Effectiveness of alternative nursing strategy on sleep pattern in coronary intensive care during hospitalization

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ABSTRACT

Background: Critically ill patients suffer from sleep pattern disturbances in intensive care units, negatively affecting their recovery. With this, nurses are faced with a great challenge to deal with these disturbances in critically ill patients.

Aim: This study aimed to explore the effectiveness of alternative methods to nursing strategies for promoting night sleep pattern among coronary intensive care patients.

Methods: The study was conducted at the coronary intensive care unit (CCU) of the Aswan University Hospital (Aswan– Egypt). Pertinent data were collected utilizing two tools. The first tool was the quality of sleep sheet, which included two parts: personal bio demographic data and a Richards–Campbell sleep questionnaire for monitoring the sleep qualities of ICU patients. The second tool was the stress factors in the ICU questionnaire used to measure stress perception. A quantitative survey was carried out to meet the aim of this study, and the purposive sample included 85 conscious CCU patients.

Results: Implementation of the alternative methods to nursing strategies revealed highly significant impacts regarding the domains in stress factor perception (p < 0.000) and items of sleep quality in the ICU. Significant differences were found in the means of sleep depth, latency, returning to sleep, sleep quality, and noise in the ICU (p < 0.005).

Conclusion: Alternative nursing strategies improved the sleep quality of ICU patients using the following alternative methods performed by nurses, which included aromatherapy, body massage, listening to calm music, and decrease of stress factors in the ICU. Therefore, it is recommended to use these alternative nursing strategies in intensive care units to improve the patients' night sleep pattern.

1. Introduction

Sleep is an essential physiological need for human life, which plays a vital role in promoting health condition, restored quality of life, and personal capacity efficiency. Formally, it is "a state of unconsciousness," in which the individual may wake up through the senses and other stimuli (Younis, Hayajneh, & Batiha, 2019). Sleep disorders, in particular, are common in critically ill patients in the intensive care unit (ICU), which may persist or develop after a serious illness (Hofhuis et al., 2018). Despite its discovery, this relationship between poor sleep in patients with critical conditions and their long-term outcomes remain unknown (Pisani et al., 2015). Many factors may possibly contribute to sleep disorders in critically ill conditions, including pain and discomfort, extreme light and strange noise stimuli at night, daily rhythm

interruption, delirium, and mechanical ventilation alarms (Pisani et al., 2015). In response, sleep disorders in the intensive care unit have been found to be managed using different pharmacologic and non-pharmacologic treatment modalities. For pharmacologic treatments, they remain the traditional therapy for managing sleep disturbance but are expensive and have several side effects. Meanwhile, for non-pharmacologic methods, complementary therapies are steadily gaining acceptance in the clinical setting due to their safety and cost-effectiveness to achieve the desired results in comparison to traditional therapy (Afshar, Bahramnezhad, Asgari, & Shiri, 2016).

In the past two decades, different methods have been used worldwide to promote good sleep in ICU patients. These methods included decreasing the noise level, light rhythm adjustment, relaxation and meditation techniques, using eye masks, earplugs, listening to relaxing

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music, and modifying the nursing care delivery time. Despite the priority of these managements, little to no attention has been paid to the efforts made in this area, with almost no guidance for nurses on how to implement these methods to help ICU patients get better quality sleep (Aitken et al., 2017). Thus, effective interventions are needed to improve the sleep-wake cycle of critically ill patients, and priority should be given to alternative nursing strategies to avoid the side effects of drug interventions (Hu, Jiang, Hegadoren, & Zhang, 2015). As previously established, sleep is a major component of health, which is directly related to physical and psychological well-being. Altered sleeping pattern, in particular, is a common problem in the coronary care unit (CCU), possibly resulting to serious detrimental impacts on health and recovery from illness (Lytle, Mwatha, & Davis, 2014). One of the most common models of alternative therapy for treating altered sleep is aromatherapy, a method focusing on the organized use of vital oils and fragrance to promote sleep using their healing properties. These studies suggest that alternative therapy seems to be beneficial in achieving positive outcomes in problems of insomnia within the ICU (Pagnucci, Tolotti, Cadorin, Valcarenghi, & Forfori, 2019).

