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The Effect of Back Massage on Perceived Sleep Quality among Adult Patients in Intensive Care Units

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Abstract **Introduction**: Sleep disturbance is a commonly reported problem in the intensive care unit (ICU). Evidence suggests that sleep disturbance has negative influences on different body systems which may delay recovery, increase the length of intensive care stay, and consequently raise the cost of health care services. **Aim:** The aim of this study was to investigate the effect of back massage on perceived sleep quality among adult patients in intensive care units (ICUs). **Method:** The study has a quasi-experimental design with repeated measures. The study involved 100 adult patients recruited from six ICUs affiliated to Mansoura University Hospitals in Egypt. The participants were randomized to either an intervention group who received a 10-minute back massage session for 3 consecutive nights or a control group who rested quietly during the intervention. Data were collected using Verran and Snyder-Halpern Sleep Scale and Factors Affecting Sleep Quality Scale. **Results:** No significant differences were detected between the two groups before the intervention concerning the three main sleep subscales 'disturbance', 'effectiveness', and 'supplementation'. However, a significant difference was noted among the two groups after implementing massage intervention (P=0.000*). The results indicated improvement in sleep quality among the back massage group. The findings illustrated that sleep-disruptive causes in ICU are multifactorial. Critical care nurses need to adopt different strategies for management of modifiable sleep-disruptive factors such as noise, light, alarms and lack of privacy to enhance patients' sleep quality. **Conclusion:** Back massage is an effective intervention in promoting sleep quality for ICU patients. It can be then included in routine nursing care of ICU patients.

Keywords: *back massage, sleep quality, intensive care unit patients*

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1. Introduction

Sleep is a basic human need that has healing, protective and energy-conservative actions [1]. The literature emphasized the vital role of sleep in enhancing critically ill patients' healing, recovery and coping with their critical illness. Sleep disturbance is a commonly reported problem by ICU patients [2,3,4]. It has been also reported as one of the most stressful factors experienced during intensive care stay [5]. A study conducted by Orwelius, et al. [6] in intensive care setting demonstrated that about 38% of patients complained of difficulty in falling asleep and 61% slept for short times. Moreover, there is evidence that ICU patients may continue to experience sleep disturbance even after discharge from the hospital [6,7].

Sleep disturbance is described as the symptom of perceived or actual alterations in night sleep which causes daytime impairment [8]. Sleep disturbances can include one or more of the following problems: 'falling asleep', 'staying asleep', 'early morning awakenings', and 'daytime sleepiness' [1,9]. Polysomnography studies which investigated sleep in ICU found that sleep disturbances are characterized by severe fragmentation with recurrent awakenings [10] and loss of restorative sleep stages [11].

Evidence suggests that poor sleep has negative effects on different body systems and functions. Sleep deprivation is associated with alteration in immune system function [12], hence increases the susceptibility to infection. Sleep disturbance can also affect carbohydrate metabolism causing insulin resistance which increases the risk of developing chronic illness such as diabetes and coronary artery disease [13]. It also decreases the strength of inspiratory muscles which affects the respiratory system function [14]. Furthermore, Mullington et al., [15] analyzed research papers which studied the effect of sleep deprivation on cardiovascular system, and concluded that lack of sleep can elevate blood pressure and increase the risk of cardiac diseases.

The literature highlighted many contributing factors to sleep disruption in ICU. These include environmental factors, critical illness, pain, medication, clinical interventions and invasive lines [4,11,13,16,17,18]. Enhancing patients' sleep quality in ICU is an integral aspect of nursing care. Complementary therapies, such as massage, music, and therapeutic touch are recommended as safe interventions that should be provided by skillful nurses to promote critically ill patients' sleep [19].

Massage is one of the most common nursing interventions used in ICUs to reduce pain, anxiety, and enhance comfort and sleep [20]. Massage is a safe, noninvasive intervention that includes the application of direct skin contact to certain acupressure points [21]. Several studies investigated the effect of massage on sleep quality in different patient population in different countries [22,23,24,25,26]. However, studies which addressed this issue in Egypt are scarce. The Cochrane library group conducted a systematic review of several studies to assess the effectiveness of non-pharmacological interventions on enhancing sleep quality in adult patients in intensive care setting [27]. The reviewers concluded that the quality of evidence provided by these studies was low, and they urged the need for further high-quality studies to strengthen the evidence base.

