

The Effect of Breathing Exercises and Sleep Hygiene Instructions on Insomnia and Pain in Patients with Burn Injuries

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Abstract

Background: Insomnia and pain are the most commonly reported problems after burn injuries. Poor sleeping and pain can be extremely distressing and debilitating, and actually interfere with recovery from a burn injury. **Aim:** This study was intended to evaluate the effect of breathing exercises and sleep hygiene instructions on insomnia and pain in patients with burn injuries. **Methods:** A quasi-experimental design was utilized. A convenience sample of 60 male and female adults who were admitted to the burn unit in one of the biggest teaching hospitals in Cairo were recruited and randomly allocated to a control and intervention group. One questionnaire and four scales were utilized to collect the data: (1) Background data sheet, (2) The Behavioral Relaxation Scale (BRS), (3) Self-rating relaxation scale, (4) Visual Analogue Scale for assessing pain and fatigue and (5) Insomnia Severity Index. The patients were followed for three days. **Results:** The intervention group achieved a significantly higher reduction in the mean pain intensity score ($p = 0.037$), decreased insomnia ($p = 0.001$) and increased relaxation level ($p = 0.000$) after the intervention compared to the control group. Fatigue was not significantly different between the two groups ($p = 0.069$). **Conclusions and recommendations:** breathing exercises and sleep hygiene instructions could reduce pain and insomnia in patients with burn injuries. Thus, breathing exercises and sleep hygiene instructions must be endorsed as a nursing role for patients with burn injuries in the early course of the disease, so that the patients experience the maximum benefit.

Keywords: burn, sleep hygiene instructions, insomnia, breathing exercises, pain

1. Introduction

Burn injuries have one of the highest causes of morbidity and mortality worldwide. An estimated 180,000 deaths annually are caused by burn injuries. The vast majority of burns occur in low and middle-income countries, such as Egypt (WHO 2018). A burn injury is considered a traumatic experience that is associated with physical and psychological functioning alterations such as post-traumatic stress symptoms, depression, insomnia (Spronk et al., 2018; Lee et al., 2017; Stavrou et al., 2014), pain (Hashemi et al., 2014) and fatigue (Gabbe et al., 2016).

Insomnia is the most common type of sleeping disturbance. It can take many forms including difficulty falling asleep, difficulty staying asleep, poor sleep quality, waking up too early and/or nightmares (Spronk et al., 2018). Thus, insomnia can be extremely distressing, debilitating and severely interfere with recovery from burn injuries. Insomnia can make pain worse; slow down wound healing, decrease the ability to handle stress, energy and concentration and increase the feeling of restlessness, mood or depression (Wiechman 2015). Dissatisfaction with sleep was positively associated with impairment of almost all quality of life (QoL) domains (Lee et al., 2017). Many factors can disturb sleep after a burn injury, such as pain, depression, anxiety, itching, stress, adverse medication effects, difficulty breathing (Spronk et al., 2018), and increased burn severity and size (Lee et al., 2017). Patients with moderate to severe burn injuries can benefit from rehabilitation interventions in terms of physical health, mental health, performance of daily living and QoL (Tang et al., 2015).

Pain is a major complication associated with burn injuries, which might continue until the wound healing and recovery is complete. A lack of effective pain relief may lead to physiological and psychosocial disorders and affect the adherence of patients to treatment adversely. In addition, it could give rise to depression, poor quality of life, delayed wound healing and sleep deprivation (Hashemi et al. 2014; Naderi, Aghayi, Mohammadzadeh, Nazemi, Salmani & Rashvand, 2014). Moreover, Fatigue is one of the most common after burn complaints; however it is rarely measured in outcome studies. A prospective longitudinal research study aimed to establish the associations between fatigue and HRQoL and work ability over a period of 12 months after burn injuries. Accordingly, more than half of the patients reported fatigue (Gabbe et al., 2016). Several theories have been proposed to explain why burn patients are at risk of continuous fatigue. They include a prolonged increase in the metabolic rate as a result of the catabolic response to burns, loss of function due to a prolonged length of stay and bed rest, lower levels of fitness, muscle weakness, and poor physical and psychological health (Gabbe et al., 2016; Holavanahalli, Helm & Kowalske, 2016; Toh et al., 2015).

Various pharmaceutical treatments are available to reduce pain intensity, fatigue and improve the sleep disturbances in burn patients. However, the use of these medications is associated with numerous side effects like drug dependency, impaired memory and performance, increased risk of falls and respiratory arrest (Ardabili, Abdi, Ghezljeh, Hosseini & Teymoori, 2016). Therefore, the use of non-pharmacological therapies would be

more beneficial. Breathing exercises and sleep hygiene instructions are among the non-pharmacological approaches used to improve and decrease the occurrence and severity of such symptoms (Yekta, Sadeghian, Larijani & Mehran, 2017). Breathing exercises help to increase concentration, treat anxiety and improve the onset and maintenance of sleep (Chen, Huang, Chien & Cheng, 2017). Also, breathing exercises may improve insomnia, since they take the mind off the issues that might be distracting from sleep (Talwar 2018; Lin, Hu, Chang, Lin & Tsauo, 2011; Ross & Thomas, 2010). Sleep hygiene is a variety of different practices and habits that are necessary to have a good quality of nighttime sleep and full daytime alertness (Wiechman 2015). There is growing research evidence supporting the practice of breathing exercises as well as sleep hygiene instructions to improve both physical and mental health. It can also improve productivity and the overall quality of life (Butterfield, Schultz, Rasmussen & Proeve, 2017).