Patients have referred to sleep pattern disorders as one of the worst experiences in the intensive care unit. Moreover, several studies have found significant decreases in the most frequent stages of sleep, as sleeping in the ICU has often been swift and fractured. Furthermore, sleep disorders may lead to immune and physiological dysfunctions, neurocognitive disorders, and possibly delirium even in previously healthy persons, consequently increasing ICU length of stay and mortality (Díaz-Alonso, Smith-Plaza, Suárez-Mier, & Lana, 2018; Pulak & Jensen, 2016). Therefore, there is a necessity for effective interventions to promote a normal sleep-wake cycle for critically ill ICU patients. Particularly, due to their safety profiles, alternative strategies and non-pharmacological interventions should be prioritized to improve the sleeping patterns of ICU patients (Elbaz et al., 2017).

2. Aims and hypotheses

The present study aimed to investigate the effectiveness of alternative methods to nursing strategies in promoting good night sleep patterns among coronary intensive care patients.

3. Design and methods

This study was conducted in the coronary intensive care unit and ward of the Aswan University Hospital from April 1, 2018 to December 31, 2018. This study was quantitative survey including a sample of 85 critically ill adult patients from the coronary intensive care unit who were followed-up in the ward after discharge for over a period of eight months.

Enrollment/inclusion criteria:

- Glasgow scale grade ≥ 13.
- Ramsay sedation score ≥ 3
- ICU length of stay ≥ 2 nights
- Ability to give informed consent to participate in the research
- Adequate vision and hearing to complete the study questionnaires

Exclusion criteria: Patients with both sleep disorders and neuro-psychological disturbances.

Tools for data collection: Two tools used for data collection are listed on the following page.

Tool 1: Quality of sleep sheet (English form) was used for collecting data of this study, comprising the following two parts:

Part one: Critical adult personal bio-demographic and clinical data, such as sex, age, weight, height, hospitalization reason, and duration of ICU stay.

Part two: An assessment sheet of the Richards–Campbell Sleep Questionnaire (RCSQ) was used, which was developed by Richards, O'Sullivan, and Phillips (2000) and consists of six components: 1) sleep depth, 2) sleep latency, 3) awakening time, 4) sleeping again, 5) sleep quality, and 6) noise. For each element, patients refer to a level using a colored analogue scale of values from 0 to 100, with 0 reflecting the most negative perception of sleep and 100 reflecting the most positive perception. Specifically, these values have been graded as the following: 1 to 20 for very poor sleep, 21 to 40 for poor sleep, 41 to 60 for well-accepted sleep, 61–80 for good sleep, and 81–100 for very good sleep quality.

Tool 2: Stress factors in the ICU questionnaire (SEDAICU) were used as the second tool, which was developed by Pagnucci et al. (2019). This tool was used to measure stress perception and consisted of 32 items divided into four sections. Each item represented a potential stress factor and is estimated in terms of a perceived stress score on the Likert scale (1 = none at all, 2 = little, 3 = very little, 4 = a lot). Stress factors and quality of sleep during the first night time (pre-test) and during second night time (post-test) were measured.

1. Environmental stress factor
    There are several environmental factors existing in the ICU such as phone rings, sounds and unusual noises (e.g., alarms on machines, monitor), strange machines (e.g., IV infusions being overhead), too hot or too cold temperatures, as well as healthcare professionals who were too busy, stressed, or hurried.
2. Feelings
    There were several items which has been used for measuring patient' feeling. These items included unknown healthcare professionals, people working continuously around the bed, health care staff that talk, joke, and discuss issues in loud voices, being awakened by healthcare professionals, no explanation about the medical treatments being done, other patients suffering, crying, or complain, and being treated by unknown doctors.
3. Emotions
    Items of measuring patient' emotion which have been used in this study included; unknown day or time of ICU stay, unknown place where one was and why one was there, little consideration to religious beliefs, unknown time of receiving treatment, being worried/afraid, having no control over one's self, lack of intimacy, unablity to express discomfort or speak, shortness of relative's visiting time , and lack of loved ones (e.g., husband, wife, children).
4. Physical state
    Physical state in ICU was measured by the following items; continuous watching the ceiling with lights always on, uncomfortable mattress or pillow, unablity to sleep due to feeling the blood pressure cuff inflate often, unablity to freely take the position desired, having tubes in the nose or mouth that restrict movement, unablity to eat, thirsty, hungry, being in pain, and having needles inserted. Prior to the actual study, a *pilot study* was done on 10% of the sample size (8 patients) to test the tool's applicability and was included in the study results.

Validity: The validity of the tool was tested using the content's validity index, which was done by five experts in the critical care nursing field, equaling to 91%.