1.1. Aim of the Study

The aim of this study was to investigate the effect of back massage on perceived sleep quality among adult patients in ICUs.

1.2. Research Question

1. Does back massage improve sleep quality for ICU patients?
2. What are factors affecting sleep quality in ICU?

1.3. Research Hypothesis

We hypothesized that ICU patients who receive a 10-minute back massage session would have better sleep quality than those who do not receive back massage.

2. Method

2.1. Design

The study has a quasi-experimental design with repeated measures.

2.2. Setting

The study was conducted at Mansoura University Hospitals in Egypt from June to December 2017. Patients were recruited from six ICUs: general surgery, neurology, hepatic, diabetes, cardiac and chest. Each unit is an open room with a curtain around each bed. All units are well equipped with advanced technology required for patient treatment and care (mechanical ventilators, monitors, infusion pumps, nebulizers, etc….). There is one landline phone in the central nursing station in every ICU. There are no carpets or televisions in these units. The nurse-patient ratio is nearly 1:2. During the data collection period, these units were screened daily for new admissions.

2.3. Sample

All patients admitted to the above mentioned ICUs during the data collection period were reviewed for potential enrollment in this investigation. A convenience sample of 100 patients was enrolled in the study. Patients were eligible for inclusion if they were 18 years old and above, fully conscious, able to speak, read and write, and spent at least 4 full nights in the above mentioned ICUs. Exclusion criteria were as follows: history of sleep disorder, mental disorder, receiving narcotics, sedatives or psychiatric drugs, conditions that could affect sleep such as skin diseases (e.g. contagious skin, eczema), phlebitis, cellulitis, blood clots and high fever or communication barriers (inability to read, write or point to answer).

2.4. Measures

2.4.1. Demographic Data and Baseline Characteristics

It includes patients' age, gender, marital status, occupation, and the level of education. It also involves the date of admission to the ICU, medication history, normal sleep hours at night (sleep habit such as sleep time, day sleep, sleep hours, sleep aids used) and the diagnosis.

2.4.2. The Verran and Snyder-Halpern (VSH) Sleep Scale

The VSH Sleep Scale was first developed by Snyder-Halpern and Verran in 1987 [28], then modified by the authors in 1990 [29]. The modified version of the VSH Sleep Scale was adopted in this study to assess sleep quality for eligible patients. The scale consists of 15 questions categorized under three subscales: 'disturbance' (interruptions and delays in sleep), 'effectiveness' (how well sleep refreshed the individual), and 'supplementation' (napping). Disturbance questions includes: 1) mid-sleep awakening, 2) wake after sleep onset, 3) movement during sleep, 4) soundness of sleep, 5) quality of disturbance, 6) sleep latency and 7) quality of latency. Effectiveness questions include: 1) rest upon awakening, 2) subjective quality of sleep, 3) sleep sufficiency evaluation, 4) total sleep time and 5) total sleep period, calculated by adding total sleep time and wake after sleep onset. Supplementation questions include: 1) daytime sleep, 2) morning sleep, 3) afternoon sleep and 4) wake after final arousal. Each question is scored using a 100-mm visual analog scale. For 'disturbance' and 'supplementation' subscales, higher scores indicate sleep disturbance, and lower scores present better sleep. For 'effectiveness' subscale, higher scores reflect better sleep.

