Effect of Implementing Nursing Interventions Bundle on Sleep Quality and Associated Delirium among Patients at Intensive Care Unit

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Abstract

Critically ill patients frequently experience sleep deprivation, which has detrimental effects such as increased pain perception, impaired cognitive function, and delirium. **Aim:** Evaluate the effect of implementing nursing interventions bundle on sleep quality and associated delirium among patients at intensive care unit (ICU). **Design:** A quasi-experimental research design was utilized in this study. **Setting:** Anesthesia Intensive Care Unit of Emergency hospital affiliated to Tanta University hospital. **Subjects:** Purposive sampling of 60 adult critically ill patients who admitted to the selected setting and divided into two equal groups; 30 patients in each (control and study groups). **Tools; Tool (I)** Patient interview schedule, **tool (II)** Richard Campbell Sleeping Questionnaire (RCSQ) and **tool (III)** Intensive Care Delirium Screening Checklist (ICDSC) **Results:** A highly significant difference was detected between the study and control groups regarding their total sleep quality after applying the nursing intervention bundle (P=0.000). The incidence of delirium was 30% in the control group compared to 13.33% in study group at the seventh day of intervention with significant differences (P=0.024). **Conclusion:** Implementing of nursing intervention bundle can improve sleep quality and decrease associated delirium. **Recommendation:** Sleep interventions bundle should be integrated into routine care for patients in ICU to promote patient sleep and reduce incidence of delirium.

Key words: Associated delirium, Nursing intervention bundle, Sleep quality.

Introduction

Sleep is a complicated physiological and behavioral process that is necessary for survival, well-being and rest. It is described as a cyclical, reversible state of disengagement from the outside world in terms of cognition and perception. Physiological rest is facilitated by nocturnal sleep, which also causes the nervous system to slow down and triggers muscle regeneration. Patients with sleep disorders do not experience this regeneration, had cognitive deficiencies and physiological disorders [1, 2].

Sleep disturbance and deprivation is one of the main concerns for critically ill patients. More than 60% of patients who are admitted to the intensive care unit (ICU) have sleep disturbance, which is characterized by reduction of circadian rhythms, poor subjective sleep quality and decreasing in restorative sleep stages[3]. In Egypt, a study was conducted by **Tolba et al, (2021)** indicated that 98% of critical ill hospitalized patients had moderate sleep disturbance [4].

There are a variety of risk factors that may contribute to sleep deprivations. These factors include environmental factors, such as noise from staff talking, monitor, telephones, infusion pump and mechanical ventilator alarms; intrinsic factors to the patients and the acute nature of their condition; and factors related to the treatments, nursing care activities and drug therapy. Additionally, continuous exposure to artificial light in ICU can inhibit melatonin release, which affects circadian rhythms and alters sleep habits [3, 5].The adverse effects of sleep deprivation include a reduction in elimination of neurotoxic waste products, an increase in inflammatory cytokines, alterations in immune and endocrine function markers, higher mortality rate and length of stay in ICU [6,7].

Additionally, it is believed that sleep disturbance contribute to delirium development. The incidence of delirium associated with sleep disturbance in the ICU range from 11% to 87%. Patients admitted to an ICU with cognitive deficits, terminally ill, undergoing major surgery, noise in ICU and clinical patient's condition make the patients susceptible to delirium [6]. Delirium has several characteristics in common with sleep deprivation, such as impaired vision, language, thought processing, concentration and memory problems which are characterized by hallucinations and delusions. It suddenly appears, usually within a few hours or days [8,9].

Both pharmaceutical and non-pharmacological therapies are used in ICU to promote sleep. However, pharmacological therapies may have adverse side effects, such as deterioration of cognitive function; increased risk of tolerance, respiratory depression, and disruptions to the normal physiology of sleep [8].The Institute of Health Care has developed the concept of "bundles" to help medical staff to provide the best care for critically ill patients. A bundle is a structured way to improve the processes of care and patient outcomes. It contains three to five set of evidence-based practices that, when performed collectively and reliably, lead to improvement of patient outcomes [10,11].

Sleep bundle is developed to improve sleep quality and decrease delirium occurrence among patients in ICU. It includes measures taken to reduce noise, light measures including eye mask, earplugs, foot, back massage, music intervention, regulation of nursing interventions, orientate

patients regarding time, place and date every eight hours and ensure early mobilization when possible [12]. Many randomized controlled trials have shown that earplugs, eye masks, noise reduction have a positive effect on sleep quality in the ICU. Although some of these studies are limited due to their small sample sizes [13, 14].

In ICU settings, the alarms sound cannot be lowered or turned off. Therefore, using earplugs and eye masks is another way to decrease effect of noise, light and keep patients safe. Previous 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 the ICU[16,17]. Also massage is a safe, noninvasive intervention that can be used in the ICU to enhance comfort and sleep pattern. It lowers the need for medication, relaxes muscles and improves sleep quality[18]. All of these measures can help in improving sleep quality and decrease delirium occurrence.