Nurses are considered an integral part of the health care team, who is responsible for the care of burn patients. Nurses also have a vital role to play in equipping the patients with tools that help them overcome their complaints through practicing evidenced-based strategies. Therefore the aim of the current study is to examine the effects of breathing exercises and sleep hygiene instructions on insomnia and pain in patients with burn injuries.

1.1 Significance of the Study

Burn injuries are the fourth leading cause of trauma worldwide. The annual incidence of burn injuries has been estimated at approximately 2.4 million cases, 650,000 and 75,000 of which require immediate treatment and hospitalization, respectively (WHO, 2018; Lalegani, Esmaeeli, Karimi, Moghani & Jivad, 2014). Burn injuries may cause irreversible, chronic complications; such as pain, fatigue, anxiety, disfigurement, depression, sleep disturbances and nightmares which affect the quality of life of patients negatively. Sleep disturbance is highly prevalent after burn injuries; more than 50% of people who had severe burn injuries reported sleeping dissatisfaction. Severe pain and fatigue is another major complication associated with burn injuries, which might continue until complete wound healing and recovery (Lee et al., 2017).

A substantial body of literature has supported the remarkable relationship between sleep, pain and non-pharmacological intervention such as yoga exercises, breathing exercises, relaxation and listening to music (Ghezeljeh, Ardebili & Rafii, 2017; Li, Zhou, & Wang, 2017; Cramer et al. 2014; Lin et al., 2011). In both healthy and chronically ill people, breathing exercises have been noted to improve a variety of health-related outcome measures effectively, such as reducing sleep disturbance, fatigue and pain (Ross & Thomas, 2010). However, definitive evidence about the impact of breathing exercises as a supportive relaxation intervention and sleep hygiene on insomnia in burn-injured patients is still lacking. Therefore, there is an urgent need to examine its effectiveness to improve insomnia in burn patients.

Breathing exercises and sleep hygiene instructions as an easy, safe, available and low cost approach should be considered in combination with medication to relieve pain and sleep disturbances in patients with burn injuries. In addition, they do not require a specific time for implementation or advanced equipment, have no side effects, and patients are willing to try out these interventions as well. Breathing exercises can be done independently anywhere and anytime, which increase their applicability. Nurses have an important role in caring for burn survivors and alleviating their suffering through teaching them hygienic sleeping habits and empowering them with non-pharmacological strategies by controlling stimuli in order to improve insomnia, pain and fatigue (European Burns Association (EBA) (2015).

1.2 Aim and Research Questions

Taking into account the fundamental role of nurses in implementing strategies for the relevant effective care of these patients, this study aims to evaluate the effect of breathing exercises and sleep hygiene instructions on insomnia and pain in burn patients. The following four research questions were formulated to achieve this study aim:

1. Is there a significant difference in the relaxation score between the intervention group, who received breathing exercises and sleep hygiene instructions, and the control group, who did not?
2. Is there a significant difference in the pain intensity score between the intervention group, who received breathing exercises and sleep hygiene instructions, and the control group, who did not?
3. Is there a significant difference in the fatigue score between the intervention group, who received breathing exercises and sleep hygiene instructions, and the control group, who did not?
4. Is there a significant difference in the insomnia score between the intervention group, who received breathing exercises and sleep hygiene instructions, and the control group, who did not?

2. Methodology

2.1 Research Design

A quasi-experimental trial using a time series design was used to conduct this study from October 2017 to May

2018 in a University Teaching Hospital in Cairo city, Egypt.

2.2 Setting and Participants

A convenience sample of 60 adult male and female patients with burn injuries was recruited from the burn unit of a university teaching hospital in Cairo city, Egypt. Inclusion criteria were: 1) patients had 2nd or 3rd degree thermal burn, 2) were admitted at least 3 days in advance of the study, in order to be hemodynamically stable, 3) had a cutoff score of 8 or higher of sleep disturbance on the insomnia severity index, 4) were willing to participate and 5) had a mobile phone. The exclusion criteria were: 1) any psychiatric disorders, 2) a neurological disturbance that may interfere with sleep such as narcolepsy, 3) a history of drug addiction, and 4) being on sleep and/or anti-anxiety medications.

The G*Power 3.10 (Faul, Erdfelder, Lang & Buchner, 2007) was used to determine the required sample size. Based on the significance level (α) at .05, the test power $1 - \beta$ at 0.95, and the effect size at 0.88, a total of 59 participants was required. An additional 10 % of participants were recruited to compensate for any dropout. The block randomization technique (Kim & Shin 2014) was used to randomly allocate the participants into either intervention ($n = 30$) or control group ($n = 30$). The intervention group received a training session on practicing breathing exercises and sleep hygiene instructions and the control group received the Routine Hospital Care (RHC) only.

Out of 65 invited participants, 62 accepted to participate with a response rate of 95.38% at the baseline stage and continued until the end of the study. Two participants in the intervention group withdrew before the end of completing the intervention without any reason. Therefore 60 participants were involved in the data analysis (Diagram 1).