2.4.3. Factors Affecting Sleep Quality (FASQ) Scale

This scale was adapted from the modified Freedman, Kotzer and Schwab [3] sleep in ICU questionnaire (questions number 6 and 7). The questionnaire was originally developed by Freedman et al., [3] and modified by Bihari et al., [2] who added 'pain factor' to the scale. In our study, factors affecting sleep quality were categorized under four factors including: environmental, movement restriction, pathological, and patient management and care. We added 'calling devices', 'room temperature' and 'lack of privacy' to the environmental factors. 'Movement restriction' factors were also added to the scale as these factors can affect sleep quality. We categorized 'pain' under pathological factors, and we added 'cough' under this category. We removed some factors from

Freedman et al., [3] questionnaire such as 'televisions' and 'bedside phones' as they were not available in the studies ICUs. 'Suctioning' was also removed from the questionnaire as all patients were fully conscious, and this procedure was not applicable to them. Factors affecting sleep quality were set on a 10-point scale (1= no disruption, 10= significant disruption)

The VSH Sleep Scale and FASQ Scale were translated by the third author into Arabic language which is the mother tongue of research participants, and reviewed by the first and second authors. Back translation technique was used to ensure the validity of the translated scales. The Arabic version of the tools was back-translated into English by a bilingual expert translator. The Arabic version was submitted to face validation by five academic staff experienced in critical care nursing. Cronbach's alpha coefficient was used to assess the internal consistency of the VSH Sleep Scale and FASQ Scale which was 0.7 and 0.75 respectively.

2.5. Intervention

The back massage protocol was developed based upon relevant literature [30,31] and reviewed by an expert massage therapist. Participants were randomly assigned to either an intervention group (back massage) or a control group using the toss method. The demographic data and baseline characteristics were collected on the first day of admission to the selected ICUs. Participants in the back massage group received a 10- minute back massage session between 8-9 pm at night for 3 consecutive nights by the second author who received intensive training program on back massaging techniques. The procedure started on the second day of ICU admission. Each patient was assisted to lie down in prone position with the help of pillows under the chest and between legs. Baby Johnson oil was used to facilitate smooth strokes and enhance patient's comfort during intervention. Effleurage and stroking technique [30] was used starting from iliac crest till supraclavicular and axillary lymph nodes.

In the studied ICUs, there was no specific care for promoting patients' sleep at night. Therefore, the control group rested quietly during the intervention. The quality of sleep was assessed for the massage and control groups for 3 consecutive days in the morning using the VSH Sleep Scale. The data collector (second author) asked the participants to rate factors affected their sleep quality using FASQ Scale. It was difficult for ICU patients to complete the questionnaires by themselves due to their critical illness or the presence of invasive lines. Hence, the data collector read the questionnaire for them and recorded their responses.

2.6. Ethical Issues

An ethical approval was granted from the Research Ethics Committee of Faculty of Nursing, Mansoura University before commencing the study. Eligible patients were informed about the voluntariness nature of participation in this investigation. An informed consent was obtained from patients who accepted to take part in the study after providing them with detailed description of the aim of research, procedure, benefits and risks. The confidentiality and anonymity of participants' personal data were maintained by using codes on data collection sheets instead of names.

2.7. Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 16. Qualitative data were described as numbers and percentages. The $\chi 2$ test and Monte Carlo test were used to compare between the groups. Quantitative data were described as means (SD) or medians. The t-test and one way ANOVA test were used for normally distributed variables, and Mann Whitney test and Kruskal-Wallis Test were utilized for non-normally distributed ones. The statistical significance level *P* value was set at ≤ 0.05.

3. Results

3.1. Participants' Demographic Data and Baseline Characteristics

Table 1 showed that the majority of participants in both groups were between 31 and 40 years of age. The study sample was predominantly females. The average usual sleeping hours for the majority of participants in the control group and back massage group were between 7 and 9 hours per day. Most participants in the control group (66%) and the massage group (74%) did use neither sleeping aids nor routine sleep assistance. The majority of participants in control group and massage group were enrolled from the surgical ICU, and they were receiving postoperative care (32%, 28% respectively). Most of the participants in the control (74%) and massage (66%) groups reported that they were not under stress. No significant differences were found between the massage group and the control group regarding their demographic data and baseline characteristics.