Significance of the study

Based on clinical observations, patients in ICU experience considerable changes in their sleep patterns, including more frequent awakenings and sleep deprivation. The critical care setting does not promote sleep due to the loud noise levels, hectic 24-hour activity, and constant artificial lighting. Sleep disturbances affect more than sixty percent of patients who are admitted to the ICU[5]. It raises the danger of delirium and immune system dysfunction, which slows recovery. In order to reduce these consequences, it is crucial for patients in ICU to undertake sleep bundle intervention for sleep promotion[5,12].Therefore this study aimed to evaluate the effect of implementing nursing intervention bundle on sleep quality and associated delirium among patients at intensive care unit.

The aim of this study was to:

Evaluate the effect of implementing nursing intervention bundle on sleep quality and associated delirium among patients at intensive care unit.

Research hypotheses:-

H1: The study patients who receive nursing intervention bundle are expected to have an improvement in sleep quality compared to the control group.

H2: The study patients who receive nursing intervention bundle are expected to have a reduced incidence of delirium compared to the control group.

Subjects and Method

Design: - A quasi experimental design.

Study settings: -

Anesthesia ICU at Tanta Emergency Hospital which included 4 wards with a totally 20 beds.

Study subjects:-

Purposive sampling of 60 patients admitted to the aforementioned setting. It was selected according to power analysis equation based on software program at 95% confidence.

-Inclusion criteria of selection of subjects:

Adult conscious patients of both sexes were included in the study with the age of 21-60 years.

-Exclusion Criteria:

- Patient who had ear /eye disturbances, delirium, sleeping disturbances on admission.

- Patients who used sedative or narcotic drugs during the study.

- Conditions that could affect application of foot bath such as skin diseases (e.g. contagious skin, eczema), phlebitis, cellulitis and vascular diseases.

The sample was divided into two equal groups 30 patients in each as follows;
Control group consisted of 30 patients, received hospital routine care for improving sleep quality which included giving analgesics or silence alarm of medical devices.

Study group consisted of 30 patients, received the nursing intervention bundle to improve sleep quality and prevent the incidence of associated delirium. This bundle included measures taken to reduce noise, light measures including eye mask, earplugs, relaxation techniques such as foot bath, back massage, environmental factor reduction, reorientation strategies to patients and early mobilization [12].

Study tools:
Three tools were used to conduct this study:-

Tool I: Patient Interview Schedule:
The researcher created this tool after studying the pertinent literature review[10,11]. It consisted of two parts:

Part (a) Patient's sociodemographic Data: included patient's age, gender, marital status, occupation, educational level, medical data as, medical diagnosis, past medical history and medication history.

Part (b) History of patient sleep pattern before admission to ICU:
This part was used to assess patient's sleep pattern before admission to the intensive care unit. It included usual sleeping hours, timing of sleep, use of sleeping aids and usual habits before sleep.

Tool II: Richard Campbell Sleeping Questionnaire (RCSQ):
This tool was developed by Richards et al (2000)[22]. It included 5 items questionnaire to evaluate perceived sleep depth, sleep latency (time to fall asleep), number of awakenings, efficiency (percentage of time awake), and sleep quality).

- Lower scores were indicated to a poor quality of sleep (Bad sleep (RCSQ score <50). Higher scores were indicated to a better quality of sleep (Good sleep (RCSQ score ≥50).

Tool III: Intensive Care Delirium Screening Checklist (ICDSC)
This tool was developed by **Bergeron N (2001)**[24] to assess the occurrence of delirium. It included checklist of eight items: altered level of consciousness, inattention,disorientation, or delusion, psychomotor agitation or retardation, inappropriate mood or speech, sleep/wake cycle disturbance, and symptom fluctuation.

Scoring system:
- (0) score was categorized as normal patient, from 1-3 score was categorized as subsyndromal delirium and from 4-8 score was categorized as delirium.

Administrative process:
A written approval to conduct the study was obtained from the responsible authority at Faculty of Nursing, Tanta University and Anesthesia ICU of Emergency Hospital at Tanta University.

Informed consent:
An informed consent was obtained from the patients to participate in the study after explaining the purpose of the study and confidentiality of collected data was preserved and assuring them of confidentiality of collected data.

Ethical consideration:
-An ethical consideration for the privacy and confidentiality of the data was concluded and explained to the patient the right to withdraw at any time of the study.
- Approval of ethical committee was obtained from the Faculty of Nursing &Medicine to conduct the study with code (96-9-2022).

Tools development:
Tool I part (a and b) were developed by the researcher after reviewing the related literature review [4,5,12], Tool

(II) Richard Campbell Sleeping Questionnaire (RCSQ) was developed by Richards et al (2000)[22] and tool (III) Intensive Care Delirium Screening Checklist (ICDSC) was developed by Bergeron N et al, (2001)[23].