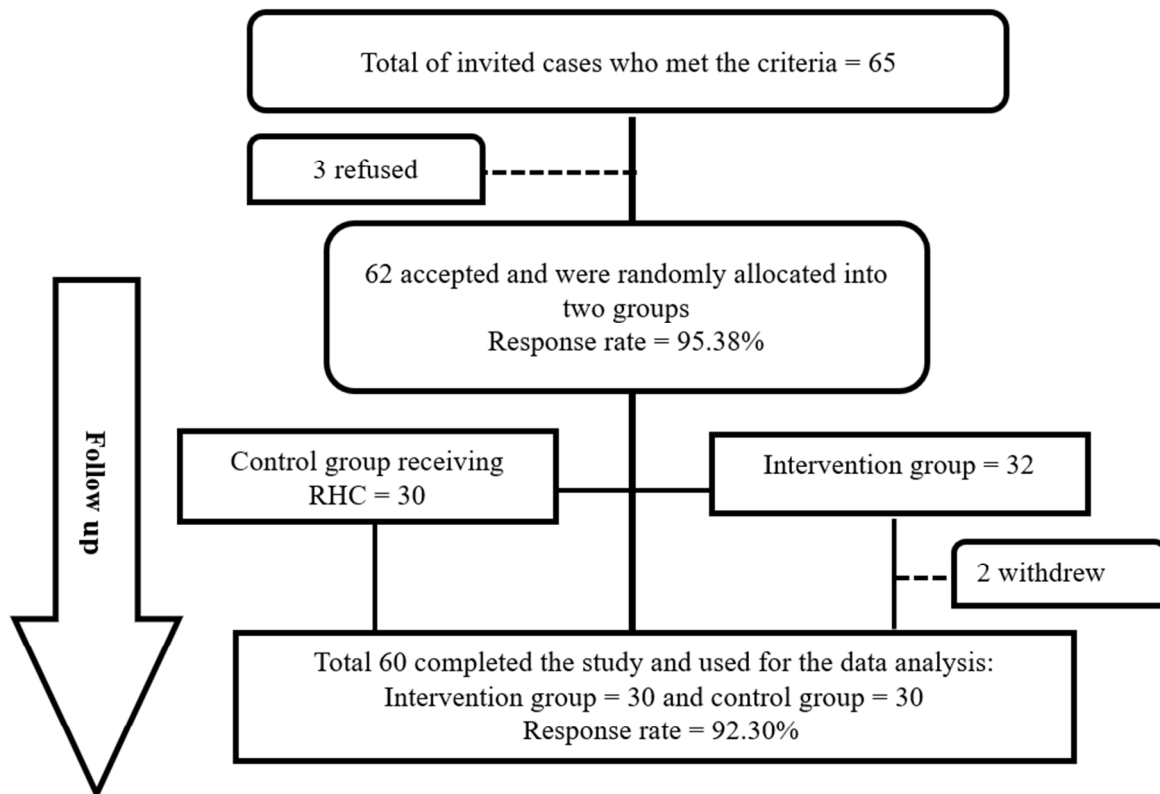


Diagram 1: Sample Flowchart

2.3 Instruments

One questionnaire and four scales were used to collect the data:

A background data sheet was used to collect the individual's demographic characteristics such as gender, age, education and employment status. In addition, it was used to collect the medical data such as body mass index, degree of burn and length of hospital stay.

A self-rating relaxation scale from one (extremely tense throughout the entire body) to seven (completely relaxed throughout the entire body) was used to assess the relaxation level by asking the participants to self-rate their relaxation level (Bechtler 2011).

The Behavioral Relaxation Scale (BRS) was used to assess the common behaviors that can be observed in a person who is relaxed. The 10 behaviour items included breathing, an absence of vocalization, body positioning,

head, eyes, mouth, throat, shoulders, hands and feet in relaxed positions (Poppen 1988). Each item had two responses, either relaxed or unrelaxed. A single BRS score, based on a short 5 minutes observation of 10 relaxed behaviours was given to each participant after practicing the breathing exercises. During these five minutes, the number of breaths were counted, the 10 behaviors were observed and the behaviors were scored as relaxed or unrelaxed (Lundervold & Dunlap 2006), where a total score of 10 indicated complete relaxation. BRS has been found to be a valid and reliable measure of relaxation (Lundervold & Dunlap 2006; Poppen 1988).

The Visual Analogue Scale (VAS) was used to assess pain and fatigue intensity. The VAS is a commonly used standardized measurement, which refers simply to the intensity of symptoms. The Numeric Rating Scale (NRS) is a segmented numeric version of the VAS, which has a single 11-point numeric scale for respondents to select a number from 0 (no pain /fatigue) to 10 (sever pain/fatigue) to reflect the intensity of their pain and fatigue (Price, McGrath, Rafii & Buckingham, 1983). The NRS has high test–retest reliability, $r = 0.96$ (Hawker, Mian, Kendzerska & French, 2011).

The Insomnia Severity Index (ISI) is a widely used scale to evaluate insomnia (Morin, Belleville, B elanger & Ivers, 2011; Bastien, Valli eres & Morin, 2001). It consists of seven items; each item has a score between (0-4), where 0 indicates no disturbance and 4 indicates very severe disturbance. The scale score gives four categories: no insomnia = 0–7; sub-threshold insomnia = 8–14; moderate insomnia = 15–21; and severe insomnia = 22–28. The Arabic ISI has ascertained satisfactory validity and reliability with a Cronbach's alpha coefficient of 0.84 (Suleiman & Yates 2011).