3.2. The Effect of Back Massage on Sleep Quality

The results of the study showed no statistical significant differences between the massage group and the control group before intervention concerning the three main sleep subscales (Table 2). However, significant differences were noted among the groups after back massage intervention (P=0.000*). The mean score of subscale 'disturbance' had changed in the massage group after back massage procedure (Before Massage: 546.4 ± 115.89 and after massage: 144.6 ± 45.8). For 'disturbance' subscale, lower score indicates better sleep. For the subscale 'effectiveness', the mean score of sleep quality was 159.4 ± 112.52 before intervention and 461.6 ± 39.55 after intervention. Higher score of this subscale reflects better sleep. The mean score of subscale 'supplementation' before and after back massage was 384.1 ± 94.19 and 36.4± 38.63 respectively. Higher total score on this subscale represents a worse outcome, as more supplemental sleep was needed.

Table 1. Participants' Demographic Data and Baseline Characteristics

Variable	Control group		Massage group		Chi square test	
	n	**%**	**n**	**%**	**χ^2**	**p**
Age (years)						
18-30	11	22	13	26	.378	.945
31-40	19	38	17	34		
41-50	10	20	11	22		
51-60	10	20	9	18		
Gender						
Female	27	54	30	60	.367	.545
Male	23	46	20	40		
Marital status						
Single	12	24	10	20	.653	.884
Married	18	36	21	42		
Widow	8	16	9	18		
Divorced	12	24	10	20		
Occupation						
Governmental	16	32	18	36	.396	.941
Nongovernmental	15	30	14	28		
Not-working	6	12	7	14		
Retired	13	26	11	22		
Level of education						
University	20	40	23	46	.368	.832
Secondary	19	38	17	34		
Primary	11	22	10	20		
Usual sleeping hours						
1-3	0	0	1	2	1.797	.786
4-6	12	24	12	24		
7-9	36	72	33	66		
> 10	2	4	4	8		
Using sleep aids						
Yes	17	34	13	26	.762	.383
No	33	66	37	74		
Routine sleep assistance						
None	33	66	37	74	2.438	.692
Radio	3	6	2	4		
TV	2	4	4	8		
Reading	3	6	2	4		
Others	9	18	5	10		
Current stress						
Yes	13	26	17	34	.762	.383
No	37	74	33	66		
Diagnosis						
Cardiac disorders	1	2	4	8	3.286	.675
Endocrine disorders	3	6	6	12		
Hepatic disorders	9	18	8	16		
Pulmonary disorders	12	24	11	22		
Neurological disorders	9	18	7	14		
Postoperative	16	32	14	28		
ICU						
CCU	1	2	4	8	3.286	.675
Diabetic ICU	3	6	6	12		
Hepatic ICU	9	18	8	16		
Chest ICU	12	24	11	22		
Neurological ICU	9	18	7	14		
Surgical ICU	16	32	14	28		

χ^2: Chi-square test, *Statistically significant $P \leq 0.05$, n: Number of participants.

Table 2. Total Mean Differences in Sleep Quality among Studied Groups before and after Intervention

VSHS	Before intervention				After intervention			
	Control group	Massage group	Significance test		Control group	Massage group	Significance test	
	$\overline{x}$ ± SD	$\overline{x}$ ± SD	t	p	$\overline{x}$ ± SD	$\overline{x}$ ± SD	t	p
Disturbance	546.4±115.89	546.4±115.89	0.00	1.00	552.5±97.39	144.6±45.8	26.8	0.000*
Effectiveness	160.7±112.21	159.4±112.52	0.19	0.84	172.2±116.22	461.6±39.55	7.91	0.000*
Supplementation	348.1±94.19	348.1±94.19	0.00	1.00	181.28±40.64	36.4±38.63	8.33	0.000*

$\overline{x}$ **:** Mean, SD: Standard Deviation, ***Statistically significant** $P \leq 0.05$, VSHS: Verran and Snyder-Halpern Subscales.

Figure 1, Figure 2 and Figure 3 describe changes of sleep during the three days of the intervention as perceived by patients. Sleep disturbance mean scores decreased by day 3 in the massage group but there were no significant changes in the control group (Figure 1). Sleep effectiveness mean scores significantly increased by day 3 in the massage group, but no significant changes were noted in the control group. Sleep supplementation mean score decreased by day 3 in the massage group compared to the control group.