Validity of the tools

The developed tool I part a and b were tested for content validity by seventh experts in the Medical-Surgical and Critical Care Nursing and accordingly needed modifications were done.

Reliability

- Reliability of the developed tool I part a and b was tested by using alpha Cronbachs factor and it was 0.950.
- Confidence intervals (CI = 0.96 to 0.98][24].
- Reliability of Richard Campbell Sleeping Questionnaire (RCSQ) for sleep quality assessment was the Interclass correlation coefficients (ICC) ranged from 0.13 to 0.49[25].
- Reliability of ICDSC for delirium assessment was high with overall Cronbach's alpha coefficient for all ICDSC scores was (0.839) [26].

A pilot study:

A pilot study was carried out on 6 patients to test the tool for its relevance and to determine the length of time needed to collect the data from each patient, since only a minor modification was done, so the patients of the pilot study didn't excluded from the actual study.

Data collection

The collection of data for the present study was done over a period of 6 months from the beginning of June 2021 to the end of December 2021.

Nursing intervention bundle was conducted on four phases as follows:

A- Assessment Phase:

- A primary assessment was done on the first day for all patients at the previous mentioned setting to determine which patient met the inclusion criteria of the study.

-Assessment of patient sociodemographic data and sleep pattern at home was obtained by the researcher through interview using the developed questionnaire tool I part (a and b).

- Assessment of sleep quality and associated delirium was done by using tool (II and III) after application of the nursing intervention bundle for study group and routine care for control group.

B-Planning Phase

-Proposed nursing intervention bundle were designed based on determined needs, relevant literature and researches.

- In order to be implemented, the researcher prepared the important supplies such as eye mask, ear plug, air freshener and baby Johnson oil for back massage.

-Expected Outcomes of the study:

Goals and expected outcomes criteria were taken into consideration when planning for patient care included:

1-Improveme sleeps quality among patients in the intensive care unit.

2-Decrease incidence of acquired delirium among patients at intensive care unit.

C- Implementation Phase

The implementation phase for the study group took about 30 minutes for each patient. In this phase the researcher implemented the nursing intervention bundle for 7 consecutive days. These interventions were started as follow;

-Relaxation Techniques: This measure was applied for the study group from the first day of study and used to promote sleep among patients at intensive care unit as follow:

- Maintain the patient's comfort through positioning by placing patient in semi-flower position.

-Made the patient's environment more calm and had no bad odor through using air freshener.

-Provide adequate pain control for the studied patients through distraction (by listening and speaking to them), relaxation techniques like foot bath and back massage. If the pain was severe, the patients were given analgesics according to the doctor ordered.

-Foot bath:

Placed the patient in the semi-fowler position. Basin was filled with warm water up to the ankle. Provide foot baths for 10 minutes. Each foot bath was followed by bed rest. During this phase, if the patient complains of pain or discomfort, foot bathing was stopped immediately.

-Back massage:

- Placed the patient 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 patients comfort during intervention. Effleurage and stroking (Effleurage is basically a form of massage involving a circular stroking movement made with the palm of the hand) technique was used starting from iliac crest till supraclavicular and axillary lymph nodes. The study group was received a 10- minutes back massage session once daily for 3 consecutive days.

- Environmental Factor Reduction: Reduce light and noise in the intensive care units through:

- Control the light exposure through curtain and close all doors.

- Control the noise exposure through the researcher asked the staff members to turn monitoring equipment to night mode if this possible, reduce volumes on all telephones, nonclinical discussions around patients' bed spaces, and instruct staff and visitors to speak quietly.

- Use the earplugs and eye mask to reduce light and noise in the ICU. The researcher encouraged the patients in study group to wear earplugs and eye mask for 7 consecutive days as follows; the eye mask and earplugs was worn at the same time each night from 9 p.m. to 7 a.m or at the time when the patient slept.

- Reorientation and mobilization Strategy: Patients were orientated to time, place and date through:

- Provide patient with a calendar and an analogue clock that shows the 24 hours of day and night through using their personal phone or ask the staff members about the date and time, if the patient was illiterate.

- Open the curtains in the morning in order the patient was able to differentiate between morning and night.

-Early mobilization of the studied patients

-Encourage the patient for mobilization as soon as possible. They were motivated by the researcher to move out of bed to improve the body circulation.

-Encourage the patient to do range of motion (ROM) exercise by themselves or by the researcher when they were unable to move out of bed.

-The researcher applied the nursing intervention bundle for patients at morning and afternoon shift. The researcher provided instruction for nurses about implementing nursing intervention bundle at night shift.