Reliability: The reliability of the tool was calculated statistically using Cronbach's alpha score (r = 0.82).

4. Methods for data collection

In the 8-month duration, a total of 85 patients were enrolled. The sample size has been calculated by using the following equation according to (Thompson, 1992) with confident level at 95%: $n = \frac{N \times p(1-p)}{[[N-1 \times (d^2 \div z^2)] + p(1-p)]}$

The patients' bio-demographic data were collected from their medical records. During the first nighttime in the ICU, all patients underwent

usual therapeutic and nursing managements following the hospital protocols, with the nurses and personnel decreasing the level of light only over the patient bed for the duration of the night. The perceived stress and average sleep quality pretests were measured after the first night of admittance to the ICU, at 8 a.m. in the following morning. Throughout the following night time of their ICU stay, a threefold of alternative therapeutic methods were designed and administered to improve the quality of sleeping pattern. Slow rhythm and simple repetitive tempos (self-selected music sound) were given to each patient, wherein they listened to calming or relaxing musical sounds through a digital MP3 player and were permitted to listen using headphones. Simultaneously while listening to these sounds, a shoulder massage was applied using almond oil with additional lavender and lemon aromas. This massage therapy was performed by researchers in the ICU. The twofold techniques of massage and aromatherapy were done for only 15 min, while the musical sounds were played for the duration of the night. During the third day of ICU stay, the visualized stress and quality of each patient's during the second night time were measured using the same questionnaires, which measured perceived stress post-test and average sleep quality. The patients were followed-up in the ward following ICU discharge for up to one week.

4.1. Field of the study

The data was collected between April and December 2018 for over eight months. The study was done during the hospital routine work at the night and all the included patients followed-up after discharge from ward for up to one week. The assessment sheet required around discontinuous 15–25 min during the shift for filling, and about 2–3 patients' data were randomly collected per week.

4.2. Ethical considerations

Ethical approval was obtained from the Ethical Committee of Faculty of Nursing, Aswan University, Egypt, under the number of Aswu/48/3/18. Oral presentation to patient has been done for clarifying the proprietors of the study and explaining the purpose of the study and consent to participate from participants was obtained in written form.

5. Statistical analysis

Data analysis was performed using the SPSS ver. 19 program (Statistical Package for Social Science), wherein data were presented as means and standard deviations. Chi-square and Fisher Exact tests were used to compare qualitative variables, whereas the Mann-Whitney test was used to compare quantitative variables in cases of non-parametric data. The *P*-values for all analyses were considered statistically significant at $P < 0.05$. The dependent variables were alternative the nursing interventions, including slow rhythm and simple repetitive tempos, shoulder massage using almond oil, and the additional lavender and lemon aromas. The study's main outcome was quality of sleep, including sleep depth, sleep latency, awakenings, returning to sleep, sleep quality, and noise.

6. Results

6.1. Data samples

Personal data of the studied sample of patients is further described in Table 1. The tabulated data showed that the majority of the studied sample were males (n = 67, 78.8%) and that their ages ranged between 22 and 82 years, with an average age of almost 52 years and most of them ranging between 50 and 60 years of age (45.9%). Regarding their education, approximately 29.4% of them were illiterate, 10.6% had basic education, 31.8% had secondary school education, and 28.2% had university level education. Additionally, this table clarified that more

Table 1
Percentage distribution of the personal data of the studied sample according to their bio-demographic characteristics (n = 85).

Personal data	No.	%
Sex:		
Male	67	78.8
Female	18	21.2
Age: (years)		
< 50	28	32.9
50 – 60	39	45.9
≥ 60	18	21.2
Mean ± SD (Range)	51.9 ± 14.0 (22.0–82.0)	
Education:		
Illiterate/ read & write	25	29.4
Basic education	9	10.6
Secondary	27	31.8
University	24	28.2
BMI:		
Normal	27	31.8
Overweight	30	35.3
Obese	28	32.9
Chronic disease:		
Diabetes mellitus	24	28.2
Hypertension	15	17.6
Heart failure	73	85.9
Kidney disease	3	3.5
Duration of ICU stay: (days)		
1 – 2	30	35.3
3 – 4	30	35.3
5 or more	25	29.4

than one third of them (35.3%) were overweight, with the majority (85.9%) being diagnosed with heart failure. Regarding length of ICU stay, this varied and was ranged from 1 to 2 days (35.3% of patients), 3–4 days (35.3% of patients), and 5 days or more (29.4% of patients). In summary, Personal patient profiles included gender, age, education, PMI, and duration of stay in ICU.