2.4 Pilot Study

Once permission was granted to proceed with the proposed study, a pilot study was conducted on seven patients to assess its feasibility and applicability as well as the clarity of the tools. The data obtained from the pilot study was excluded from the study results. The results of the pilot study confirmed that the study was feasible.

2.5 Intervention and Data Collection

The burn treatment guidelines of the European Burns Association (EBA) (2015) and Jaffe and Patterson guidelines (2004) were used to design the interventions for this research project. These guidelines suggest non-pharmacological approaches for treating sleeping disturbances and other symptoms such as pain by using sleep hygiene instructions (Jaffe & Patterson 2004) and breathing techniques (EBA 2015). This study had three phases for completion:

2.5.1 Preparatory phase:

An official permission to carry out the study was granted from the head manager of the burn unit to proceed with the study. The purpose of the study was explained to the patients who met the inclusion criteria, and those who agreed to participate were included in the study. The patients who agreed to participate were given the ISI and those who had a cutoff score of sleep disturbance of 8 or higher were recruited for the study. After selection, the patients were randomly assigned to two groups (intervention & control). In order to obtain baseline data, the background data sheet, VAS (to assess pain intensity and fatigue level), ISI, BRS, as well as the self-rating relaxation scale were completed by both groups on day-1 (baseline data), before conducting any intervention.

2.5.2 Implementation phase:

Both groups (intervention & control group) were receiving the same routine hospital care (RHC) which included non-steroidal anti-inflammatory drugs (NSAID) (I.e. Diclofenac sodium 75 mg, 3 times a day). The control group received only RHC while the intervention group received RHC alongside the breathing exercises and sleep hygiene instructions.

The intervention group received two training sessions over a period of two days (Day-1 & Day-2), the training time for each session was based on each participant's capabilities, but generally it took around 30 – 45 min. Each session included a demonstration and re-demonstration of the breathing exercises to insure that each person had acquired the skill. After the breathing exercises, the BRS, based on the researchers' observations, and the self-rating relaxation scale were completed again. In addition, the sleep hygiene instructions were explained to the participants after they had completed the self-rating relaxation scale. The participants were encouraged to carry out their breathing exercises three times per day, one of them at night before going to sleep.

The breathing exercise procedure and sleep hygiene instructions were audio recorded by a volunteer male nurse. A copy of the recorded sessions was given to the participants on their mobile phone so they could easily recall the intervention. The audio recording was created with the participant's educational level and health condition in mind. The audio recording of the intervention is one of this study's strength as it assured the participant's adherence over the short period of the intervention. Although most of the participants could read and write, giving them the support material as an audio recording was better than reading material, because reading material requires a higher concentration, reading ability and acuity of vision. Several years ago, audio recordings were highly recommended as a method to improve cancer patients' understanding and recall information (Ong et al., 2000). Audio recordings are valuable to patients and positively associated with patient □

recall ability and health. In addition, records being held by patients has been found effective for enhancing their knowledge (Rieger, Hack, Beaver & Schofield, 2018; Coulter & Ellins 2007).

Breathing exercises:

- A. Ask the participants in the intervention group to:
 1. Lie on their backs with their arms by their sides, several inches from their legs.
 2. Close their eyes and breathe in through their nose.
 3. Inhale for a count of two and hold the breath in for a count of one.
 4. Exhale gently, over a count of four and finish by holding the breath out for a count of one.
 5. Keep breathing even and smooth.
 - If the count of two feels too short to inhale, try to increase the breath lengths to four in and six out or more, according to the participant's capability. But if longer breaths create any anxiety there is no need to push the participant.
 - The most important thing is that the exhale is longer than the inhale, not the absolute length of the breath.
- B. Set a timer and breathe this way for at least five minutes.
- C. During the procedure, the participants were asked to relax and to think about the feeling of relaxation while doing the breathing exercise.
- D. The participants were asked to repeat this exercise on their own until each had acquired the skill.

10-Sleep hygiene instructions

1. Do not nap during the day, if a nap is needed, it should be at the same time every day and last no more than one hour.
2. Maintain a regular time to go to bed and to get up.
3. If you have difficulty falling asleep, get up again after 15 minutes and do something else (listening to music), until to feel sleepy.
4. Avoid stimulant-containing food and drinks in the late evening such as chocolate, soft drinks, coffee, candy and bakery products.
5. Stop any stimulating activities late in the evening, such as surfing the Web, watching exciting movies, or playing video games
6. Don't go to bed hungry, but avoid large meals
7. If you have trouble staying asleep, a light snack an hour before bedtime may help you sleep through the night.
8. Avoid smoking or using other forms of nicotine close to bedtime.
9. Set a regular wake-up time, no matter what time you actually fell asleep the night before.
10. Go to bed only when sleepy.

Note: the procedure for the breathing exercises and sleep hygiene instructions were delivered in Arabic language to the participants.

2.5.3 Evaluation phase:

The entire sample (intervention & control groups) was followed for three days. The self-rating relaxation scale and behavioral relaxation scale were completed three times during the study period (on days-1, 2 & 3), while the pain, fatigue and insomnia severity index were filled in twice during the period of the study (on days-1 & 3).

2.6 Ethical Considerations

Official permission and approval from the hospital and the burn unit directors were obtained. The study was conducted in accordance with the Helsinki Declaration. All the participants gave informed consent after they were given a full explanation about the study's aims and benefits. It was emphasized that participation in the study was voluntary. Confidentiality of the participants was insured through the coding of all data. In addition, the participants were informed that they could refuse or withdraw from the study at any time without giving any reason and this would not affect their process of care.

