Effect of Nursing Care Bundle on Burned Patients Outcomes during Transitional Phase

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Abstract

Background: Burn injuries are a global problem that can significantly impact a patient's quality of life in the long term, leading to ongoing issues such as scarring, contractures, weakness, itching, pain, sleep disturbances, and psychosocial challenges. So, the study **aimed** to assess the effect of the nursing care bundle on burned patient outcomes during the transitional phase. **Research design:** A quasi-experimental (pre/post-test) research design was utilized. **Setting:** The research was conducted at the burn unit at Assiut University Hospitals and El-Eman General Hospital (affiliated with the Ministry of Health), Assiut Governorate, Egypt. **Sample:** A convenient sample of 70 adult patients who suffered from a recent burn with a percentage $\geq 10\%$ Total Body Surface Area. **Tools**: Two tools were used for data collection: **(tool I)** a structured interview patient questionnaire and **(tool II)** a patient outcomes assessment sheet. **Results:** The mean age was (35.41) years, and males represented (52.9%) of studied patients. There was a highly statistically significant difference between pre-, post, and follow-up of the nursing care bundle implementation regarding the following items (pain, pruritus, and scars) with a ($p < 0.001^*$). **Conclusion:** Effectively implementing a developed care bundle content helps maintain satisfactory outcomes among the patients under study. **Recommendations:** It is recommended that burn patients be provided with a simplified booklet containing essential instructions including a nursing care bundle for post-discharge care to ensure a secure transition after leaving the hospital.

Keywords: Burn, nursing care bundle, outcomes & transitional phase

Introduction

Burns rank as the fourth most prevalent cause of injury globally, following traffic accidents, falls, and interpersonal violence (**Sasor & Chung, 2019**). Burn injuries are an under-appreciated trauma that can affect anyone, anytime and anywhere. Burns result from damage to the skin and underlying tissues due to exposure to various sources, including dry heat (such as fire), moist heat (like steam or hot liquids), chemicals, electricity, friction, or radiant energy (**Ashouri, 2022**).

Burn injuries are categorized based on size and depth, guiding treatment protocols and predicting healing times. First-degree and superficial second-degree burns heal well within approximately two weeks, often resulting in favorable functional and cosmetic outcomes. In contrast, deep second-degree (partial thickness), third-degree (full thickness), and fourth-degree burns generally require more than two weeks to heal and are likely to result in scar tissue formation (**Kelly et al., 2019**).

Evidence indicates that burns can negatively impact a patient's quality of life, affecting their physical, psychological, social, and spiritual well-being. Delayed or inadequate treatment of burn injuries can lead to severe complications such as contractures,

hypertrophic scar tissue, heterotopic ossification, and ongoing stretching of the soft tissue. Additionally, these injuries can significantly diminish the quality of life due to chronic pain, itching, deformities, and difficulties in performing daily personal needs. (**Rouzfarakh et al., 2021**).

Positive patient outcomes depend on the structure of the burn care team and the close collaboration among its members, with the burn nurse serving as the core of this team. (**Mohammed et al., 2021**). Nurses responsible for burn injury care must comprehensively understand the physiological and psychological changes resulting from burns. They should be proficient in evaluating the patient's condition, managing their rehabilitation, and communicating effectively with the patient, their family, and the treatment team. These skills are essential for providing high-quality care, increasing patient survival rates, and improving overall quality of life (**Lotfi et al., 2019**).

The concept of a care bundle was first introduced by the Institute for Healthcare Improvement (IHI) in 2001 (**Li et al., 2021**). A care bundle consists of three to five evidence-based interventions that when implemented together, yield better outcomes compared to when they are applied individually.

These bundles are designed to guarantee a minimum standard of care. They focus on both the interventions themselves and the processes of delivering care. It is essential for nurses to actively participate in adapting care bundles to fit local contexts **(Taksande et al., 2020)**.

Hospital discharge represents a critical and complex transition in the recovery process for burn patients. It does not signify the end of treatment; instead, it marks the point at which patients and their families must continue their recovery independently, without the direct support of hospital staff. Ongoing discussions about discharge should start as early as admission. When the patient is prepared for discharge, the teaching plan typically covers essential topics such as skin care, managing scarring, maintaining range of motion, using splints, and performing activities of daily living or developmental tasks. **(Lotfi et al., 2018)**.

Operational definition:
The transitional phase is when a burn patient moves from the acute care phase, where immediate medical treatment is provided to stabilize the patient and manage the burn injury, to the rehabilitation phase, where the focus shifts towards maximizing functional recovery and improving quality of life.

Outcomes are the results of patient care and treatments in hospitals or other settings. They focus on meeting the physical, social, and emotional needs. Outcomes of this study typically encompass a range of physical goals, including pain and itching improvement and prevention or minimization of hypertrophic scarring.

Significance of the study:
From the researcher's experience as a nursing deputy in the burn unit at Assiut University Hospitals for two years, she observed numerous physical, psychological, and socioeconomic problems, most of which occurred after the patient's discharge. These problems include skin issues, ulcers, pain, itching, scars, stress, anxiety, depression, and post-traumatic stress disorder, which have been reported to hurt the recovery process. Additionally, some burn patients might not return for follow-up care because of the long travel distances and the associated costs. For these reasons, a nursing care bundle was developed.

A nursing care bundle focusing on pain management, pruritus relief, and hypertrophic scarring management is essential for burn patients post-discharge. It enhances comfort, promotes functional recovery, and improves long-term outcomes by providing a comprehensive approach to managing common and challenging issues associated with burn injuries.