6.2. Quality of sleep

Quality of sleep was assessed using the Richards–Campbell Sleep Questionnaire (RCSQ). On assessment, highly significant differences were shown in the RCSQ components, including sleep depth, latency, awakenings, returning to sleep, sleep quality, and noise in the ICU pre- and post-implementation of alternative nursing strategies (Table 2. It was worth noting that sleep depth and noise improved significantly following the implementation of alternative nursing strategies in the ICU (Table 3.

6.3. Stress factors

The results of stress factors in the ICU are further shown in Table 4. The data illustrated that perception stress factors and its domain decreased significantly after implementation of alternative nursing strategies in the ICU as compared to pre-implementation data. The mean value of the total perception stress factor scores within the ICU revealed that 92.49% were suffering from stress contributing to sleep distribution before implementation, and this value decreased to 77.4% following the implementation of alternative nursing strategies in the ICU (Table 4.

6.4. Correlation coefficients

Table 5 revealed that there was a negative correlation between the perception of total stress factors and its domains, and quality of sleep item categories. Table 6, on the other hand, revealed that the highest mean score of stress factors was in the group aged ≥ 60 years (100%) and the overweight group (97.70%), with high statistically significant

Table 2

Percentage distribution of the quality of sleep in ICU (RCSQ) among studied sample in pre and post implementing alternative nursing strategies (n = 85)

Quality of sleep	Pre-test		Post-test		P-value
	No.	%	No.	%	
Sleep depth:					0.000*
Very poor	21	24.7	3	3.5	
Poor	58	68.2	30	35.3	
Well-accepted	6	7.1	43	50.6	
Good	0	0.0	9	10.6	
Sleep latency:					0.000*
Very poor	0	0.0	0	0.0	
Poor	33	38.8	6	7.1	
Well-accepted	34	40.0	64	75.3	
Good	18	21.2	15	17.6	
Awakenings:					0.005*
Very poor	3	3.5	3	3.5	
Poor	52	61.2	36	42.4	
Well-accepted	30	35.3	37	43.5	
Good	0	0.0	9	10.6	
Returning to sleep:					0.000*
Very poor	0	0.0	3	3.5	
Poor	61	71.8	36	42.4	
Well-accepted	24	28.2	38	44.7	
Good	0	0.0	8	9.4	
Sleep quality:					0.000*
Very poor	0	0.0	0	0.0	
Poor	82	96.5	41	48.2	
Well-accepted	3	3.5	36	42.4	
Good	0	0.0	8	9.4	
Noise:					0.000*
Very poor	0	0.0	0	0.0	
Poor	67	78.8	28	32.9	
Well-accepted	18	21.2	49	57.6	
Good	0	0.0	8	9.4	

Table 3

RCSQ sleep in the ICU and ward post implementing alternative nursing strategies (n = 85).

	ICU		Ward		P-value
	No.	%	No.	%	
Sleep depth:					0.000*
Very poor	3	3.5	0	0.0	
Poor	30	35.3	9	10.6	
Well-accepted	43	50.6	61	71.8	
Good	9	10.6	15	17.6	
Sleep latency:					0.299
Very poor	0	0.0	0	0.0	
Poor	6	7.1	2	2.4	
Well-accepted	64	75.3	70	82.4	
Good	15	17.6	13	15.3	
Awakenings:					0.126
Very poor	3	3.5	2	2.4	
Poor	36	42.4	22	25.9	
Well-accepted	37	43.5	48	56.5	
Good	9	10.6	13	15.3	
Returning to sleep:					0.999
Very poor	3	3.5	3	3.5	
Poor	36	42.4	35	41.2	
Well-accepted	38	44.7	39	45.9	
Good	8	9.4	8	9.4	
Sleep quality:					0.949
Very poor	0	0.0	0	0.0	
Poor	41	48.2	39	45.9	
Well-accepted	36	42.4	38	44.7	
Good	8	9.4	8	9.4	
Noise:					0.000*
Very poor	0	0.0	0	0.0	
Poor	28	32.9	0	0.0	
Well-accepted	49	57.6	80	94.1	
Good	8	9.4	5	5.9	