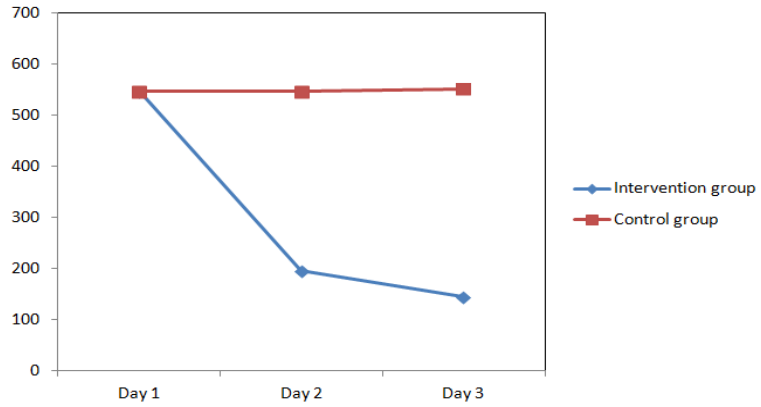

Figure 1. Changes of Sleep Disturbance Mean Score during the Intervention Period between Groups

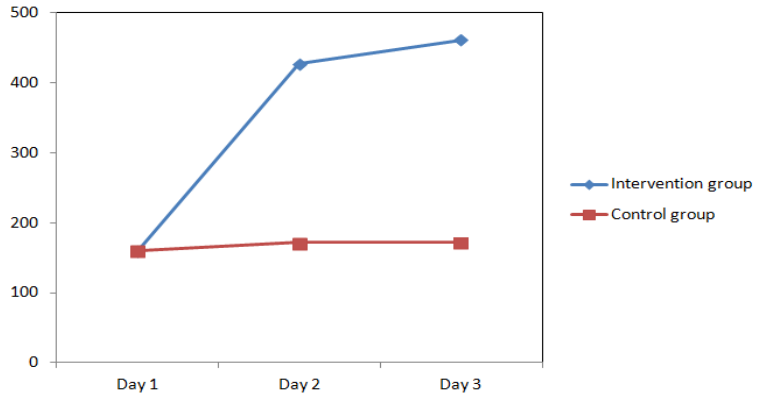

Figure 2. Changes of Sleep Effectiveness Mean Score during the Intervention Period between Groups

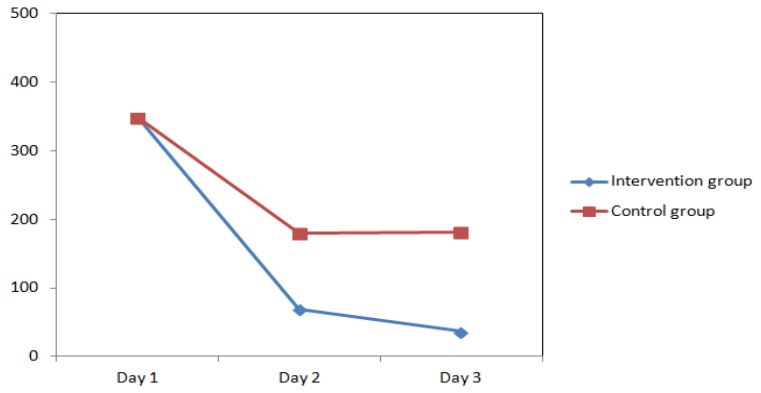

Figure 3. Changes of Sleep Supplementation Mean Score during the Intervention Period between Groups

