

# **RESEARCH ARTICLE**

# IMPACT OF NURSING REHABILITATION PROGRAM ON MINIMIZING POST- BURN JOINT CONTRACTURE

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# Manuscript Info

#### Abstract

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#### Key words:-

Burn, Contracture, ROM, Rehabilitation, Positioning

Globally, burns are a serious public health problem. Rehabilitation isanessential and basic part of burn treatmentto limit contracture. It isn't something whichhappens following healing of skin grafts or discharge from hospital; all things considered a process that beginnings from day one of admission and proceeds for a long time and sometimes years after the initial event.

Aim of the current study: The aim of this study was to evaluate the impact of nursing rehabilitation program on minimizing post-burn joint contracture.

**Research Design:** Quasi-experimental pretest, posttest research design was utilized.

**Setting:** The study was conducted in Burn Unit at General Kafrelsheikh Hospital- Kafrelsheikh City- Kafrelsheikh Governorate).

**Subjects:** A purposive sample of 60 adult's male and female inpatients diagnosed with major burn injury at shoulder, elbow, hip or knee joint where they included in the study, Patients assigned into two groups (control and study).

Tools of data collection: tool 1:Demographic and medical data sheet, tool II: Joint motion measurement scale.

**Results:**most of the study group were suffering contractures with active range of motion; compared with more than three quarter of control group. While, about one third of the study have contractures with passive range of motion; compared with more than two third of control group. A Statistically significant difference put into evidence between the two groups regarding severity, and frequency of range of motion limitation for affected joints.

**Conclusion**: contractures are common problems after a major burn injury. Number of contractures occurred in spite of receiving a rehabilitation program. Despite the frequency of contractures at time of hospital discharge, very few contractures were severe.

**Recommendations.**Early application of rehabilitation program as an important intervention for minimizing contracture in sever burn patients.

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#### Introduction:-

Burn injuries are the most destroying of all injuries and significant worldwide general health danger (**World Health Organization, 2018**). Burns are the fourth most general type of injuryaround the world, following traffic accidents, falls, and relational force(**Odondi, Shitsinzi, &Emarah, 2020**); **Hinkle & Cheever (2014)** indicated thatburn injury can take place all age groups and in all socioeconomic groups.

Internationally, burns are a dangerousgeneral health issue; More than 11 million individuals seek burn-related clinical consideration each year, representing an expected 180 000 deaths every year. Likewise, more than 96% of fatal fire-related burns happen in low- and middle-income countries (**World Health Organization, 2018**). The overall prevalence of fire-related injuries in 2004 was determined as 1.1 per 100,000 populations with the most noteworthy rate in low- and moderate-income countries (**Peck & Pressman, 2013**). According to the Center for Disease Control (CDC), 1.1 million individuals endure burn injuries that needlinical consideration every year in the United States (**Dachlan&Anam, 2018**).

In Egypt, exactly 100,000 individuals get burned yearly, the death rate of burn casualties in Egypt is pretty much as high as 37%, contrasted with the normal of just 5% in different nations in the region. In addition, the greater partwho do survive find it difficult to continue with their daily activities because of their actual deformation and physiological injury (Ahl Masr Foundation, 2016: Kandeel, 2019).

There are 300 burns sufferers per day in Egypt, and death rates reach 38% as a result of wrongly dealing with burns pointing out that the patient in the developed world can survive although the percentage of burns is 80% and he may die in Egypt with a 30% burn rate as a result of delaying medical intervention or wrong treatment (Mamashli, Ardebili, Bozorgnejad, Ghezeljeh&Manafi, 2019).

Contractures are a typical and critical complexity of burn injury. It results in diminished joint movement and may likewise bring aboutimpaired joint capacity and disability, deformation, and restorative and mental disability. Contractures are generally occurred at the shoulder, elbow, and knee regions (**Rizzo, Silver & Frontera, 2014**).

The management of burn contracture is not confined to any specialty and indeed not only to the medical profession but must be practiced by nurses. Proper and timely rehabilitation services can minimize medical costs and improve quality of burn patient life; through proper positioning of burned body parts, early active exercises, and appropriate splinting. In this regard; the nurse guides the patient to understand that he can again be active constructive member of the society (**Tirgari, Mirshekari&Forouzi, 2018**).

#### Significance of the Study

The annual Statistics of Medical Records Department at one of the General Hospital- Kafrelsheikh Governorate-Egypt report denoted that 126 patient were admitted to the burn unit with different degrees of burn injuries and age groups (Statistics & Medical Records Department, General Hospital- Kafrelsheikh governorate, 2015). Also, in 2015; Plastic, Reconstructive and Burn Surgery Center-Mansoura University-Egypt was received about (210) case with different degrees of burn injuries and age groups (Annual Statistics of Plastic, Reconstructive and Burn Surgery Center-Mansoura University-Egypt, 2015).