2.7 Statistical Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences version 20 (SPSS-v20). Descriptive statistics were computed to summarize the patients' demographic and medical data as percentages, means and standard deviations. The homogeneity of the two groups at baseline was analyzed using the independent *t* test and chi-square test. The independent *t*-test was used also to evaluate the differences in insomnia, relaxation, pain and fatigue scores between the intervention and control groups. The statistical significance point was at p -value ≤ 0.05 .

3. Results

The findings of the current study are presented in four sections. Section-1 describes the study participants'

demographic characteristics and medically related information. Section-2 indicates their relaxation status, section-3 shows their pain and fatigue status; and section-4 displays the insomnia status between the intervention and control groups during the study period.

3.1 Demographic Characteristics and Medically Related Information (Baseline Data)

Regarding the participants' age, 70% and 63.6% of the intervention and control groups respectively had an age range between 18 to less than 35 years with a mean age \pm SD: (29 \pm 10.8) and (33 \pm 10) for both groups respectively. The male gender was represented with (56.7%) and (60%) of the intervention and control groups respectively. 40% of the intervention group and 46.7% of the control group could read and write, whereas (30%) and (16.6%) of the intervention and control groups respectively had secondary education. In relation to marital status (53.3%) and (50%) of the intervention and control groups respectively were married, (70%) and (63.3%) of the intervention and control groups respectively were employed. Moreover, there was no statistically significant difference between the intervention and control groups regarding all demographic variables (table 1).

Table 1. Comparison between the Intervention and Control Groups' Demographic and Medical Characteristics

Variable	Intervention group n = 30		Control group n = 30		Statistical test	p-value
	No	%	No	%		
Age:					t-test: 1.506	0.137
18 > 35	21	70	19	63.3		
35 > 50	7	23.3	7	23.3		
\geq 50	2	6.7	4	13.4		
$\bar{x} \pm$ SD	29 \pm 10.8		33 \pm 10			
Gender:					X ² : 0.069	0.793
Male	17	56.7	18	60		
Female	13	43.3	12	40		
Education:					X ² : 2.782	0.595
Can't read & write	2	6.7	5	16.6		
Read and write	12	40	14	46.7		
Primary	4	13.4	4	13.4		
Secondary	9	30	5	16.6		
University	3	10	2	6.7		
Marital status:					X ² : 0.067	0.796
Married	16	53.3	15	50		
Unmarried	14	46.7	15	50		
Employment status:					X ² : 0.300	0.584
Employed	21	70	19	63.3		
Unemployed	9	30	11	36.7		

*Result was significant at p-value \leq 0.05

Figure (1) shows that 76.7% of the intervention group and 70% of the control group had third degree burns (full thickness), with no statistically significant difference between the two groups (X²=0.341 at p-value=0.557).

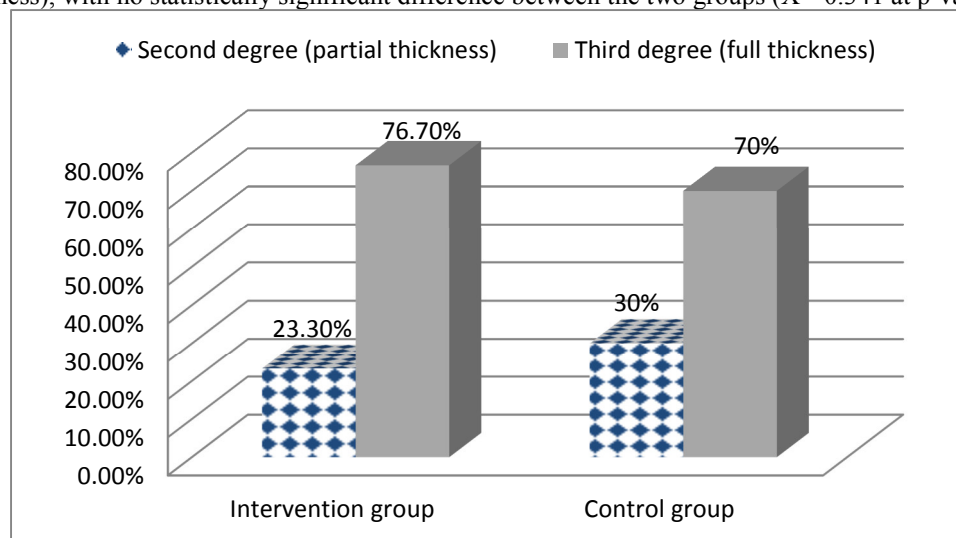


Figure 1. Distribution of the Degree of Burn in the Intervention and Control Groups (n=60)

As shown in Figure (2) the mean of the Body Mass Index (BMI) \pm SD of the intervention and control group was (24.80 \pm 5.73 & 26.53 \pm 6.14 respectively). There was no statistically significant difference between the two groups (t-test: 1.127 at p-value: 0.264).