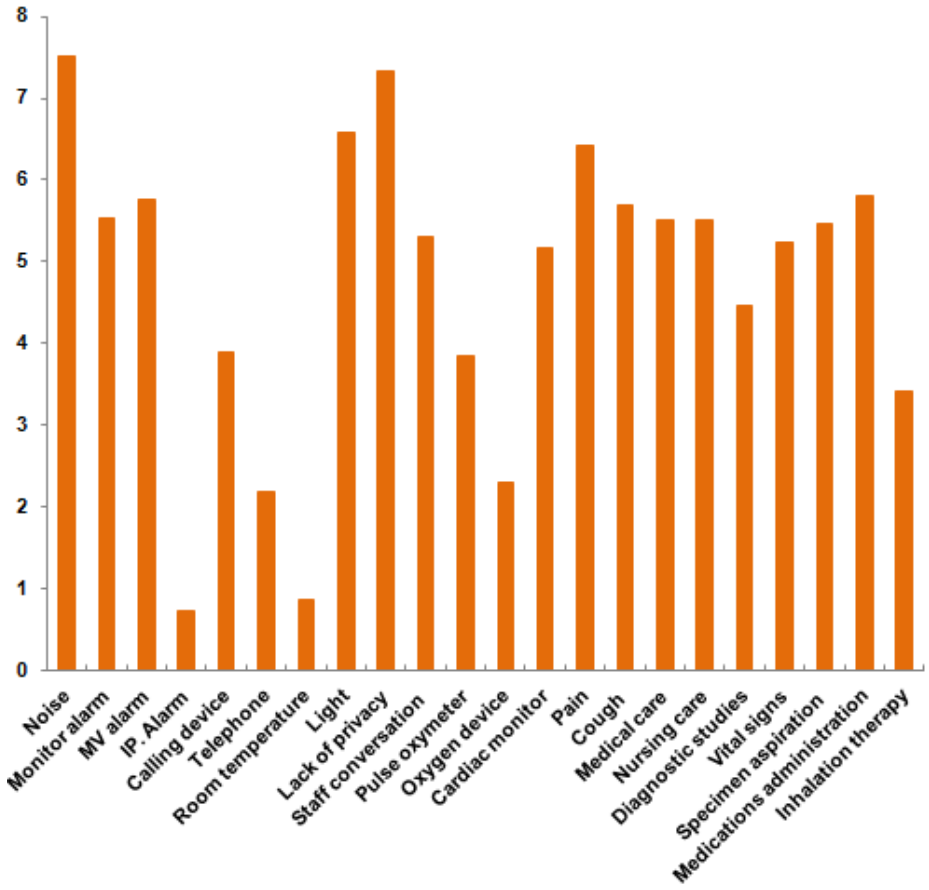

Figure 4. Total Mean Factors Affecting Sleep Quality in ICU

Table 3. Total Mean Differences in Factors Affecting Sleep Quality in ICU

Factors	$\overline{x}$	SD
Environmental Factors		
Noise	7.51	1.95
Monitor alarm	5.54	2.07
MV alarm	5.75	1.56
IP. alarm	0.73	1.69
Calling device	3.90	1.56
Telephone	2.18	1.74
Room temperature	0.86	2.10
Light	6.59	2.04
Lack of privacy	7.32	1.94
Staff's conversations	5.31	1.97
Movement Restriction Factors		
Pulse oxymeter	3.85	1.02
Oxygen device	2.31	3.18
Cardiac monitor	5.16	1.96
Pathological Factors		
Pain	6.41	3.07
Cough	5.70	3.84
Patient Management and Care Factors		
Medical care	5.51	1.82
Nursing care	5.51	1.36
Diagnostic studies	4.46	1.20
Vital signs	5.23	1.44
Specimen aspiration	5.47	1.35
Medications administration	5.81	1.27
Inhalation therapy	3.41	3.16

$\overline{x}$: Mean, SD: Standard Deviation.

3.3. Factors Affecting Sleep Quality in ICU

Factors affected patients' sleep quality in ICU are presented in Table 3 and Figure 4. Environmental factors were perceived by patients as the most sleep-disturbing factors. Noise and lack of privacy (7.51±1.95, 7.32±1.94 respectively) were the highest factors to disrupt patients' sleep. Other environmental sleep-disruptive factors were the light, alarms of the ventilator and monitor, and staff's conversations. Regarding movement restriction, the patients reported that movement limitation due to attachment to the lead wire of the monitor was significantly a disruptive factor for sleep quality (5.16±1.96). Pathological factors, such as pain and cough also affected patients' sleep quality (6.41±3.07, 5.70±3.84 respectively). Many aspects of patient management and care activities were also perceived by patients as causes for sleep disturbance in ICU. The most sleep disturbing factors in order were administration of medication (5.81±1.27), medical care and nursing care (5.51±1.82, 5.51±1.36 respectively).