D- Evaluation Phase:

Evaluation was done for both control and study groups as follow: Tool II and tool III were used to evaluate sleep quality and incidence of acquired delirium among studied patients three times at 1st, 3rd and 7th day of intervention

Results

Table (1): shows Percent distribution of the studied patients according to their socio–demographic characteristics (n=60).
It was noticed that 50% of control group and 30.0% of the study group were in age group of 50-60 years respectively. As regard to gender, more than half of control and study groups (56.67% and 53.33%) were female respectively and the majority (80%) of control and about two third (66.67%) of the study group were married. In relation to educational level, less than half (40%) of study group had secondary school education, while more than one third of control group (36.67) were illiterate. Regarding occupation, more than half of control and study groups (66.67%) had no work without any significant variations between two groups in relations to their socio-demographic traits.

Table (2): shows Percent distribution of the studied patients according to their clinical data.
 Concerning medical diagnosis, more than one third of control and study groups (36.67% and 33.33%) respectively had postoperative complications, followed by cardiovascular disorders (26.67%) of the control group and 16.67% of the study group. While the most common past medical history was cardiovascular disorder (43.33%) of the study group and 36.67% of control group followed by endocrine and metabolic disease (23.33%). Also, this table illustrated that more than half (60% and 70%) of control and study group had past medication history for cardiac disease respectively. Additionally, no statistical significant differences were observed among two groups regarding their clinical data.

Table (3): illustrates Percent distribution of the studied patients according to their history of sleep pattern (n=60).
It was observed that more than half (56.67%) of the study group slept from 7-9hours daily at home compared to (46.67%) of control group. As regard use of sleeping aids and usual habits before sleeping, more than half (66.67% and 56.67%) of control and study groups didn't use any sleeping aids or had usual habits before sleeping at home respectively. Only less than one quarter (16.67%) of the study group had reading habits before sleeping. Finally**,** no statistical differences were noticed among studied patients regarding their history of sleep pattern.

Table (4): Presents percent distribution of the studied patients according to their total RCSQ level throughout period of the study (N=60).
In this table, it was observed that, the vast majority (96.67%) of control group had a bad sleep at the first day of routine care and the percentage was decline to (80%) at the seventh day. The mean score of RCSQ was (38.37±7.19) at the first day of routine care and reached to (30.87±14.69) at the seventh day with P= 0.027*.
On the other hand, the nearly three quarters of the study group (73.33%) reported good sleep at the 7th day of implementing intervention bundle with significant difference was observed P= 0.000. Also**,** the mean score of RCSQ for study group was (37.13±7.46) at the first day of implementing the intervention bundle and reached to (51.43±14.14) at the seventh day with P= 0.000.
   Finally, this table showed that no significant differences were observed among control and study groups regarding their total sleep quality at the

first day of study. While, highly significant differences were observed among study and control groups regarding their total sleep quality after applying the nursing intervention bundle on the third and seventh days of the study in which P =0.001* and 0.000* respectively.

Table (5) Describes Percent distribution of the studied patients regarding the incidence of acquired delirium throughout period of the study (n=60).

It was observed that, all studied patients in control and study groups (100%) were normal at the first day. While less than one quarter (23.33%) of control group with mean score (0.70±1.264) and only (6.67%) of study group with mean score (0.13±0.57) had sub-syndromal delirium at the third day.

On the other hand, delirium was reported among control group with the percentage of 30% compared with only 13.33% in the study group at the seventh day of applying the intervention bundle. Moreover, there were statistically significant differences between control and study groups regarding incidence of acquired delirium after the third and seventh days in which P=0.026 and 0.024 respectively.

Table (6) shows relation between socio–demographic characteristics of the studied patients and their RCSQ score throughout period of study. It was reported that a significant relation between age of the studied patients and their RCSQ score throughout the in the seventh day of study in which P value at 0.034 and 0.024 in control and study group respectively.

Table (7) showed relation between socio–demographic characteristics of the studied patients on their ICDSC score throughout period of study (n=60). It was noticed that a significant relation between occupation among control group and their ICDSC score in the seventh of study at P (0.025). Moreover, a significant relation was recorded between age of studied patients and their ICDSC score in the third day of intervention among study group in which at P value (0.031).

Table (1): Percent distribution of the studied patients according to their socio–demographic characteristics (n=60).

Characteristics	Studied patients (n=60)				χ² P
	Control group (n=30)		Study group (n=30)		
	n	%	N	%	
Age (in years)					
▪ (21-<30)	7	23.34	8	26.67	3.931
▪ (30-<40)	4	13.33	8	26.67	0.269
▪ (40-<50)	4	13.33	5	16.66	
▪ (50-60)	15	50.00	9	30.00	
Gender					
▪ Male	13	43.33	14	46.67	FE
▪ Female	17	56.67	16	53.33	1.00
Marital status					
▪ Single	3	10.00	5	16.67	
▪ Married	24	80.00	20	66.67	1.397
▪ Widow	2	6.67	3	10.00	0.706
▪ Divorced	1	3.33	2	6.67	
Educational level					
▪ Illiterate	11	36.67	9	30.00	
▪ Read and write/Primary	8	26.67	5	16.67	2.874
▪ Secondary school	10	33.33	12	40.00	0.411
▪ University	1	3.33	4	13.33	
Occupation					
▪ Manual work	4	13.33	3	10.00	
▪ Employee	5	16.67	7	23.33	1.476
▪ Not work	20	66.67	20	66.67	0.688
▪ Retired	1	3.33	0	0.00	