The aim of the study was:
To assess the effect of the nursing care bundle on burned patient outcomes during the transitional phase.
Research Hypotheses:
Patients receiving a nursing care bundle will exhibit better outcomes post-implementation.

Patients and Methods
Research design:
This study used a quasi-experimental (pre-posttest) research design, which is intended to determine a cause-and-effect relationship between an independent variable and a dependent variable.
Study Variables:
This study's independent variable was the nursing care bundle, while the dependent variable was maintaining optimal outcomes among burn patients.
Setting:
This study was carried out in the burn units of two hospitals, Assiut University Hospitals and El-Eman General Hospital (affiliated with the Ministry of Health), and follow-up was carried out in outpatient clinics in the settings mentioned above. The burn unit at Assiut University Hospital has a total capacity of twenty-two beds distributed in four rooms for each gender, and the burn unit at Eleman General Hospital has a total capacity of eighteen beds distributed in three rooms.
Sample:
A convenient sample of seventy (70) patients was admitted to the Burn Unit at Assiut University Hospital and El-Eman General Hospital. The study inclusion criteria were as follows: Adult patients aged 18 to 65 who have sustained a recent burn covering 10% or more of their total body surface area (TBSA), as determined by a burn surgeon, regardless of the burn's depth. The exclusion criteria included minor burns and electrical and chemical burns.
Sample size:
The sample size was estimated using **Steven & Thompson (2012)** using the following equation to detect an effect size of one group (pre/ post-test).

$$n = \frac{N \times p(1-p)}{\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)}$$

The final sample size was (70) patients. Where N = total patient population size.
The Z= confidence level is 0.95 and is equal to 1.96,
D= the error ratio is = 0.05
P= the property availability ratio and neutral = 0.50
Tools for data collection:
Two tools were used to achieve the aims of the study:
Tool I: Structured interview patient questionnaire:
This questionnaire was developed and utilized by the researcher based on recent national and international literature **(AbdElaal et al., 2022)**, (**Magbool et al.,**

2021) (Rouzfarakh et al., 2021), (Shabana et al., 2021), and (Mohammed et al., 2019). This tool consisted of the following two parts:

Part (I): Demographic data for the patient, including four items (age, gender, address, and marital status).

Part (II): Medical data included four items: causes, degree of burn, burn site, and percent burn.

Tool II: Patient outcomes assessment sheet (pre/post) :
Care bundles are sets of evidence-based practices that originated in North America. They are based on the principle that combining multiple evidence-based interventions into a single protocol enhances patient outcomes. **(Mohammed et al. et al., 2021) , (El-dawoody et al., 2020); (Resar et al., 2005).** The researcher adopted it included three parts:

Part (I): Brief Pain Inventory scale -short form (BPI-sf):
It was first developed by **Cleeland and Ryan, 1994** and adopted by the researcher to evaluate the severity of pain and its impact on the patient's daily function. BPI -sf consists of two dimensions: intensity of the pain (included four items: current (right now) and worst, least, and average pain for the past 24 hours) and interference with various activities of daily living (included seven items; general activity, mood, walking ability, routine work, relations with others, sleep, and enjoyment of life).

Scoring system: Each of the 11 items was scored from 0 to 10, where 0 represents no pain or interference, and 10 represents the worst pain or maximum interference. The total scores for the pain intensity dimension are calculated by adding the scores of the four items. In contrast, the interference dimension is estimated by adding the scores for the corresponding items and dividing them by 7. The final scores were interpreted as the following: 1-4: mild pain; 5-6: moderate pain; and 7-10: severe pain. The Cronbach α internal consistency indicated the coefficient was .85 for the Intensity scale and .88 for the Interference scale **(Tan et al., 2004)**.

Part (II): Visual analogue scale (VAS): VAS was initially developed to assess pain intensity but was subsequently adopted for pruritus evaluation. **Hayes and Patterson** used The VAS for the first time in **1921** to determine the severity of itching in the burn area. VAS is a 10-cm line where the beginning of the line indicates no itch (score 0) and the end represents worst itch (score 10)

Scoring system: The following conclusions were drawn from the final scores: More than 9 indicates the worst pruritus (extremely severe pruritus), while 0 indicates no pruritus, 1-3 indicates mild pruritus, 4-6 indicates moderate pruritus, 7-8 indicate severe pain. The VAS has been observed to have an intraclass correlation coefficient of 0.88 **(Reich et al., 2012)**.

Part (III): Vancouver scar scale (VSS):
Developed in 1990 by **Sullivan et al.,** the VSS was the first widely used assessment to measure the change in scar appearance during healing and treatment using a semi-quantitative approach. It assesses four variables: vascularity, height/thickness, pliability, and pigmentation. Each variable is given a score, which is added together to provide an overall score between 0 and 13. with 0 representing normal skin and 13 indicating scarring. VSS's Overall interrater reliability is good, with an interclass correlation coefficient of 0.81.

Vancouver Scar scale Variables	Score
1. Vascularity	
- Normal	0
- Pink (slight increase in local blood supply)	1
- Red (significant increase in local blood supply)	2
- Purple (excessive increase in local blood supply)	3
2. Pigmentation	
- Normal	0
- Hypopigmentation	1
- Hyperpigmentation	2
3. Pliability (Elasticity)	
- Normal	0
- Supple (flexible with minimal resistance)	1
- Yielding (giving way to pressure)	2
- Firm (inflexible, not easily moved, resistant to manual pressure)	3
- Ropes (rope-like tissue that blanches with the extension of the scar)	4
- Contracture (permanent shortening of scar producing deformity or distortion)	5
4. Height	
- Flat	0
- Less than 2	1
- 2-5	2
- More than 5	3
Total	13

Nursing Care bundle booklet:
The researcher developed a designed nursing care bundle based on the latest educational guidelines, patient assessment needs, and literature review **(DeBruler et al., 2020)**, **(Tang et al., 2021)**, **(Lin et al., 2022),** and **(Joshi et al., 2023)** as well as researcher's experience, and opinion of the medical and nursing experts to evaluate the effect of the nursing care bundle on burned patient outcomes during the transitional phase. It was written in Arabic and included theoretical and training components. The theoretical part consisted of general information about the following: general knowledge about burns, complications of burns, and healthy lifestyle.