differences (P = 0.00), as shown in this table. Furthermore, the mean score between stress factors, secondary education level, and duration of ICU stay were 3:4 days, 97.78%, and 98.30%, respectively. Tables 7 and 8 both summarized the correlations of perception stress factors with quality of sleep in the post-implementation of alternative nursing strategies in the ICU and after transferring the patients to the ward. Total stress and physical state showed some significant negative correlations with quality of sleep, particularly after transfer to the ward. Additionally, the study findings indicated significant satisfaction in the sleep pattern level of the patients in the ICU. Research results showed that 50 patients admitted to the surgical ICU had significant differences in overall sleep quality (P < 0.05), wherein sleep quality was better in study grouped in all categories of depth of sleep, awakening, falling asleep sleep after awakening, and overall sleep pattern. A strong positive correlation was also found between the stress factor domains and sleep quality items, indicating that most of the alternative nursing intervention strategies tested for sleep promotion might be effective for acutely ill patients with a usual poor sleep quality (Table 8).

7. Discussion

This study was done on 85 critically ill patients admitted to the coronary care unit from April 1, 2018 until December 31, 2018 in the Aswan University Hospital. Total stress factor scores were significantly associated with patient personal profiles, with exception of sex. These scores were not affected by sex, as their scores were about 90% for females and 93% for males. It was obviously clear that the total stress factor scores increased with increasing patient age, wherein it increased from 82% for patients younger than 50 years to reach 100% for patients older than 60 years of age.

In terms of education, the highest total score was observed for

Table 4

Mean and standard deviations of the perception stress factor and its domains in the ICU pre and post implementing of alternative nursing strategies (n = 85).

Perception stress factor and its domains	Pre-test	Post-test	P-value
ICU Environmental stress factor	14.38 ± 3.48	11.91 ± 3.40	0.000*
Patient Feelings toward health care personal	19.64 ± 3.57	16.15 ± 4.37	0.000*
Emotional stress	26.80 ± 5.55	22.24 ± 5.27	0.000*
Physical state	31.68 ± 5.71	27.14 ± 4.99	0.000*
Total Stress factor	92.49 ± 12.84	77.44 ± 14.97	0.000*

patients who have had a secondary school education. Overweight and obese patients also showed higher stress scores as compared to normal patients, and those who stayed 3–4 days in the ICU showed higher stress scores compared to those who stayed for a shorter time. From the researchers' point of view, reduced or controlled perceived stress factors in the ICU plays an important role in regulating central nervous system functioning, which is effective in alleviating stress that reflects on the decreased duration of ICU stay among critically ill patients. On the other hand, personality characteristics also lead to alterations in endocrine secretions and neurotransmitters in the brain, including serotonin and dopamine, consequently resulting to poor sleeping patterns. Therefore, it is important to apply complementary non-pharmacological sleep promotion strategies that nurses can standardly apply in ICU patient care. Moreover, Alves, Rabiais, and Nascimento (2015) found that significant relations between stress and certain personal history factors, such as age, length of time in the ICU, educational level, patient experiences, and the disease itself, may affect the sleep pattern of the critically ill.

Table 5

Relationship between total stress factor score and personal data of studied sample in ICU in pre and post implementing alternative nursing strategies (n = 85). The data represented Mean values ± SD

Personal data	Stress factor score	P-value
Sex:		0.325
Male	93.21 ± 12.51	
Female	89.83 ± 14.06	
Age: (years)		0.000*
<50	82.25 ± 15.89	
50–60	96.38 ± 6.57	
≥ 60	100.00 ± 7.10	
Education:		0.025*
Illiterate/ read & write	87.08 ± 15.08	
Basic education	91.33 ± 18.19	
Secondary	97.78 ± 10.26	
University	92.63 ± 8.12	
BMI:		0.000*
Normal	82.11 ± 14.13	
Overweight	97.70 ± 10.63	
Obese	96.93 ± 6.42	
Duration of ICU stay: (years)		0.004*
1–2	87.70 ± 15.85	
3–4	98.30 ± 10.12	
5 or more	91.28 ± 8.82	