FE: Fisher' Exact test

Table (2): Percent distribution of the studied patients according to their clinical data (n=60).

| Clinical data | Studied patients (n=60) | | | | χ^2 |
| | Control group (n=30) | | Study group (n=30) | | |
	N	%	N	%	P
# Medical diagnosis					
▪ Cardiovascular disorder	8	26.67	5	16.67	
▪ Respiratory disorder	2	6.67	4	13.33	
▪ Musculoskeletal disorder	1	3.33	0	0.00	
▪ Gastrointestinal disorder	1	3.33	4	13.33	4.492
▪ Endocrine/metabolic disorder	3	10.00	4	13.33	0.610
▪ Renal disorder	4	13.33	3	10.00	
▪ Postoperative complications	11	36.67	10	33.33	
Past medical history					
▪ Cardiovascular disorder	11	36.67	13	43.33	
▪ Respiratory disorder	3	10.00	4	13.33	
▪ Musculoskeletal disorder	0	0.00	2	6.67	
▪ Gastrointestinal disorder	0	0.00	1	3.33	0.659
▪ Endocrine/metabolic disorder	7	23.33	7	23.33	0.417
▪ Renal disorder	9	23.33	5	16.67	
▪ Oncological disorder	1	3.33	3	10.00	
Medication history					
▪ Yes (cardiac medication)	18	60.00	21	70.00	FE
▪ No	12	40.00	9	30.00	0.589

FE: Fisher's Exact test   # More than one answer was chosen

Table (3): Percent distribution of the studied patients according to their history of sleep pattern (n=60).

| History of sleep pattern | Studied patients (n=60) | | | | χ^2 |
| | Control group (n=30) | | Study group (n=30) | | |
	n	%	n	%	P
Usual sleeping hours					
▪ (4-6)	14	46.67	12	40.00	
▪ (7-9)	14	46.67	17	56.67	0.778
▪ 10	2	6.67	1	3.33	0.678
Timing of sleeping					
▪ at Night	30	100.00	30	100.00	-
Use of sleeping aids					
▪ Yes	10	33.33	13	43.33	FE
▪ No	20	66.67	17	56.67	0.596
Usual habits before sleeping					
▪ None	20	66.67	17	56.67	
▪ Radio	2	6.67	2	6.67	
▪ TV	2	6.67	2	6.67	0.886
▪ Reading	3	10.00	5	16.67	0.927
▪ thinking	3	10.00	4	13.33	

FE: Fisher's exact test

Table (4): Percent distribution of the studied patients according to their total RCSQ level throughout period of the study (n=60).

Total RCSQ Level	Studied patients (n=60)												
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	1st day		3rd day		7th day			1st day		3rd day		7th day		
	n	%	n	%	n	%		N	%	n	%	n	%	
Bad sleep	29	96.67	27	90.00	24	80.00	**9.164**	29	96.67	18	60.00	8	26.67	**52.07**
Good sleep	1	3.33	3	10.00	6	20.00	**0.027***	1	3.33	12	40.00	22	73.33	**0.000***
Range Mean ± SD	(18-50) 38.37±7.19		(15-53) 35.20±9.57		(9-62) 30.87±14.69		**F=5.48 P=0.001***	(19-52) 37.13±7.46		(21-57) 43.73±9.258		(19-67) 51.43±14.14		**22.57 0.000***
Control Vs Study t	0.651		**3.510**		**5.522**									
P	0.517		**0.001***		**0.000***									

< 50 Bad sleep   ≥ 50 Good sleep   (*) Significant at level P < 0.05.

RCSQ: Richard Campbell Sleeping Questionnaire

Table (5): Percent distribution of the studied patients regarding to the incidence of acquired delirium throughout period of the study (n=60).

ICDSC level Intensive Care Delirium Screening Checklist	Studied patients (n=60)												
	Control group (n=30)						χ^2 P	Study group (n=30)						χ^2 P
	1st day		3rd day		7th day			1st day		3rd day		7th day		
	N	%	N	%	N	%		N	%	N	%	N	%	
▪ Normal	30	100.0	22	73.34	18	60.00	**40.32**	30	100.00	28	93.33	25	83.33	**16.261**
▪ Subsyndromal delirium	0	0.00	7	23.33	3	10.00	**0.000***	0	0.00	2	6.67	1	3.33	**0.012***
▪ Delirium	0	0.00	1	3.33	9	30.00		0	0.00	0	0.00	4	13.33	
Range Mean ± SD	(0-0) 0.00±0.00		(0-4) 0.70±1.264		(0-7) 1.83±2.437		**11.929 0.000***	(0-0) 0.00±0.00		(0-2) 0.13±0.57		(0-4) 0.63±1.45		**F=4.610 P=0.004***
Control Vs Study t	-		**2.279**		**2.318**									
P			**0.026***		**0.024***									

(*) Significant at level P < 0.05.