The training and practical approaches include skin care, scar management, wearing compression clothing, using massage therapy, and taking general measures to reduce the severity of pruritus and pain. Regular assessment and monitoring of these practical

outcomes as part of a care bundle can help healthcare providers track the patient's progress and identify areas for reintervention.

Content validity and reliability:

Five professors in medical-surgical nursing and plastic surgery evaluated the tools for content validity and reviewed them for clarity, relevance, and comprehensiveness. As a result, minor modifications and corrections were made.

The reliability of the proposed Tool II was evaluated using Cronbach's alpha, with scores of 0.88 for part (I), 0.88 for part (II), and 0.81 for part (III).

Pilot study:

The purpose of this pilot study was twofold: first, to assess the clarity of the designated study tools, and second, to evaluate their utility and identify any issues that needed to be addressed before the main study. In February 2023, the pilot study involved 10% of the sample (7 patients). Patients participating in the pilot study were excluded from the primary research.

Ethical considerations:

Before conducting the study, ethical approval was secured from the Ethical Committee of the Faculty of Nursing at Assiut University, with approval number 1120240468, dated October 27, 2022. An official letter was issued by the Dean of the Faculty of Nursing to the head of the Plastic Surgery and Burn Unit at two hospitals, detailing the study's purpose. The researcher highlighted that participation was entirely voluntary, and patients had the right to decline or withdraw from the study at any time without providing a reason. Verbal consent was obtained from each patient before their involvement. The study posed no risks to participants, and confidentiality and anonymity were strictly maintained by coding all collected data.

Procedure:

The study was carried out in three phases:

Preparatory phase:

- After an extensive literature review (textbooks, journals, internet resources, etc.) about pain, itching management, and how to avoid the risk of hypertrophic scarring development, the researchers designed the study tools and the nursing care bundle booklet. A panel of experts checked the final form of the proposed protocol to test content validity.
- The head of the plastic surgery and burn department granted official permission to proceed with the proposed study.
- The researcher collected data 1 day/week during morning and afternoon shifts.

Implementation phase:

- Once permission was granted, the researcher reviewed the medical records to identify potential patients who met the study criteria. During the initial interview, the researcher introduced herself,

explained the nature and purpose of the study, and completed **(tools I and II).**

- The researcher implemented a nursing care bundle for patients through three sessions.

First session: started during the transitional phase of burn management at least (72) hours before the day of discharge from the hospital.

- The researcher explained the theoretical contents of the care bundle to the patient, and their caregiver was present in the session to support the patient and increase their sense of responsibility. This session took about 15 minutes.
- The researcher collected patients' telephone numbers to arrange appointments and finalize the data collection process following their discharge.
- **The second session** included instructions and measures to help relieve pain and itching, such as avoiding sun exposure, wearing cotton clothing, and keeping fingernails short. Do not use heavily scented lotions. Place a cold compress over the itchy area and shower cool with unscented soap. And distractions such as television and games. This session took about 30 minutes.

Third session: The primary goal of scar management is to prevent abnormal scarring following a burn. So, the researcher explains the importance of compliance with massage therapy, pressure garment wearing, and how to use it.

- Encourage patients to use the pads or soft tips of their fingers to massage the scar and the surrounding tissue. Start with light pressure and gradually increase to deeper and firmer strokes. The massage should be performed two to three times daily, each lasting ten minutes.
- The garments should be worn for 23 hours daily, with up to one hour for bathing and personal care. They can be washed by hand, gently soaked, or put in a washing machine on a gentle cycle. This session took 25 minutes.
- After completing the sessions, reinforcement was performed according to the patient's needs to ensure their understanding. The researcher emphasized the importance of follow-up.
- Each patient was given a printed booklet, and pictures were used to improve comprehension and aid in retaining the information.
- After discharge, each patient received a regular telephone call to ensure compliance with the treatment plan.
- Data collection occurred from March 2023 to November 2023.

Evaluation phase:

In this phase, the studied patient was assessed three times to evaluate the effect of the nursing care bundle. The first time (pre-test) was done at least 72 hours

before discharge **(Tools I and II)**, and the second (post) and third time (follow-up) were done after one month and three months respectively **(tool II)**.

Statistical design:

Data entry was conducted using a personal computer that was compatible with the researcher's setup. All data were entered into the Statistical Package for the Social Sciences (SPSS) version 23.0 for analysis. Categorical variables were described using numbers and percentages, while continuous variables were summarized with mean and standard deviation (Mean, SD). The significance of the obtained results was judged at the 5% level. The used tests were:

- **Friedman test:** For abnormally distributed quantitative variables, to compare between more than two periods or stages.
- **Mann Whitney test:** For abnormally distributed quantitative variables, to compare between two studied groups.
- **Kruskal Wallis test:** For abnormally distributed quantitative variables, to compare between more than two studied groups.
- **Chi-square test:** For categorical variables, to compare between different groups.
- **Monte Carlo correction:** Correction for chi-square when more than 20% of the cells have an expected count of less than 5.

