**		**Control group (n=33)**		Test
	No	**%**	**No**	**%**	
Age (Years)					
< 20	3	9. 1	4	12. 1	
20 – 29	11	33. 3	10	30. 3	
30 – 39	7	21. 2	8	24. 2	X^2= 23. 628 P=0. 57
40 – 49	8	24. 2	6	18. 2	
≥ 50	4	12. 1	5	15. 2	
Min – Max	18 – 72		18 – 72		t=1. 876
Mean ± SD	35. 42 ±14. 02		34. 48 ±14. 04		P= 0. 132
Gender					
Male	17	51. 5	20	60. 6	X^2= 0. 554
Female	16	48. 5	13	39. 4	P= 0. 46

Table 2 revealed that 12.1% of the study group had a diagnosis of acute subdural hemorrhage (ASDH), dorsal fracture and Pneumocephalus. On the other hand, 12.1% and 15.2% of patients in the control group had a diagnosis of hemorrhagic brain contusion (HBC) and chronic subdural hemorrhage (CSDH). A statistically significant difference was detected between the study and the control group in relation to the length of hospitalization. Regarding the Glasgow Coma Scale scores for patients throughout three consecutive days, there were no significant differences were found between the two groups.

Table 2: Frequency distribution of the studied sample by their health relevant data (n=66)

Variables	**Study group (n= 33)**		**Control group (n= 33)**		**Test**
	No	**%**	**N**	**%**	
Diagnosis					
Acute Sub-dural hemorrhage	4	**12. 1**	2	6. 1	
Space Occupying Lesion	2	6. 1	3	9. 1	
Depressed skull fracture	2	6. 1	3	9. 1	
Lumbar Disc Prolapse	1	3. 0	1	3. 0	
Depressed skull fracture + Hemorrhagic Brain Contusion	3	9. 1	1	3. 0	
Hemorrhagic Brain Contusion	3	9. 1	4	12. 1	
Depressed fracture	3	9. 1	1	3. 0	X2=11.986 P= 0. 85
Pneumocephalus	4	**12. 1**	3	9. 1	
Chronic Sub-Dural Hemorrhage	1	3. 0	5	15. 2	
Dorsal fracture	4	**12. 1**	3	9. 1	
Cervical fracture	2	6. 1	2	6. 1	
Dorsal tumors	1	3. 0	1	3. 0	
Extra Dural Hemorrhage + Hemorrhagic Brain Contusion	1	3. 0	1	3. 0	
Extra Dural Hemorrhage + Pneumocephalus	1	3. 0	1	3. 0	
Length of hospitalization					
3 days	23	69. 7	11	33. 3	X2=10.028 P= 0.007*
4 days	10	30. 3	19	57. 6	
5 days	0	0. 0	3	9. 1	
Glasgow coma score					
1st day					
14	6	18. 2	3	9. 1	X2= 1.158 P= 0. 28
15	27	81. 8	30	90. 9	
2nd day					
14	1	3. 0	2	6. 1	X2= 0.349
15	32	97. 0	31	93. 9	P= 0. 55
3rd day					
14	0	0. 0	3	9. 1	X2= 3.143
15	33	100.0	30	90. 9	P= 0.08

From table 3 it was noticed that, the control group subjects complained from many factors more than the participants in the study group particularly experiencing pain, noise, light, and alarms

Table 3: Comparison of factors affecting sleep quality between the study and control groups (n= 66)

Variables	Study group (n= 33) Mean ± SD	Control group (n= 33) Mean ± SD	t-test	p-value
Pain	8. 03 ± 0. 73	8. 39 ± 0. 75	-2. 002	0. 05*
Noise	2. 88 ± 0. 60	7. 64 ± 0. 70	-29. 670	0. 000**
Light	2. 70 ± 0. 59	7. 61 ± 0. 83	-27. 834	0. 000**
Nursing interventions	3. 70 ± 0. 64	4. 97 ± 0. 85	-6. 899	0. 000**
Diagnostic testing	4. 15 ± 0. 67	5. 09 ± 0. 63	-5. 878	0. 000**
Vital signs measurement	4. 39 ± 0. 61	4. 61 ± 0. 49	-1. 551	0. 13
Blood samples	5. 21 ± 0. 65	6. 0 ± 0. 56	-5. 280	0. 000**
Administrating medications	5. 06 ± 1. 12	5. 79 ± 0. 74	-3. 120	0. 003*
Alarms	2. 61 ± 0. 56	8. 0 ± 0. 87	-30. 114	0. 000**
O2 finger probe	3. 15 ± 0. 62	4. 18 ± 0. 68	-6. 425	0. 000**
Talking	2. 21 ± 0. 42	3. 36 ± 0. 55	-9. 613	0. 000**
Nurses and doctors' phones	2. 00 ± 0. 25	3. 06 ± 0. 56	-10. 00	0. 000**

Table 4 revealed no significant statistical differences were found in the total score of sleep quality between the study and control group on the first night. However, significant differences were found in some sub-items of sleep questionnaire such as awakening and sleep depth. So, most of the study group subjects (84.8%) awaked very little during night versus (45.5%) in the control group. As well, more than two thirds of the study group patients experienced deep sleep (69.7%) versus (45.5%) in the control group.