Table (6): Relation between socio–demographic characteristics of the studied patients and their RCSQ score throughout period of study (N=60).

Characteristics	The studied patients (n=60) Total RCSQ score Mean ± SD					
	Control group			Study group		
	1st day	3rd day	7th day	1st day	3rd day	7th day
Age (in years) ▪ (21-<30) ▪ (30-<40) ▪ (40-<50) ▪ (50-60)	44.71±3.15 35.25±12.04 40.50±5.07 35.67±5.88	43.86±8.36 33.75±14.18 38.50±5.97 30.67±6.78	43.14±17.16 32.25±20.55 33.00±11.80 24.20±8.72	39.75±6.96 35.25±9.30 36.00±5.76 37.25±7.69	49.38±4.78 44.38±6.26 37.67±12.47 42.00±10.50	61.00±4.63 53.75±10.44 39.17±18.21 48.75±14.63
F, P	**3.686, 0.025***	4.328, 0.013	**3.354, 0.034***	0.517, 0.674	2.197, 0.112	**3.696, 0.024***
Gender ▪ Male ▪ Female	38.38±5.61 38.35±8.39	33.54±7.46 36.47±10.97	26.54±11.21 34.18±16.44	37.57±6.88 36.75±8.15	42.64±10.66 44.69±8.07	49.21±14.89 53.38±13.65
F, P	0.000, 0.991	0.684, 0.415	2.063, 0.162	0.088, 0.769	0.356, 0.555	0.638, 0.431
Marital status ▪ Single ▪ Married ▪ Widow ▪ Divorced	40.00±10.58 38.33±7.20 34.00±4.24 43.00±0.00	39.00±13.00 35.17±9.60 28.50±7.78 38.00±0.00	38.00±21.17 30.54±14.81 23.50±7.78 32.00±0.00	35.40±11.01 37.80±7.10 34.00±7.21 39.50±2.12	41.00±12.69 45.65±8.62 36.00±4.58 43.00±9.90	49.20±17.28 54.65±12.72 37.33±6.03 46.00±24.04
F, P	0.408, 0.748	0.486, 0.695	0.383, 0.766	0.361, 0.782	1.150, 0.347	1.564, 0.222
Educational level ▪ Illiterate ▪ Read and write/Primary ▪ Secondary school ▪ University	36.45±7.29 37.25±8.97 41.50±5.36 37.00±0.00	32.73±8.91 33.00±9.43 39.80±10.12 34.00±0.00	27.00±12.57 26.75±10.11 38.60±18.46 29.00±0.00	36.11±5.30 37.00±7.81 39.42±6.86 32.75±12.66	41.89±11.51 43.60±11.10 45.83±7.06 41.75±9.78	49.11±19.15 50.20±16.54 53.25±10.96 52.75±10.81
F, P	0.963, 0.425	1.183, 0.336	1.457, 0.249	0.880,0.464	0.361, 0.782	0.156, 0.925
Occupation ▪ Manual work ▪ Employee ▪ Not work ▪ Retired	42.50±5.45 38.40±2.79 37.85±8.17 32.00±0.00	40.75±8.30 33.00±3.39 35.20±10.59 24.00±0.00	36.25±17.29 27.00±4.00 31.30±16.21 20.00±0.00	42.67±4.73 37.29±7.89 36.25±7.57 -	50.00±2.00 42.00±10.36 43.40±9.44 -	61.00±2.65 47.14±14.02 51.50±14.88 -
F, P	0.713, 0.553	0.992, 0.412	0.455, 0.716	0.964, 0.394	0.812, 0.454	1.008, 0.378

* Significant at level P<0.05

Table (7): Relation between socio–demographic characteristics of the studied patients and their ICDSC score throughout period of study (N=60).