Results

Table (1): Frequency of percentage distributions of studied patients regarding their demographic characteristics and medical data (n = 70).

Variables	n	%
Age (years)		
18 < 30	**27**	**38.6**
30 < 40	21	30.0
40 < 50	12	17.1
50 < 65	10	14.3
Mean ± S.D.	**35.41 ± 11.49**	
Gender		
Male	**37**	**52.9**
Female	33	47.1
Address		
Urban	17	24.3
Rural	**53**	**75.7**
Marital status		
Single	20	28.6
Married	**42**	**60.0**
Divorced	4	5.7
Widow or widower	4	5.7
causes and mechanisms		
Flame	**53**	**75.7**
Scald	17	24.3
Burn site		
Face	**46**	**65.7**
Neck	25	35.7
Chest	14	20.0
Abdomen	27	38.6
Upper limbs	**64**	**91.4**
Lower limbs	**38**	**54.3**
Genitalia	10	14.3
Buttocks	2	2.9
Circumferential burn	6	8.6
Degree of burn		
Second-degree burn	**34**	**48.6**
Third-degree burns	17	24.3
Second and third-degree burns	19	27.1
Percent of burn (TBSA)		
10<20	25	35.7
20<30	17	24.3
30<40	19	27.1
40<50	6	8.6
50<60	3	4.3
Min. – Max.	10.0 – 60.0	
Mean ± SD.	**29.19 ± 13.21**	

Table (2): Distribution of the studied patients regarding their pain intensity score (pre), (post), and (follow-up) after implementation of the nursing care bundle (n = 70).

Pain intensity items	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
Worst in the past 24 hours								
No pain	1	1.4	15	21.4	34	48.6	96.341*	<0.001*
Mild Pain	28	40.0	43	61.4	35	50.0		
Moderate Pain	19	27.1	11	15.7	1	1.4		
Severe Pain	22	31.4	1	1.4	0	0.0		
Min. – Max.	0.0 – 10.0		0.0 – 7.0		0.0 – 5.0		103.297*	<0.001*
Mean ± S.D.	5.16 ± 2.37		2.73 + 1.92		1.0 ± 1.27			
Least in the past 24 hours								
No pain	1	1.4	15	21.4	34	48.6	62.323*	<0.001*
Mild Pain	58	82.9	54	77.1	36	51.4		
Moderate Pain	7	10.0	1	1.4	0	0.0		
Severe Pain	4	5.7	0	0.0	0	0.0		
Min. – Max.	0.0 – 8.0		0.0 – 5.0		0.0 – 4.0		89.929*	<0.001*
Mean ± S.D.	2.69 ± 1.92		1.26 ± 1.0		0.73 ± 0.92			
Describes your pain on the Average								
No pain	2	2.9	17	24.3	34	48.6	71.298*	<0.001*
Mild Pain	47	67.1	50	71.4	36	51.4		
Moderate Pain	13	18.6	3	4.3	0	0.0		
Severe Pain	8	11.4	0	0.0	0	0.0		
Min. – Max.	0.0 – 9.0		0.0 – 6.0		0.0 – 4.0		104.336*	<0.001*
Mean ± S.D.	3.51 ± 2.15		1.50 ± 1.34		0.76 ± 0.94			
How much pain do you have Right Now?								
No pain	1	1.4	15	21.4	34	48.6	72.743*	<0.001*
Mild Pain	50	71.4	54	77.1	36	51.4		
Moderate Pain	9	12.9	1	1.4	0	0.0		
Severe Pain	10	14.3	0	0.0	0	0.0		
Min. – Max.	0.0 – 9.0		0.0 – 6.0		0.0 – 4.0		103.581*	<0.001*
Mean ± S.D.	3.67 ± 2.19		1.84 ± 1.33		0.83 ± 1.02			

SD: Standard deviation   *Fr: Friedman test*
p: p-value for comparing between the three periods   **: Statistically significant at $p \le 0.05$*

Table (3): Distribution of the studied patients regarding their pain interference score (pre), (post), and (follow-up) after implementation of the nursing care bundle (n = 70).

Pain interference items	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
A. Daily Activity								
No pain	1	1.4	15	21.4	34	48.6	103.298*	<0.001*
Mild Pain	26	37.1	47	67.1	35	50.0		
Moderate Pain	18	25.7	8	11.4	1	1.4		
Severe Pain	25	35.7	0	0.0	0	0.0		
Min. – Max.	0.0 – 10.0		0.0 – 6.0		0.0 – 5.0		107.597*	<0.001*
Mean ± S.D.	5.59 ± 2.39		2.51 ± 1.89		1.03 ± 1.27			
B. Mood								
No pain	1	1.4	16	22.9	37	52.9	90.545*	<0.001*
Mild Pain	27	38.6	41	58.6	28	40.0		
Moderate Pain	10	14.3	8	11.4	4	5.7		
Severe Pain	32	45.7	5	7.1	1	1.4		
Min. – Max.	0.0 – 10.0		0.0 – 9.0		0.0 – 8.0		107.960*	<0.001*
Mean ± S.D.	5.79 ± 3.06		2.41 ± 2.29		1.0 ± 1.65			
C. Walking Ability								
No pain	1	1.4	16	22.9	37	52.9	88.528*	<0.001*
Mild Pain	37	52.9	52	74.3	32	45.7		
Moderate Pain	15	21.4	2	2.9	1	1.4		
Severe Pain	17	24.3	0	0.0	0	0.0		
Min. – Max.	0.0 – 10.0		0.0 – 5.0		0.0 – 5.0		104.622*	<0.001*
Mean ± S.D.	4.41 ± 2.84		1.54 ± 1.33		0.61 ± 0.87			