This finding indicated that wide ranged non-pharmacological nursing intervention skills can be interrelated with relevant scientific quality of patient sleep. The total stress factor score in this study decreased by about 16% in the post-implementation of alternative nursing strategies as compared to pre-implementation, which was due to a 17% decrease in ICU environmental stress, 18% decrease in their feelings toward health care, 17% decrease in their emotional stress, and a 14% decrease in their physical states. From the researchers' point of view, this may be due to having focused on modifying their environment that contributed to improving their sleep disorders, with strategies involving reducing noise levels with a quit alarm sound, ringing telephone, unnecessary staff conversation beside patients' beds, and providing an appropriate room temperature. All of these changes provided a good ICU sleeping opportunity in this study. Ding, Redeker, Pisani, Yaggi, and Knauert (2017), for one, stated that an ICU guideline on improvement intervention, especially environmental disturbance reduction, was a mean of ICU sleep pattern promotion. The total stress factor score in that study was significantly associated with the following domains: environment, feelings, emotions, and physical state. These results not only indicated the great impact of emotional stress as a major perception stress factor, but also highlighted the important role of implementing nursing strategies in improving stress conditions and therefore improving patient confidence in our health care.

The current study revealed that the mean of the patients' feeling perception toward health care personnel was significantly reduced in the post-implementation of alternative nursing strategies as compared to pre-implementation. This result was opposed to another study by Valle (2019), which stated that there was an increase in the feeling category of stress factor in the ICU than in the patients' perceived stress feeling. Regarding emotional stress, Matthews, Tanner, and Dumont (2016) stated that the emotional category perceived by a patient in the ICU was the most stressful item in the majority of patient complementary intervention applications. Additionally, the physical state was found to be significantly effective, and this effectiveness may be tied to the fact that all the alternative nursing strategy items included relaxing musical sounds, combined massage-aromatherapy, thirst prevention, unnecessary light reduction, quit provision during night time, room temperature promotion, and comfort provision, in most of them. Matthews

Table 6

Correlation between perception of stress factor and its domains in ICU in pre and post implementing alternative nursing strategies (n = 85)

			Environment	Feelings	Emotions	Physical state
Pre-test	Feelings	*r*-value	0.564			
		P-value	0.000			
	Emotions	*r*-value	0.323	0.349		
		P-value	0.003	0.001		
	Physical state	*r*-value	0.110	0.236	0.355	
		P-value	0.315	0.030	0.001	
	Stress factor	*r*-value	0.616	0.687	0.774	0.693
		P-value	0.000	0.000	0.000	0.000
Post-test	Feelings	*r*-value	0.770			
		P-value	0.000			
	Emotions	*r*-value	0.418	0.673		
		P-value	0.000	0.000		
	Physical state	*r*-value	0.593	0.673	0.430	
		P-value	0.000	0.000	0.000	
	Stress factor	*r*-value	0.796	0.928	0.787	0.816
		P-value	0.000	0.000	0.000	0.000

Table 7

Correlation between perception of stress factors and quality of sleep in ICU post implementing alternative nursing strategies (n = 85)

		Environment	Feelings	Emotions	Physical state	Stress Factor
Sleep depth	*r*-value	0.150	0.096	−0.012	0.051	0.085
	P-value	0.170	0.381	0.913	0.641	0.439
Sleep latency	*r*-value	−0.150-	−0.275	−0.093	0.045	−0.138
	P-value	0.170	0.011	0.395	0.685	0.209
Awakenings	*r*-value	−0.255	−0.050	−0.098	−0.025	−0.136
	P-value	0.019	0.647	0.373	0.821	0.213
Returning to sleep	*r*-value	0.272	0.153	−0.105	0.077	0.105
	P-value	0.012	0.162	0.338	0.486	0.340
Sleep quality	*r*-value	0.256	0.181	0.111	0.044	0.187
	P-value	0.018	0.097	0.312	0.686	0.086
Noise	*r*-value	−0.081	−0.434	−0.169	−0.169	−0.291
	P-value	0.459	0.000	0.122	0.122	0.007

Table 8

Correlation between stress factors and quality of sleep in the ward

Items		Environment	Feelings	Emotions	Physical state	Total Stress Factor
Sleep depth	*r*-value	−0.067	−0.287	−0.167	−0.477	−0.317
	P-value	0.544	0.008	0.126	0.000	0.003
Sleep latency	*r*-value	−0.145	−0.142	−0.149	−0.226	−0.202
	P-value	0.187	0.196	0.175	0.038	0.064
Awakenings	*r*-value	−0.063	−0.192	−0.085	−0.225	−0.175
	P-value	0.565	0.079	0.440	0.039	0.109
Returning to sleep	*r*-value	0.014	−0.183	−0.048	−0.310	−0.170
	P-value	0.900	0.093	0.665	0.004	0.119
Sleep quality	*r*-value	−0.097	−0.212	−0.118	−0.227	−0.201
	P-value	0.379	0.052	0.283	0.037	0.066
Noise	*r*-value	−0.034	−0.107	−0.164	−0.399	−0.230
	P-value	0.759	0.330	0.134	0.000	0.034