Characteristics	The studied patients (N=60) Total ICDSC score Mean ± SD					
	Control group			Study group		
	1st day	3rd day	7th day	1st day	3rd day	7th day
Age (in years)						
▪ (21-<30)	0.00±0.00	0.43±1.13	0.71±1.89	0.00±0.00	0.00±0.00	0.00±0.00
▪ (30-<40)	**0.00±0.00**	**1.00±2.00**	1.00±2.00	0.00±0.00	0.00±0.00	0.50±1.41
▪ (40-<50)	0.00±0.00	0.25±0.50	1.75±2.06	**0.00±0.00**	**0.67±1.03**	**1.83±2.04**
▪ (50-60)	0.00±0.00	0.87±1.30	**2.60±2.75**	0.00±0.00	0.00±0.00	0.50±1.41
F, P	-	0.412, 0.746	1.164, 0.342	-	**3.467, 0.031***	2.153, 0.118
Gender						
▪ Male	**0.00±0.00**	**0.85±1.35**	**2.38±2.50**	0.00±0.00	**0.14±0.54**	0.57±1.45
▪ Female	0.00±0.00	0.59±1.23	1.41±2.37	0.00±0.00	0.13±0.50	**0.69±1.49**
F, P	-	0.300, 0.589	1.182, 0.286	-	0.009, 0.925	0.046, 0.831
Marital status						
▪ Single	0.00±0.00	0.00±0.00	0.00±0.00	**0.00±0.00**	**0.40±0.89**	0.80±1.79
▪ Married	**0.00±0.00**	**0.88±1.36**	2.08±2.50	0.00±0.00	0.10±0.45	0.40±1.23
▪ Widow	0.00±0.00	0.00±0.00	**2.50±3.54**	0.00±0.00	0.00±0.00	1.00±1.73
▪ Divorced	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	**2.00±2.83**
F, P	-	0.747, 0.534	0.878, 0.465	-	0.578, 0.635	0.837, 0.486
Educational level						
▪ Illiterate						
▪ Read and write/Primary	0.00±0.00	0.45±1.04	2.18±2.68	**0.00±0.00**	**0.44±0.88**	**1.22±1.86**
▪ Secondary school	**0.00±0.00**	**1.38±1.69**	**2.38±2.77**	0.00±0.00	0.00±0.00	0.80±1.79
▪ University	0.00±0.00	0.50±1.08	1.20±1.99	0.00±0.00	0.00±0.00	0.33±1.16
	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
F, P	-	1.096, 0.368	0.595, 0.624	-	1.733, 0.185	0.936, 0.437
Occupation						
▪ Manual work	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
▪ Employee	0.00±0.00	0.40±0.89	0.60±1.34	0.00±0.00	0.00±0.00	0.57±1.51
▪ Not work	0.00±0.00	0.80±1.36	2.25±2.45	**0.00±0.00**	**0.20±0.62**	**0.75±1.55**
▪ Retired	**0.00±0.00**	**3.00±0.00**	**7.00±0.00**	**-**	**-**	**-**
F, P	-	1.783, 0.175	**3.670, 0.025***	-	0.500, 0.612	0.341, 0.714

* Significant at level P<0.05

Discussion

Sleep deprivation is the third problematic issue among critically ill patients in ICU and had effects on increasing delirium incidence[27]. Therefore applying nursing interventions bundle including using eye mask and earplug, relaxation techniques (massage and foot bath) and music interventions are attempt to improve the quality of sleep and prevent incidence of acquired delirium in the intensive care unit [28].

As regard patients' socio demographic data, the findings of the current result revealed that the majority of the total samples were in the age between 50-60 years. This finding was in agreement with **Magdy D et al, (2019)** [29] who found that the majority of studied patients were in the same age group (50-60yrs). This finding is supported by longer life expectancy and rising rate of sleep disturbances in patients over 50 years occurred as a result of changes in circadian rhythm and sleep/wake cycle. In contrast, **Abd El Khalik E, (2020)**[30] discovered that most of the studied patients were in the age group between 20-40 years.

Also the present study showed that, about more than half of studied patients in control and study group were females and married with no discernible changes in the sociodemographic traits of the two groups. This indicated homogeneity of the studied groups.

These findings were agreed with **Ghanbarabadi R et al, (2019)**[31] who noted that more than half of the participants were female and there were significant different in terms of demographic variables such as age, gender, or education in both groups. While, these findings were disagreed with **Wang S et al, (2020)**[32] who illustrated that more than half of studied patients were male but the majority of them were married.

As regard to educational level and occupation of studied patients, this study revealed that more than one quarter of the studied patients had secondary school education, while a few percentages of them had university degree education and more

than half of them had no work. This finding was supported by **Sayed Z, (2022)**[33] reported that less than half of studied patients had secondary school education but, n of them had university level education.

Concerning medical diagnosis at ICU admission, it was found that postoperative complications and cardiovascular disorders were the most common diagnoses among two groups. This could attributed to that the setting of data collection were mainly specialized to receive complicated postoperative patients. **AL-Sulami G, (2020)** [34] supported this result and concluded that most of the studied group in his study had postoperative complications. On the other hand, those findings were contradicted to **Knauert M et al, (2019)** [35] who reported that acute respiratory failure was the most common diagnosis among the studies patients.