Pain interference items	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
D. Normal work (Includes both work outside the home and housework)								
No pain	1	1.4	15	21.4	35	50.0	102.174*	<0.001*
Mild Pain	14	20.0	43	61.4	30	42.9		
Moderate Pain	27	38.6	6	8.6	5	7.1		
Severe Pain	28	40.0	6	8.6	0	0.0		
Min. – Max.	0.0 – 10.0		0.0 – 9.0		0.0 – 6.0		109.024*	<0.001*
Mean ± S.D.	6.11 ± 2.31		2.96 ± 2.22		1.26 ± 1.74			
E. Relation with other people.								
No pain	1	1.4	16	22.9	37	52.9		
Mild Pain	43	61.4	50	71.4	32	45.7		
Moderate Pain	11	15.7	4	5.7	1	1.4	78.655*	<0.001*
Severe Pain	15	21.4	0	0.0	0	0.0		
Min. – Max.	0.0 – 10.0		0.0 – 6.0		0.0 – 7.0		108.591*	<0.001*
Mean ± S.D.	4.21 ± 2.56		1.53 ± 1.39		0.76 ± 1.21			
F. Sleep								
No pain	1	1.4	16	22.9	37	52.9	78.012*	<0.001*
Mild Pain	44	62.9	50	71.4	30	42.9		
Moderate Pain	10	14.3	4	5.7	2	2.9		
Severe Pain	15	21.4	0	0.0	1	1.4		
Min. – Max.	0.0 – 10.0		0.0 – 6.0		0.0 – 7.0		112.557*	<0.001*
Mean ± S.D.	4.24 ± 2.45		1.67 ± 1.43		0.77 ± 1.28			
G. Enjoyment of life								
No pain	1	1.4	15	21.4	37	52.9	100.320*	<0.001*
Mild Pain	21	30.0	48	68.6	30	42.9		
Moderate Pain	24	34.3	2	2.9	2	2.9		
Severe Pain	24	34.3	5	7.1	1	1.4		
Min. – Max.	0.0 – 10.0		0.0 – 9.0		0.0 – 7.0		113.937*	<0.001*
Mean ± S.D.	5.71 ± 2.76		2.23 ± 2.04		0.94 ± 1.46			

SD: Standard deviation   *Fr: Friedman test*
p: p-value for comparing between the three periods   **: Statistically significant at $p \leq 0.05$*

Table (4): Distribution of studied patients regarding the severity of post-burn pruritus (pre), (post), and (follow-up) after implementation of the nursing care bundle (n =70).

Pruritus assessment	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
No	4	5.7	9	12.9	25	35.7	57.519*	<0.001*
Mild pruritus	34	48.6	45	64.3	36	51.4		
Moderate pruritus	22	31.4	12	17.1	9	12.9		
Severe pruritus	9	12.9	3	4.3	0	0.0		
Very severe pruritus	1	1.4	1	1.4	0	0.0		

SD: Standard deviation   *Fr: Friedman test*
p: p-value for comparing the three periods   **: Statistically significant at $p \leq 0.05$*

Table (5): Distribution of studied patients regarding post-burn scars (pre), (post), and (follow-up) after implementation of the nursing care bundle (n = 70).

Vancouver scar variables	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
1. Vascularity								
Normal	2	2.9	45	64.3	66	94.3	102.408*	<0.001*
Pink	64	91.4	25	35.7	4	5.7		
Red	4	5.7	0	0.0	0	0.0		
Purple	0	0.0	0	0.0	0	0.0		
2. Pigmentation								
Normal	0	00	11	15.7	25	35.7	85.586*	<0.001*
Hypopigmentation	0	00	49	70.0	34	48.6		
Hyperpigmentation	0	00	10	14.3	11	15.7		

Vancouver scar variables	Pre-test		Post-test		Follow up		Friedman test	p
	n	%	n	%	n	%		
3. Pliability								
Normal	5	7.1	33	47.1	55	78.6		
Supple	41	58.6	36	51.4	15	21.4		
Yielding	21	30.0	1	1.5	0	0.0	89.043*	<0.001*
Firm	3	4.3	0	0.0	0	0.0		
Ropes	0	0.0	0	0.0	0	0.0		
Contracture	0	0.0	0	0.0	0	0.0		
4. Height								
Flat	0	00	70	100	70	100		
Less than 2	0	0	0	0	0	0	-	-
2 – 5	0	00	0	0.0	0	0.0		
More than 5	0	00	0	0.0	0	0.0		
Total score								
Min. – Max.	0.0 – 4.0		0.0 – 4.0		0.0 – 3.0		74.155*	<0.001*
Mean ± S.D.	2.34 ± 0.74		1.89 ± 0.99		1.07 ± 0.87			

SD: Standard deviation   *Fr: Friedman test*
p: p-value for comparing the three periods   **: Statistically significant at p ≤ 0.05*

Table (6): Relation between the mean score of the brief pain inventory scale of the studied patients and their demographic and medical data (pre-, post-, and Follow-Up) from the implementation of the nursing care bundle (n =70).