4. Discussion

This study investigated the effect of back massage on perceived sleep quality of adult patients in ICU. The results showed that a 10-minute back massage session significantly improved the sleep quality for patients who received back massage in comparison with the control group. This is consistent with the findings of Shinde and Anjum [26] who reported significant differences in sleep

quality among ICU patients after slow stroke back massage on 3 consecutive days. Our findings are also harmonious with other studies which examined the effectiveness of massage on improving sleep quality in different patient population in different countries, and concluded its effectiveness in improving sleep quality [2,22,24,25,30,32].

Similar to other studies, sleep disturbance in the ICU was multifactorial [2]. The most sleep-disruptive factors highlighted by the patients were related to the environment such as noise and lack of privacy. Other reported environmental factors involved light, alarms and staff's conversations. Non-environmental factors such as movement restriction by cardiac monitor, pain, cough, medical and nursing interventions and patient care activities (e.g. vital signs, medication administration) were also perceived by the patients as sleep-disruptive factors. These findings are remarkably consistent with similar previous studies which investigated factors affecting sleep in ICUs in different countries [2,4,33,34]. This actually may indicate that there is general consensus regarding sleep disruptive factors in ICUs. Despite environmental factors such as noise from alarms, phones and staff's conversations were highlighted in the literature as the most sleep disturbing reasons in ICUs[11], some authors concluded that environmental noise is partially responsible for sleep disturbance, but not a major factor [2,18,35]. On the other hand, Ding et al., [33] found that despite the disturbing noise during night sleep, patients and their surrogates were satisfied and felt comfortable because they were continuously monitored by the staff. However, this study has a small sample size which restricts the generalization of its results.

Noise and light in the ICU during the night can negatively affect patients' physiological and psychological conditions [36] as they may be associated with decrease in nocturnal melatonin secretion and elevated cortisol secretion [37]. Melatonin is a natural hormone secreted by the pineal gland in response to darkness at night. When melatonin level elevates, the person usually falls asleep [36]. Hence, critical care nurses should manage modifiable sleep-disruptive factors and implement sleep promotion strategies in ICU such as reduction of light, noise and staff's conversations [36] as well as minimizing alarm volumes at night as possible. Nurses should also immediately attend to these alarms to reduce noise [2]. However, it is not always possible to control noise because of the need for continuous monitoring of patients' status, and care activities [37]. Hence, critical care nurses should adopt other strategies, such as making the patient wear earplugs and eye masks which have been found to promote sleep and hormone balance in healthy people [37].

Critical care nurses are ethically committed to maintain ICU patient's privacy. Maintenance of privacy is very important aspect of protecting patients' dignity. Nurses should avoid inappropriate patient's exposure as possible. There is a need for staff's raising awareness program concerning the importance of maintaining privacy in ICU [38]. Despite the fact that some medical and nursing interventions that the ICU patient is exposed to are inevitable, nurses need to be sensitive to patient needs [39]. Treatment and care activities can be planned before bedtime if possible to prevent sleep interruption. Additionally, pain and cough should be alleviated [39]. Creating a healing, relaxing environment around the patient will promote comfort and sleep which will enhance healing and recovery.

5. Limitations

This study has two limitations. First, the collected data were based upon self-report approach which might have increased the subjectivity of the results. Second, the study involved a small size convenience sample from Mansoura University Hospitals in one city which may limit the generalizability of the research findings.

6. Conclusion and Recommendations

A 10 minute-back massage is an effective intervention for promoting sleep quality for ICU patients. We recommend incorporation of back massage into routine nursing care of ICU patients before bed time to promote sleep, and consequently enhance healing and recovery. Critical care nurses should be aware of sleep-disruptive factors in intensive care setting and implement sleep promotion strategies. Further large scale studies using objective approach are required for more strong evidence about the efficiency of back massage in enhancing sleep in ICU.

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Author Contributions

Study Conception and Design: NAK.
Data Collection: MME
Data Analysis: MME, NAK, NT
Manuscript Writing: NK, MME, NT

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