Table 4: Frequency distribution of the studied sample regarding their sleep quality in the first night (n= 66)

Item	Study group (n= 33) No	%	Control group (n= 33) No	%	Test/ p value
Sleep depth					
Light sleep	10	30. 3	18	54. 5	**t= 2. 02; p=0. 04***
Deep sleep	23	69. 7	15	45. 5	
Mean ± SD	**69.69 ± 46.67**		**45.45 ± 50.564**		
Sleep latency					
Just never could fall asleep	18	54. 5	11	33. 3	**t= -1. 750; p=0. 09**
Fell asleep almost immediately	15	45. 5	22	66. 7	
Mean ± SD	**45.45 ± 50.564**		**66.67 ± 47.87**		
Awakenings					
Wake up the whole night	5	15. 2	18	54. 5	**t= 3. 632; p=0. 001***
Awake very little	28	84. 8	15	45. 5	
Mean ± SD	**84.85 ± 36.41**		**45.45 ± 50.56**		

Returning to sleep					
Could not return to sleep	24	72. 7	13	39. 4	**t= -2. 852; p=0. 01***
Got back to sleep immediately	9	27. 3	20	60. 6	
Mean ± SD	**27.27 ± 45.23**		**60.61 ± 49.61**		
Sleep quality					
A bad night's sleep	3	9. 1	7	21. 2	**t= 1. 372; p=0. 18**
A good night's sleep	30	90. 9	26	78. 8	
Mean ± SD	**90.91 ± 29.19**		**78.78 ± 41.51**		
Total sleep quality					
Good	30	90. 9	27	81. 8	**t= 1. 411; p=0. 16**
Poor	3	9. 1	6	18. 2	
Mean ± SD	**318.18 ± 63.51**		**296.96 ± 58.55**		

Table 5 showed high significant improvement in the total sleep quality in the second night, So, all the patients in the study group demonstrated good sleep quality (100%) versus (15.3%) of patients in the control group.

Table 5: Frequency distribution of the studied sample regarding their sleep quality in the second night (n= 66)

Variables	**Study group (n= 33)**		**Control group (n= 33)**		**Test**
	No	**%**	**No**	**%**	
Sleep depth					
Light sleep	4	12. 1	27	81. 8	**t= 7. 8; p=0. 000**
Deep sleep	29	87. 9	6	18. 2	
Mean ± SD	**87.88 ± 33.14**		**18.18 ± 39.1**		
Sleep latency					
Just never could fall asleep	2	6. 1	12	36. 4	**t=3.19; p=0.002**
Fell asleep almost immediately	31	93. 9	21	63. 6	
Mean ± SD	**93.94 ± 24.23**		**63.64 ± 48.8**		
Awakenings					
Wake up the whole night	2	6. 1	31	93. 9	**t= 14. 7; p=0. 000**
Awake very little	31	93. 9	2	6. 1	
Mean ± SD	**93.94 ± 24.23**		**6.06 ± 24.2**		
Returning to sleep					
Could not return to sleep	20	60. 6	6	18. 2	t= **-3. 8; p=0. 000**
Got back to sleep immediately	13	39. 4	27	81. 8	
Mean ± SD	**39.39 ± 49.61**		**81.81 ± 39.1**		
Sleep quality					
A bad night's sleep	3	9. 1	26	78. 8	**t= 7. 8; p=0. 000**
A good night's sleep	30	90. 9	7	21. 2	
Mean ± SD	**90.91 ± 29.19**		**21.21 ± 41.5**		
Total sleep quality					
Good	33	100. 0	5	15. 2	t= **14; p=0. 000**
Poor	0	0. 0	28	84. 8	
Mean ± SD	**406.06 ± 60.93**		**190.90 ± 63**		

Table 6 showed high significant improvement in the total sleep quality in the third night, So, almost all the patients in the study group demonstrated good sleep quality (97%) versus (6.1%) of patients in the control group.

Table 6: frequency distribution of the studied sample regarding their sleep quality in third night (n= 66)

Variables	Study group (n= 33)		Control group (n= 33)		Test
	No	%	No	%	
Sleep depth					
Light sleep	2	6. 1	31	93. 9	**t= 14. 7; p=0. 0**
Deep sleep	31	93. 9	2	6. 1	
Mean ± SD	**93.94 ± 24.2**		**6.06± 24.2**		
Sleep latency					**t= 6. 1; p=0. 00**
Just never could fall asleep	0	0. 0	18	54. 5	
Fell asleep almost immediately	33	100. 0	15	45. 5	
Mean ± SD	**100 ± 0.0**		**45.45 ± 50.5**		
Awakenings					**t= 8. ; p=0. 0**
Wake up the whole night	2	6. 1	25	75. 8	
Awake very little	31	93. 9	8	24. 2	
Mean ± SD	**93.93 ± 24.2**		**24.24 ± 43.5**		
Returning to sleep					**t= 0. 5; p=0. 61**
Could not return to sleep	10	30. 3	12	36. 4	
Got back to sleep immediately	23	69. 7	21	63. 6	
Mean ± SD	**69.69 ± 46.6**		**63.64 ± 48.8**		
Sleep quality					**t= 11. 4;p=0.0**
A bad night's sleep	4	12. 1	31	93. 9	
A good night's sleep	29	87. 9	2	6. 1	
Mean ± SD	**87.88 ± 33.1**		**6.06 ± 24.2**		
Total sleep quality					**t= 18; p=0. 0**
Good	32	97. 0	2	6. 1	
Poor	1	3. 0	31	93. 9	
Mean ± SD	**445.45± 66.5**		**145.4± 61.6**		