Demographic and medical data	n	Total scores brief pain inventory scale		
		Pre-test	Post-test	Follow-up
		Mean ± SD	Mean ± SD	Mean ± SD
Age (years)				
18 < 30	**27**	60.70±24.75	23.33±16.29	10.52±13.26
30 < 40	**21**	43.81±24.59	21.19±19.06	11.19±15.74
40 < 50	**12**	39.83±18.15	17.42±13.49	7.25±8.40
50 < 65	**10**	54.00±18.63	26.90±8.56	7.20±8.47
Test of Sig. **P.value**		**H=8.935*** **p=0.030***	**H=4.413** **p=0.220**	**H=0.668** **p=0.881**
Gender				
Male	**37**	48.30±25.0	20.19±15.73	9.54±11.32
Female	**33**	54.24±22.96	24.42±15.97	9.85±14.29
Test of Sig. **P.value**		**U=553.5** **p=0.365**	**U=522.0** **p=0.295**	**U=572.5** **p=0.633**
Burn site				
Face	**46**	56.24±22.28	23.24±13.91	8.98±11.55
Neck	**25**	63.52±21.61	31.32±11.36	12.60±13.26
Chest	**14**	63.29±21.47	30.0±17.46	12.93±14.05
Abdomen	**27**	59.67±22.11	22.26±14.66	10.37±13.23
Upper limbs	**64**	51.31±24.38	23.14±15.85	10.28±12.94
Lower limbs	**38**	49.92±23.77	19.53±13.39	5.74±7.31
Genitalia	**10**	64.20±19.56	31.30±16.51	15.50±10.58
Buttocks	**2**	34.0±4.24	11.50±16.26	6.0±8.49
Circumferential burn	**6**	67.83±28.44	30.0±9.03	11.33±6.02
Test of Sig. **P.value**		**H=13.900*** **p=0.084**	**H=16.913*** **p=0.031**	**H=12.993** **p=0.112**
Degree of burn				
second degree burn	**34**	37.26±15.59	13.68±12.76	6.74±10.96
Third degree burns	**17**	77.65±14.86	31.76±10.38	15.35±13.75
Second and third-degree burns	**19**	52.11±23.47	28.84±17.35	9.89±13.58
Test of Sig. **P.value**		**H=30.737*** **P<0.001***	**H=20.071*** **P<0.001***	**H=8.216*** **p=0.016***

Demographic and medical data	n	Total scores brief pain inventory scale		
		Pre-test	**Post-test**	**Follow-up**
		Mean ± SD	**Mean ± SD**	**Mean ± SD**
Percent of burn (TBSA)				
10< 20	**25**	35.20±18.70	15.48±15.91	7.72±11.97
20 < 30	**17**	53.0±19.35	19.82±17.85	7.06±12.27
30 < 40	**19**	55.21±21.66	26.32±9.99	12.05±15.19
40 < 50	**6**	81.67±9.79	40.0±11.75	16.17±10.30
50 < 60	**3**	85.67±19.86	29.67±7.09	13.0±2.65
Test of Sig. **P.value**		**H=26.229*** **P<0.001***	**H=16.535*** **p=0.002***	**H=7.470** **p=0.113**

SD: Standard deviation   *U: Mann Whitney test*
H: H for Kruskal Wallis test   **: Statistically significant at p ≤ 0.05*

Table (7): Relation between the visual analogue score of the studied patients and their demographic and medical data (pre-, post-, and Follow-Up) from the implementation of the nursing care bundle (n =70).

Medical data	Pre-test										χ^2	^{MC}p
	No (n = 4)		Mild pruritus (n = 34)		Moderate pruritus (n = 22)		Severe pruritus (n = 9)		Very severe pruritus (n = 1)			
	no.	%	no.	%	no.	%	no.	%	no.	%		
Degree of burn												
Second degree	2	50.0%	28	82.4%	3	13.6%	1	11.1%	0	0.0%	39.356*	<0.001*
Third degree	2	50.0%	4	11.8%	10	45.5%	2	22.2%	1	100.0%		
Second & third	0	0.0%	2	5.9%	9	40.9%	6	66.7%	0	0.0%		
Percent of burn (TBSA)												
10< 20	4	100.0%	18	52.9%	3	13.6%	0	0.0%	0	0.0%	33.492*	<0.001*
20 < 30	0	0.0%	7	20.6%	6	27.3%	3	33.3%	1	100.0%		
30 < 40	0	0.0%	7	20.6%	10	45.5%	2	22.2%	0	0.0%		
40 < 50	0	0.0%	1	2.9%	1	4.5%	4	44.4%	0	0.0%		
50 < 60	0	0.0%	1	2.9%	2	9.1%	0	0.0%	0	0.0%		
Medical data	Post-test (after one month)										χ^2	^{MC}p
	No (n = 9)		Mild pruritus (n = 45)		Moderate pruritus (n = 12)		Severe pruritus (n = 3)		Very severe pruritus (n = 1)			
	No.	%	No.	%	No.	%	No.	%	No.	%		
Degree of burn												
second degree	8	88.9%	25	55.6%	1	8.3%	0	0.0%	0	0.0%	22.195*	0.001*
third degree	1	11.1%	12	26.7%	4	33.3%	1	33.3%	1	100.0%		
Second & third	0	0.0%	8	17.8%	7	58.3%	2	66.7%	0	0.0%		
Percent of burn (TBSA)												
10-< 20	9	100.0%	15	33.3%	0	0.0%	0	0.0%	1	100.0%	34.875*	<0.001*
20 < 30	0	0.0%	13	28.9%	3	25.0%	1	33.3%	0	0.0%		
30 < 40	0	0.0%	14	31.1%	4	33.3%	1	33.3%	0	0.0%		
40 < 50	0	0.0%	2	4.4%	3	25.0%	1	33.3%	0	0.0%		
50 < 60	0	0.0%	1	2.2%	2	16.7%	0	0.0%	0	0.0%		
Medical data	Follow-up (after three months)										χ^2	^{MC}p
	No (n = 25)		Mild pruritus (n = 36)		Moderate pruritus (n = 9)		Severe pruritus (n = 0)		Very severe pruritus (n = 0)			
	n	%	No.	%	n	%	n	%	n	%		
Degree of burn												
second degree	16	64.0%	17	47.2%	1	11.1%	-	-	-	-	14.604*	0.003*
Third degree	5	20.0%	13	36.1%	1	11.1%	-	-	-	-		
Second & third	4	16.0%	6	16.7%	7	77.8%	-	-	-	-		
Percent of burn (TBSA)												
10< 20	13	52.0%	11	30.6%	1	11.1%	-	-	-	-	13.4525	0.055
20 < 30	7	28.0%	9	25.0%	1	11.1%	-	-	-	-		
30 < 40	4	16.0%	12	33.3%	3	33.3%	-	-	-	-		
40 < 50	1	4.0%	2	5.6%	3	33.3%	-	-	-	-		
50 < 60	0	0.0%	2	5.6%	1	11.1%	-	-	-	-		