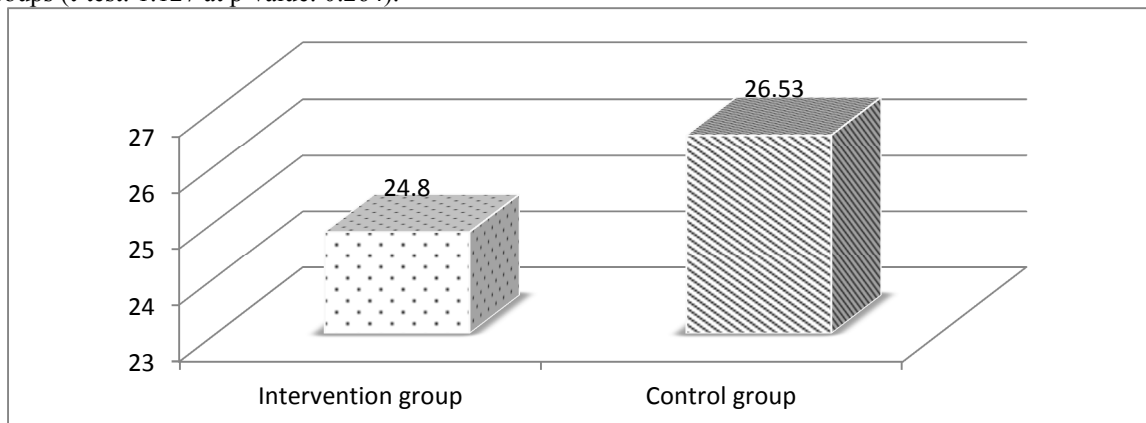


Figure 2. Mean Score of Body Mass Index in the Intervention and Control Groups (n=60).

Moreover, the mean length of hospital stay in the intervention group was (7.43 \pm 4.62), and in the control group was (7.80 \pm 4.90), with no statistically significant difference between the two groups (t-test: 0.298, p-value: 0.767).

3.2 Relaxation Status

Table (2) shows the comparison of the mean score of the level of relaxation between the intervention and control groups using the self-rating relaxation scale. There was no statistically significant difference between the two groups at baseline reading (t = 0.779 at p-value = 0.439), neither one day later (Day-2) (t = 0.082 at p-value = 0.93). However, there was a statistically significant difference between the two groups on day-3 of the study (t = 3.4 at p-value = 0.001).

Table 2. Comparison of the Self-Rating Relaxation Mean Score between the Intervention and Control Groups

Observation periods	Intervention group, n= 30	Control group n= 30	t-test	p-value
	Mean \pm SD	Mean \pm SD		
Day-1 (Baseline)	3.23 \pm 1.5	3.6 \pm 2.1	0.779	0.439
Day-2	4.6 \pm 1.4	4.5 \pm 1.7	0.082	0.935
Day-3	5.9 \pm 1.7	4.6 \pm 1.2	3.400	0.001*

*Result was significant at p-value \leq 0.05

Table (3) shows that there was no statistically significant difference between the intervention and control groups (p = 0.136) at baseline behavioral relaxation level using BRS. However, there was a statistically significant difference between the two groups on day-2 (t = 3.659 at p = 0.001) and day-3 (t = 4.705 at p = 0.000) of the study.

Table 3. Comparison of the Behavioral Relaxation Mean Score between the Intervention and Control Groups

Observational periods	Intervention group n = 30	Control group n = 30	t-test	p-value
	Mean \pm SD	Mean \pm SD		
Day-1 (Baseline)	3.4 \pm 2.1	4.1 \pm 1.7	1.512	0.136
Day-2	6.1 \pm 0.9	5.0 \pm 1.5	3.659	0.001*
Day-3	7.1 \pm 1.3	5.6 \pm 1.2	4.705	0.000*

*Result was significant at p-value \leq 0.05

3.3 Pain Intensity and Fatigue Status

Table (4) shows the comparison of the mean score of pain intensity between the intervention and control groups. The results reveal that there was no statistically significant difference between the intervention and control groups at baseline reading (t = 1.093 at p-value = 0.279). However, there was a statistically significant difference between the two groups on day-3 of the intervention (t = 2.136 at p-value = 0.037).

Table 4. Comparison of the Pain Intensity Mean Score between the Intervention and Control Groups

Observation periods	Intervention group n= 30	Control group n = 30	t-test	p-value
	Mean±SD	Mean±SD		
Day-1 (Baseline)	7.9 ± 1.3	7.4 ± 2.1	1.093	0.279
Day-3	5.8 ± 1.6	6.8 ± 1.9	2.136	0.037*

*Result was significant at p-value ≤ 0.05

Regarding the fatigue level, table (5) shows that there was no statistically significant difference between the intervention group and the control group either on the baseline reading (t = 1.541 at p-value = 0.129) or on day-3 (t = 1.850 at p-value = 0.069).

Table 5. Comparison of the Fatigue Mean Score between the Intervention and Control Groups

Observation periods	Intervention group n= 30	Control group n = 30	t-test	p-value
	Mean±SD	Mean±SD		
Day-1 (Baseline)	8.5±1.4	7.9±1.7	1.541	0.129
Day-3	6.3±1.8	7.1±1.4	1.850	0.069

*Result was significant at p-value ≤ 0.05

3.4 Insomnia Status

Table (6) shows that there was no statistically significant difference between the intervention group and the control group regarding all variables of insomnia as well as the total scores of insomnia (p = 0.156) at baseline reading.