DISCUSSION

The present study aimed to evaluate the effects of non-therapeutic measures such as earplugs and eye masks on sleep quality among critically ill patients. Despite, the sample was smaller than required, worthy recognitions about the impact of non-therapeutic measures such as earplugs and eye masks on the quality of sleep were detected. The current study revealed highly significant statistical differences between the study and control group concerning the quality of sleep in the second and third nights. So, the study group subjects who wore the eye mask and earplugs showed an increased mean of sleep quality scores.

This finding may have relevant to the fact that using earplugs and eye masks improves patients' sleeping in critical care settings to reduce the environmental noise that arises from many causes, as well as talking, phone sounds, and equipment sounds originated from suction machines and mechanical ventilators' alarms. One other possible explanation for that finding is that wearing mask and earplugs prevent sensory stimulation and prevent the sympathetic nervous system's release of adrenalin and these effects make the patient soothing and falling asleep. Similar to the current study, recently done studies on the efficacy of earplugs and eye masks for promoting sleep quality in critical ill adults by Scharf, Kasinathan & Sunderram, (2019); Sweity et al., (2019) &Su& Wang, (2018) found some evidence that these interventions can deliver some advances in subjective measures of sleep quantity and quality.

On the other hand, Le Guen, Nicolas-Robin, Lebard, Arnulf & Langeron, (2013), assessed the effect of earplug and eye blinders on sleep quality in patients in the post-anesthetic care unit, and proved that earplugs increased overall sleep quality, but had no effect on the depth of sleep. Regarding sleep latency, the present study findings is consistent with another study done by Huang et al., 2015; who detected statistically significant decreases in onset of sleep latency (71.4 min, 46.6 min, P = 0.01) when providing earplugs and eye masks during ICU nights. Furthermore, Bajwa, Saini, Kaur, Kalra & Kaur, (2015) concluded that applying earplug and eye mask showed significant effects in enhancing the sleep latency of critically-ill patients admitted to ICU's than control group and is well thought-out as economical and uncomplicated method which can enhance pattern of sleep in ICU's patients.

Concerning awakenings, our study findings showed highly statistically significant differences between the study and control group. So, most of the patients in the study group experienced very little awake during night in the three days when compared in the control group. In a study by Longley et al., (2018), it was discussed that patients in a surgical, trauma, and burn when exposed to the ordinary non-simulated ICU environment, appeared to fall asleep relatively well, but were awakened and had difficulty returning to sleep. Scores indicated that the depth of patients' sleep and quality of sleep were not sufficient. In contrast, a study by Demoule et al., 2017 who concluded that prolonged awakening times were smaller in the intervention group than in the control group.

Moreover, the present findings revealed significant differences between both groups in relation to returning to sleep after awakening in the first and second nigh but there was no statistically significant difference between the intervention and control groups on the third night. Our findings are agreed with another similar study done by Bani Younis et al., 2019 who found a significant statistical difference between both groups regarding returning to sleep after awakening. Also, Huang et al., 2015 in their study reported that those who wore earplugs and eye masks had less awakenings and shorter sleep latency.

On the other hand, our study finding is contradicted with Arttawejkul & Chirakalwasan (2018) who found that using non-therapeutic measures in medical ICU patients during the first night was associated with an improvement in sleep quality. As well, the present finding is not congruent with Demoule et al., 2017 who proved that there was no statistic difference between the intervention group and control group in terms of quality of sleep following the first night. That study rationalized that participants of the study group who used earplugs only for a short time of night had more worse quality of sleep than patients in the control group. This was due to their poor tolerance of the devices provided. Generally, earplugs and eye masks represent cost-effective methods that can be applied in all ICUs to enhance quality of sleep.. Despite, most participants in this study who used earplugs and eye masks considered this strategy as effective and beneficial.

CONCLUSION

Non-therapeutic measures such as earplugs and eye masks significantly reduced the environmental stressors at night and also, using them improved sleep quality among critically ill patients.

RECOMMENDATIONS

Replication of the study on a larger sample from different geographical regions of Egypt and in general intensive care units is recommended. Furthermore, studying the barriers facing patients in critical care units and lead them to sleeping deprivation. Also, evidence-based care protocols or bundles for promoting sleep should be integrated into ICUs to improve patients' quality of life.

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