χ^2*: Chi-square test*   *MC: Monte Carlo*   **: Statistically significant at p ≤ 0.05*

Table (1): Shows that more than one-third (38.6%) of the studied patients were in the age group of 18 and 30 years with a mean of (35.41 ± 11.49) years. Males represented (52.9%), and most of them (75.7%) lived in rural areas. Furthermore, more than half (60%) of them were married. Regarding medical data, the common cause of burns was flame and then scald (75.7%, and 24.3% respectively); nearly half (48.6%) of the studied patients had second-degree burns. The most common sites of the body affected by burn were the upper limbs, face, and lower limbs (91.4%, 65.7%, and 54.3 %), respectively, and more than one-third of patients had 10 to 20% of the total body surface area burned.

Table (2): This table illustrates that there was a significant decrease in pain intensity from the pre-test (before discharge) to the post-test (after one month) and from the post-test to the follow-up (after three months). This is apparent from the decreasing mean pain scores and the increasing percentage of patients reporting no pain with p.value (< 0.001).

Table (3): Exhibits a significant improvement in pain interference scores over time across various aspects of daily functioning, with fewer patients reporting pain and lower mean interference scores in the post-test and follow-up compared to the pre-test, with a statistically significant difference (p < 0.001).

Table (4): There is a significant reduction in pruritus severity over time, with a notable decrease in the percentage of patients reporting moderate, severe, and very severe pruritus over the follow-up period after the implementation of the care bundle with a statistically significant difference with p.value <0.001.

Table (5): Shows improved scar characteristics over time, as indicated by reduced vascularity, pigmentation abnormalities, and increased pliability. All scars were flat at the post-test and follow-up assessments, indicating no significant changes in height over time, and the total Vancouver Scar Scale score decreased significantly from the pre-test to the post-test and continued to decrease at the follow-up assessment, which was statistically significant (p < 0.001).

Table (6): Indicates a positive relation between patient age and pain score pre-implementation of the nursing care bundle. Also, there was a statistically significant relationship between burn site, degree of burn, total body surface area, and pain score (pre) and (post) implementation of the nursing care bundle.

Table (7): This table states that there was a statistically significant relation between the severity of pruritus with both the degree and the extent of the burn injury pre- as well as one month after discharge with p.value <0.001* and =0.001*, respectively. as

higher TBSA burns were strongly associated with more severe pruritus.

Discussion:
A burn is an injury that damages the skin and underlying tissues, potentially affecting entire soft tissue layers, including nerve endings. Various physical, chemical, or radiological agents can cause it. The complications resulting from a burn can vary widely, depending on the extent of tissue damage, the injury's location, and the burn's severity. **(Żwierełło et al., 2023)**.

Concerning the demographic and medical data of the studied patients, the current study showed that most studied patients were in the young adult group, with a mean of (35.41 ± 11.49) years, and more than half were males. From the researcher's point of view, young adult males often engage in activities that increase their risk of burn injuries, such as cooking, using flammable materials (e.g., in hobbies or work), or participating in activities where heat or fire is involved.

These results are consistent with **Ibrahim & Omran (2020),** and **Tibebu et al. (2021)** reported that more than one-third of the participants were in age groups between eighteen and thirty; the mean age was thirty-five, and around two-thirds were male. Also, **Harorani et al. (2020)** were on the same line as they reported that most participants in both the study and control groups were males, with a mean age of 36.35 ± 10.28 years. On the other hand, this result contradicts **Najafi et al. (2019),** who reported that more than half of the patients studied were females.

Most of the patients in the study were married and from rural areas. This finding could be because rural households may lack modern kitchen facilities. Also, Crowded living conditions and limited space can exacerbate the risk of burns from hot surfaces, boiling liquids, or contact with open flames. The study results align with findings from **Shabana et al. (2021)** and **Ebrahem et al. (2022),** who reported a notable increase in burn cases in rural areas, with a prevalence of two third. This finding is consistent with research by **Magbool et al. (2021)** which noted that approximately three-quarters of the patients were married. Additionally, **AbdElaal et al. (2022)** found that over half of the patients studied were males and married, further supporting these results.

Regarding medical data, the present study showed that a flame was the primary cause of the burn. This result was compatible with **Ibrahim & Omran (2020)** and **Daffue et al. (2018)**, who stated that flames, including flaming and hot liquids, were the two leading causes of burn injuries. Likewise, **Škunca et al. (2023)** pointed out that flames caused most burns, the leading cause of adult burns.