et al. (2016) also discovered that multiple nursing interventions can reduce sleep disturbances and negative clinical outcomes in the intensive care unit. In the present study, a great improvement in the levels of the total stress factor scores at post-implementation of the alternative nursing strategies was observed, which was concluded by the presence of significant differences between pre- and post-implementation values. This finding indicated that ICU patient sleep patterns can be easily improved if complementary nursing strategies and techniques, such as receptive musical sounds, and combined massage aromatherapy, among others are applied to ICU patients. Similarly, Sandoval (2017) stated that several ICU sleeping strategies might be used by nurses to provide better sleep quality in ICU patients, indicating that the implementation of these strategies had beneficial effects on sleep quality and patient outcomes. As established, sleep patterns in the ICU were significantly improved at the post-implementation of alternative nursing strategies, which might be related to the numerous alternative interventions carried out that allowed increased quality of sleep in ICU patients.

Similar to our study, Machado, Souza, Poveda, and Costa (2017) conducted a study in coronary intensive care to promote sleep through a combination of non-pharmacological actions performed by nurses, including several measures, such as the reduction of light and noise, and providing rationales of night management tasks, among others. The results of the current study showed correlations between perception stress factors and patients' quality of sleep in the ward. This indicated that applying alternative nursing strategies can improve stress factors and sleep quality of patients, which are consistent with a study (Hu, Jiang, Zeng, Chen, & Zhang, 2010) stating that using earplugs and eye masks as non-pharmacological interventions can improve rapid eye movement (REM) sleep and sleep quality in healthy subjects in a simulated ICU environment. This may also indicate that both noise and light levels were lower and more "physiological" in a ward than in an ICU. With the absence of noise peaks above 80 dB during the night and with ward light exposure reflecting the circadian rhythm, patients received natural illumination (range: 100–3000 lx), which was usually higher than artificial illumination (300 lx) and was with sudden changes from day to night. This exposure pattern may help to restore circadian melatonin secretion, which had been demonstrated to be abolished in ICU patients (Campo et al., 2010). This study also revealed that subjective sleep quality in the ward was significantly higher than subjective sleep quality in the ICU sampled patients, which may be attributed to the fact that ICU patients were exposed to an environment with high noise levels and continuous day-to-night lighting. Furthermore, continuous monitoring and care were found to be commonly needed in the ICU, as patients find themselves surrounded by medical and technological equipment. Given this, the ICU environment may increase stress levels among ICU patients, which is consistent with findings from previous studies (Engwall, Fridh, Bergbom, & Lindahl, 2014; Walder, Francioli, Meyer, Lançon, & Romand, 2000).

In this study, massaging was also utilized with mixing of lavender and lemon oil aromas for 15 min, showing a noticeable effect on improving the sleep quality of patients in the ICU. Taking into account the safety of using essential oils and their low cost, we recommend conducting further studies on using essential oils of common aromatic plants in the region as an alternative nursing strategy for improving the sleep quality of ICU patients.

8. Conclusion

According to the results of this study, it was concluded that: Alternative nursing strategies allowed for increased quality of sleep and promoting rest of intensive care unit patients through the following methods performed by the nurses: aromatherapy, body massage, listening to calming music, and decrease of stress factors in the ICU. Our results comprehensively showed improved sleeping patterns and ICU environment satisfaction, following the implementation of these alternative nursing strategies.

9. Recommendations

Based on the results of the present study, the current study recommended that:

1. Alternative nursing strategies should be used in all ICUs to improve patients' sleep quality.
2. More scientific evidences are needed to improve sleep quality in the ICU.
3. More training programs for the ICU staff on alternative methods of nursing strategies for the promotion of good night sleep patterns to raise their awareness and general knowledge on sleep, although further investigation is needed.
4. Conducting more researches on using aromatherapy as an alternative nursing strategy.

CRediT authorship contribution statement

Zahra Ahmed Sayed: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project adminstration, Resources, Software, Supervision, Visualization, Writting - original draft. **Ghada Hassan Ahmed:** Conceptualization, Data curation, Investigation, Validation, Visualization. **Wagdi Saber Soliman:** Resources, Software, Writting - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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