Table 6. Comparison of the Insomnia Mean Score between the Intervention and Control Groups before Intervention (Baseline)

Variables of insomnia	Intervention group n = 30	Control group n = 30	t-test	p-value
	Mean±SD	Mean±SD		
Difficulty falling asleep	3.2±0.81	3.4±0.5	1.345	0.184
Difficulty staying asleep	2.8±1.0	2.6±0.5	0.973	0.334
Problems of waking up too early	2.3±1.6	2.0±1.4	0.701	0.486
Satisfaction with current sleep pattern	3.4±0.7	3.0±0.8	1.907	0.061
Sleep problems impairing quality of life	3.2±0.7	3.1±0.3	0.488	0.628
Worried about current sleeping pattern	3.4±0.7	3.1±0.8	1.567	0.123
Sleep problems interfere with daily function	3.6±0.7	3.4±0.5	1.306	0.197
Total insomnia scores	21.8±3.1	20±3.2	1.438	0.156

*Result was significant at p-value ≤ 0.05

As table (7) shows, there was a statistically significant difference between the intervention group and the control group on day-3 of the study in relation to insomnia. The differences were found at difficulty falling asleep (t = 4.1 at p-value = 0.000), problems of waking up too early (t = 1.998 at p-value = 0.05), sleep problems impairing QoL (t = 2.497 at p-value = 0.015), sleep problems interfere with performing daily functions (t = 3.520 at p-value = 0.001) and the total score of insomnia (t = 3.429 at p-value = 0.001).

Table 7. Comparison of Insomnia Mean Score between Intervention and Control Groups at Day-3

Variables	Intervention group n= 30	Control group n = 30	t-test	p-value
	Mean±SD	Mean±SD		
Difficulty falling asleep	2.1±0.9	3.2±1.1	4.1	0.000*
Difficulty staying asleep	2.2±0.9	2.4±0.9	0.753	0.454
Problems of waking up too early	2.0±1.1	2.5±0.7	1.998	0.050*
Satisfaction with current sleep pattern	2.2±0.8	2.2±0.8	0.321	0.749
Sleep problems impairing quality of life	2.2±0.7	2.6±0.6	2.497	0.015*
Worried about current sleeping pattern	2.2±0.9	2.4±0.9	0.772	0.443
Sleep problems interfere with daily function	1.9±0.8	2.5±0.6	3.520	0.001*
Total insomnia scores	14.9±3.3	17.8±3.2	3.429	0.001*

*Result was significant at p-value ≤ 0.05

4. Discussion

Insomnia, pain and fatigue are common distressing complaints after burn injuries. Studies demonstrate that insomnia and pain remain problems for the majority of adults who have suffered a burn injury. The lack of sleep

over a cumulative period can result in biopsychological symptoms and affects the overall QoL (Lee et al., 2017; Wiechman 2015; Matthews 2011). Non-pharmacological approaches to improve insomnia, pain and fatigue have been suggested (Matthews 2011). Therefore, this study aimed to evaluate the effect of breathing exercises and sleep hygiene instructions on insomnia and pain in patients with burn injuries. To achieve this aim, two matched groups in demographic and medical characteristics were randomly allocated to control and intervention groups.

4.1 Participants' Characteristics

The study results showed the mean age of the intervention group (29 ± 10.8) and control group (33 ± 10) which indicated that most of the participants were young adult less than 35 years old. More than half of the participants in both groups were males, married and employed. More than two thirds in both groups had a low-medium education level. The study results were congruent with other studies performed among burn patients (Varvani, Hekmatpou & Shamsi, 2013; Radwan, Samir, Aty & Attia, 2011). A very recent retrospective study was conducted at Cairo University Hospital, which serves mainly burn patients from the region of Greater Cairo and other governorates. It showed that adult males with a mean age of 31.9 ± 7 constituted the majority of the total number of admitted burn cases over a period of year (from March 2016 to February 2017) (Taha, Beshr, Tahseen, Nawar, & Darwish, 2017). Thus, the current study participants represented the majority of adult burn patients in Cairo and Giza cities where this study was conducted. Similarly, in Australia and New Zealand, a long term outcomes project Gabbe and colleagues (2016) found that about two thirds of the study sample were males. In an Italian study, also most of the participants were males, aged around 40, employed and with a low-medium level of education (Sideli et al., 2010). Therefore burn injuries seem common among young adult males in both developing and developed countries.

4.2 Relaxation Status

The current research found a statistically significant increase in the mean of the relaxation score in the intervention group when compared to the control group at day-3 of the study. In order to ensure the competence of the participants in the breathing exercises, after the breathing exercise session on day-1, the patient self-rating questionnaire was used to assess their relaxation level. Interestingly, there was a statistically significant difference between the two groups only on day-3 of the study, while at baseline and at day-2, however, there was no statistically significant difference between the two groups. This result shows that the breathing exercises enhanced the self-reported feelings of relaxation. On the other hand, the BRS filled in by the researchers, identified that the intervention group had a statistically significant higher level of relaxation than the control group on day-2 and day-3 as well. This discrepancy between the patients' self-rating relaxation scores and the researchers' observation of relaxation using the BRS was noted only on day-2; they were similar on day-3. The researchers thought that, these results may be due to the positive effects of the breathing exercises as well as the sleep hygiene instructions on the physical and mental health via its Mindfulness effect through the down-regulation of the sympathetic nervous system. There is growing research evidence supporting the use of breathing exercises, whatever the type, as a combination therapy for the management of stress, anxiety and depression and improving the sense of wellbeing and biological health (Brandani, Mizuno, Ciolac & Monteiro 2017; Kaminsky et al., 2017; Bidgoli, Taghadosi, Gilasi & Farokhian, 2016; Govindaraj, Karmani, Varambally & Gangadhar, 2016) as well as tension and anxiety feelings during the acute stage of an illness (Chen et al., 2017; Borge et al., 2014). The practice of breathing exercises in general can increase the endogenous secretion of melatonin, which might be responsible for an improved sense of well-being (Masters, Pandi-Perumal, Seixas, Girardin & McFarlane, 2015).