Also, **Mohamed et al. (2023)** found that the most common etiology was flame burns, followed by scald. In contrast, **Mulatu et al. (2022)** found that scald burns were the primary cause followed by flame burns; this difference indicated that the burn etiology varied significantly by region and population.

The current study showed that nearly half of the patients had a second-degree burn, and the upper limbs were among the most sites affected by burns. Likewise, **Alajmi et al. (2021), Seyedoshohadaee et al. (2022), & Adnan et al. (2023)** supported the result as they demonstrated that the upper limbs were the most frequently affected body region, with second-degree burns being the prevailing type. Moreover, **Shabana & his colleagues (2021)** emphasized that in most cases, the burn site was in the upper arms, face, and lower limbs. Also, **Hasan & Al-Humairi (2022)** supported the study findings as they reported that more than half of the patients in their study had second-degree burn injuries.

Concerning the total body surface area, the present study revealed that more than one-third of studied patients had 10 to < 20% burned with a mean (29.09 ± 13.3). This finding aligns with the results of **Ali et al. (2019)**, which indicated that the mean total body surface area (TBSA) for the study and control groups were (29.17±11.3 and 29.83±11.48) respectively. This finding also matched with **Vélez et al. (2022)**, who mentioned that the percent total body surface area (TBSA) burnt in admitted patients ranged from 1-100% and found that more than one-third of patients with 10-19% TBSA.

Regarding the effect of the nursing care bundle on the outcomes of studied patients, the results showed an improvement in the mean score of pain level, itching severity, and post-burn scars, supported by **Heydarikhayat et al. (2018).** They reported that the studied patient's health status and scar management improved after post-discharge follow-up. However, burn patients require continued care for pain and itching problems. Another supported study by **Tang et al. (2015)** confirmed that burn patients benefit from interventions to maximize their outcomes, such as Activity of Daily Living, Quality of life, pain, itchiness, sleep quality, and mental health. In addition, **Lotfi et al. (2018) and Elazazy (2018)** state that massage therapy can be one of the modalities for controlling post-burn pain, pruritis, and scar characteristics.

Regarding pain management, after discharge from the hospital, patients may still experience pain due to ongoing wound care, scar management, and rehabilitation exercises. The current study's results revealed a significant improvement in pain scores from the pre-test to the post-test.

The previous results are congruent with those of **Mahmoud et al. (2022),** who found a statistically significant difference in reducing pain intensity among the study group after implementing the deep breathing technique. Similarly, **Kim & his colleague (2019)** and **William et al. (2024)** found that muscle relaxation positively affected pain, pruritus, and vital signs among the burn patients studied.

Regarding post-burn pruritus and its management, post-burn pruritus is a prevalent complication that often occurs following burn injuries. It can occur during healing and persist even after the wound has healed completely. The current study revealed a decrease in the severity of pruritus after implementing the care bundle. These results were supported by **Kyung et al. (2023),** who clarified that video material on percussion and cold therapy techniques, general skin care, and dietary guidelines effectively improved post-burn pruritus. Also, these results are in the same line as **Bekheet et al. (2021),** which revealed that massage therapy was effective in treating chronic burn-induced neuropathy.

The study also matched with **Joo et al. (2018),** who studied "the Effect of cold pack therapy for managing burn scar pruritus: A pilot study". They mentioned that cold pack therapy significantly reduced the severity of post-burn pruritus and interference with activities of daily living in the experimental group.

The current study revealed the **reduced risk of burn scars** after implementing the care bundle regarding pressure garments and the scar massage effect. This result is consistent with the findings of **Tsai et al. (2023)**, who demonstrated that scar massage is both convenient and effective in preventing and alleviating hypertrophic burn scarring. Additionally, **DeBruler et al. (2020)** showed that wearing pressure garments for 24 hours a day significantly reduced scar contraction compared to wearing them for only 8 or 16 hours, while also preventing collagen misalignment within the dermis and enhancing scar flexibility and elasticity.

Considering the relation between pain and pruritus and their demographic and medical data, the current study clarified a positive relation between pain, pruritus, age, degree of burn, and burn percentage. These results are in agreement with **Klifto et al. (2020),** who reported that older age, a greater percent total body surface area burned (%TBSA), third-degree burns, and a longer hospital length of stay were associated with a higher likelihood of developing chronic neuropathic pain (CNP) following a burn injury, compared to patients who did not develop CNP.

Similarly, **Prasad et al. (2019)** conducted a study titled "The Association of Patient and Burn Characteristics with Itching and Pain Severity." They

found that factors such as age, gender, the extent of burn injuries (percent total body surface area), and facial/neck injuries were predictors of more severe itching. Patients with these characteristics may require more intensive care and closer follow-up to manage itching effectively after healing.

Salati (2023) reported that the risk factors for pruritis appear to be female gender and burns affecting larger body surface areas (TBSA) or extending deep (Third-degree burn). This finding is also in line with **Obanigba et al. (2023)**, who reported that post-burn pruritus is more prevalent with increased burn depth and a higher number of surgeries. Patients experiencing post-burn pruritus tend to report greater pain, stiffness, and associated neuropathic discomfort.

Conclusions

The study findings supported the research hypotheses as it had been proven that implementing a nursing care bundle during the transitional phase of burn patient care had statistically significant promising results in improving patient outcomes. These outcomes included alleviating pain and itching severity and minimizing the formation of hypertrophic scars.

Recommendation:

1. Enhance patient understanding regarding care bundle components' significance in preventing complications following burns.
2. Providing a written care bundle booklet is highly valuable in reminding patients of its contents and application methods.
3. Burn patients require long-term follow-up to assess outcomes such as scar management, functional recovery, and psychological well-being.

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