According to the present result, less than half of the studied groups had past history of cardiovascular disorders followed by endocrine and metabolic disease. This may be related to that the majority of studied patient were elderly and had chronic disease especially cardiovascular and metabolic disease that was increased with aging and estrogen deficiency. These findings were in contrast with **Ting S& Yousff D, (2018)**[36] who conducted a study on patients with chronic disease in Malaysia and stated that about half of studied patients had endocrine and metabolic disorders.

Additionally, more than fifty percent of studied patients in the current study having a history of using medication for cardiovascular disorders. with no significant differences between both groups. This justified by that common medical disease and past medical history in this study was cardiovascular disease. These results were in agreement with **Alsulami (2019)** [37] **and Chaudhary (2020)** [38] who stated that the majority of the investigated group had past history for taken beta blocker and calcium channel blocker with no discernible variations between the two groups regarding their admission medical diagnosis and medication history.

History of sleep pattern of studied patients, it was noticed from the present study that more than half of the study group had slept from 7-9hours daily at home and didn't use any sleeping aids before sleeping. This could be explained by that the majority of studied patients didn't have any problems with falling in sleep at home.

These findings were in the same line with **Kandeel et al, (2019)** [39] who founded that more than two third of studied patients had usual sleep hours 7-9hrs daily and didn't often use sleep aids or get sleep help. On the other hand, those findings were contradicted to **Liao W et al, (2021)**[40] who mentioned that the majority of patients in their study slept five hours daily and listen to music or reading books to induce sleep at home.

Regarding total sleep quality, the majority of control group in the current study had bad sleep on the first day of routine care and the percentage was still high at the seventh day. On the other hand, the majority of the study group reported good sleep at the seventh day of applying bundle of care compared to 1st day of intervention.

Also, significant differences were observed among two groups regarding their total sleep quality after applying the nursing intervention bundle at the third and seventh days of study. This finding may be due to the fact that nursing intervention bundle was composed of several relaxations techniques that reduce anxiety, heart rate, oxygen consumption; and release of endorphins that reduce pain and increase sleep efficiency and REM sleep in the patients admitted to the ICU. This result was supported by **Khalil N et al, (2019)**[41] they reported that there were no significant differences in the total score of sleep quality between studied groups on the first night. While fifty percent of the intervention group had good sleep quality compared to control group. Also, **Akpinar R et al, (2022)**[42] emphasized this result.

As regard incidence of ICU acquired delirium, the present finding revealed a minority sample of the study group that had delirium compared with the control group. Also, there was a statistically significant difference between control and study groups regarding incidence of acquired delirium at the third and seventh days. From the researcher point view, the study group's incidence of acquired delirium was lower than that of the control group. Science applying the sleep bundle such as reorientation and mobilization strategy that optimize functioning and reduce disability among the study group had promote sleep and decrease the incidence of ICU delirium

Those findings were consistent with **Kanga J et al, (2018)** [43] who reported that decreasing the incidence of delirium in the study group who managed by multicomponent interventions. As well, a review conducted by **Chen T et al, (2022)**[44] emphasized that the application of intervention bundle were effective in preventing delirium in ICU. On the other hand, these findings were disagreed with **Obanor O et al, (2021)**[45] who stated that the using of sleep hygiene interventions didn't effect on the incidence of delirium with no significant differences were observed.

Regarding relation between socio-demographic and sleep quality.
A significant relation between age of the studied patients and their RCSQ score was observed the in the seventh day of study in in control and study group respectively. This could be related that with aging, there were some physiological changes in sleep which reduced sleep efficiency and the majority of studied patients especially in control group were elderly patients more than fifty years.

Those findings were agreed with **Naik et al, (2018)** [46] who reported that elderly patients had poor sleep at higher rate. On the other hand, these study findings were disagreed with **Alsulami G et al, (2019)**[37] who illustrated a significant difference was observed between gender of studied patients and their sleep quality.

As regarding relation between socio-demographic and incidence of acquired delirium. A significant relation between occupation among control group and their ICDSC score was noticed in the seventh. Moreover, a significant relation was

recorded between age of studied patients and their ICDSC score in the third day of intervention among study group.

Those findings were agreed with **Lee and Kim (2018)** [47] who illustrated that delirium incidence was increasing with increasing age, especially elderly patients. Conversely, this result contradicted by **Xiao et al,(2020)** [48] who revealed that no significant relation between sociodemgraphic data of studied patients and incidence of acquired delirium .

Conclusion:-

Implementing of nursing intervention bundle improved sleep quality and decreased the incidence of acquired delirium among studied patients who received sleep intervention bundle.

Recommendations: -

Upon completion of this study, it was recommended that:

- Sleep interventions bundle should be integrated into routine care for patients in ICU to promote patient sleep and reduce incidence of delirium.

- Further studies will be needed to confirm the reliability of the larger probability sample.

Limitations of the study:- Sometimes, patient refused to wear eye mask or ear plug or both, so this obligate the researcher to look for other patient who accept to apply the whole nursing intervention bundle.

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