4.3 Pain Intensity and Fatigue Status

Participants who followed the breathing exercises and sleep hygiene instructions had a statistically significant decrease in the mean pain intensity score at day-3 of the intervention when compared to the control group. From the researchers' point of view, breathing exercises and practicing sleep hygiene instructions may contribute to relaxation, and relaxation in general has been found an effective way to relieve pain. Therefore, following the breathing exercises and sleep hygiene instructions can be a promising intervention to improve the health outcomes of patients. Breathing exercises are universally applied to relieve pain. Even with their frequent use, their efficiency and the underlying physiological mechanisms are still not completely known. A recent systematic review concluded that a slow breathing technique has a significant association with pain reduction (Jafari, Courtois, Van den Bergh, Vlaeyen & Van Diest, 2017). Pain severity and hindrance were found to be associated with a significantly lower health-related quality of life (HRQoL) after burn injuries (Gauffin et al., 2016) as slow breathing makes the body more relaxed (Varvani et al., 2013).

With regards to fatigue, it was expected that with relaxation and pain improvement in the intervention group, fatigue would also improve. However, the study result showed that there was no statistically significant difference in the fatigue scores between the intervention group and the control group. This finding can be

interpreted in the light of the fact that fatigue is a multi-factorial phenomenon, as patients may suffer from fatigue because of pain, dietary impairment, and/or anxiety from hospital admission or burn injuries. Improvement of fatigue may therefore need more than one intervention and fatigue may not be correlated only with relaxation and pain relief. Another possible explanation is that fatigue may need a relatively long time to improve, so patients may need more time to apply the breathing exercises and sleep hygiene instructions in order to have an effect on the fatigue status. Although, fatigue is one of the most common after-burn complaints, it is rarely measured in outcome studies (Gabbe et al., 2016). However, in both healthy and chronically ill people, breathing exercises have been noted to be effective at improving a variety of health-related outcome measures, such as reducing sleep disturbance, fatigue and pain (Ross & Thomas 2010).

4.4 *Insomnia Status*

In the current study, after practicing the breathing exercises and sleep hygiene instructions, the intervention group had a remarkably higher improvement in insomnia than the control group. In comparison to the control group, the intervention group had a statistically significant decrease in complaints of difficulty in falling asleep, problems of waking up too early; sleep problems impairing QoL, sleep problems interfering with performing daily functions as well as the total score of sleeping disorders. Accordingly, breathing exercises and sleep hygiene instructions were effective in improving insomnia. The researchers thought that the practice of breathing exercises alongside sleep hygiene instructions helped to decrease the pain intensity and increased the relaxation level of those patients, therefore patients reported an improvement in insomnia. Due to a shortfall of similar studies, a comparison of the current study results with other studies was difficult. However, these results are in line with results of previous studies which tested the effectiveness of breathing exercises on other patients (Brandani et al., 2017; Kaminsky et al., 2017). A study done at a sleep center to evaluate the effect of breathing exercises on insomnia concluded that two days of breathing exercises improved the quality of sleep of individuals suffering from insomnia (Tsai, Kuo, Lee & Yang, 2015). Another study done on 280 post-traumatic stress disorder patients found that breathing exercises relieved the symptoms of anxiety and insomnia (Armington 2015). Moreover, as melatonin is a natural hormone made by the body at night, particularly due to the effect of darkness to trigger sleepiness (Wiechman 2015), it was essential to give sleep hygiene instructions alongside the breathing exercises in order to improve insomnia.

5. Conclusion

In conclusion, the study results answered the four research questions. However, the results also revealed that the breathing exercises and sleep hygiene instructions were effective in reducing the pain score, increasing the relaxation level, as well as improve insomnia but not the fatigues score when an intervention group was compared with a control group.

6. Recommendations

Based on the study results, the following recommendations are suggested:

1. Breathing exercises and sleep hygiene instructions recommended to be endorsed as a nursing role for patients with burn injuries in the early course of the disease, so that patients can experience the maximum benefit.
2. Replicate this study on a larger scale in different settings to be able to generalize the results.
3. Further studies may be needed to determine the stability of the effects of the breathing exercises and sleep hygiene instructions on insomnia and pain relief in patients with burn injuries.
4. Further studies may be needed to asses if using different non-pharmacological methods may be useful to treat fatigue in those patients.

7. Nursing Implications

A nurse is the health staff member who is in contact with the patient for the longest period. Patients with burn injuries suffer from tremendous complications. Thus, the nurse must act as a pro-active member to support burn-injury patients by empowering them to use self-management strategies to improve their sleep and reduce their pain and thus enhance their quality of life. Therefore, the endorsement of breathing exercises and sleep hygiene instructions in routine hospital care is crucial in providing a practical nursing framework for patients with burn injuries, as well as, these interventions may contribute to improve quality of nursing care for such patients Breathing exercises and sleep hygiene instruction can be done independently anywhere and anytime, which increases their applicability. Moreover, the current study delivered innovative research by examining the effects of sleep hygiene instructions to improve insomnia and pain relief in patients with burn injuries.

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