Therefore, the current study was carried out to evaluate the impact of nursing rehabilitation program on minimizing post-burn joint contracture among a sample of adult patients with burn injuries, hoping that the findings of the study might help in developing nursing guidelines to assure high quality of evidence-based nursing care for such patients.

#### Aim of the study;

The aim of this study was to evaluate the impact of nursing rehabilitation program on minimizing post- burn joint contracture.

#### **Research hypotheses;**

Burned patients who received nursing rehabilitation program experienced minimal joint contracture.

# Method:-

# 1. Research Design;

A Quasi-experimental study - control research design was used in this study.

# 2. Study Setting;

The study was carried out in Burn Unit at General Kafrelsheikh Hospital- Kafrelsheikh City- Kafrelsheikh Governorate) affiliated to Ministry of Health, Egypt. It is composed of four floors with 403 patient's bed. The burn unit located in the third floor and it consists of eleven rooms, with capacity of twenty-one beds. Three out of the eleven rooms are occupied with three patents' beds. The other six rooms each one occupied by two beds; and the last two rooms are assigned for wound dressing. Burn unit was received patients from emergency and outpatient clinics.

# 3. Study Subjects;

A purposive sample of 60 patients was the study sample. The actual time of data collection started from beginning of October 2018 to the May of 2019. Patients were assigned into two groups i.e.,the control group; those who received the routine hospital treatment regimen only. The data of control group collected throughout three months fromOctober 2018 to the January of 2019. While, the second group was the study group (30 patients); those who received the routine hospital treatment regimen plus the designed nursing rehabilitation program, this program applied for the study group throughout five months from January to May of 2019.

# Inclusion criteria:

Adult male and female hospitalized patients diagnosed with second or third degree burn injury at shoulder, elbow, hip, or knee joint and admitted immediately to hospital i.e., at early stage of getting the burn injury. Adult male and female conscious patients aged from  $\geq 21$  years to 60 years or more. **Exclusion criteria:** Patient with pre-existing physical disability at joints.Patient admitted to hospital after 48 hours of burn injury.

# Tools:

Assessment questionnaire sheet as developed by the study researcher after reviewing related literature; and consisted of two parts:

- a. **Demographic Data of Study Subjects;** it included data related to age, gender, level of education, occupation, and place of residence.
- b. **Medical Data Sheet** where it covered the following; cause of burn, type of burn, depth of burn, total body surface area (TBSA), history of chronic illness (item 7 to 15). This part of medical data sheets also included data related to assessment of the factors which contribute to burn joint contracture during hospitalization (item 16).

# Tool II:

Joint motion measurement scale by (**Norkin& White, 2009**). This scalewas modified by the study's researcher, and utilized to assess patient's ability of performing passive and active range of motion exercises of each joint utilizing a goniometer following as standardized strategy. Numerous planes of motion (for example flexion/extension) were assessed at each selected intentional joint. For each debilitated joint muscle activity (active range of motion) is alloted a severity rating' scale; these ratings are determined by dividing the normal range of motion value similarly into three levels; mild, moderate, and severe. A limit in the scope of movement in at least one plane of movement at a predetermined joint was viewed as contracture at that joint.

	Muscle action	Average ROM	Contracture's severity			
Joint			Mild	Moderate	Severe	
Shoulder	Flexion	0-180	120-180	60-119	<60	
	Extension	0-60	32-50	16-31	<16	
	Abduction	0-180	120-180	60-119	<60	
	Adduction		32-50	16-31	<16	
Elbow	Flexion	0-150	93-140	46-92	<46	
	Extension	0	-140-93	-46-92	>-46	
	Pronation		53-80	26-52	<26	
	Supination		53-80	26-52	<26	
Hip	Flexion	0-120	67-100	34-66	<34	

# Scoring system:

	Extension	0-30	20-30	10-19	<10
	Abduction	0-45	26-40	13-25	<13
	Adduction	0-30	13-20	7-12	<7
Knee	Flexion	0-135	100-150	50-99	<50
	Extension		-150-100	-99-50	>-50

# Validity and reliability:

The content validity of the program and the developed tools were reviewed by a panel of five expertise (two professors in medical surgical nursing, one assistant professor of physical therapy, Director of surgical and burn unit & the head nurse of burn unit). The aim of reviewing the content validity was to check its feasibility, clearness, pertinence, comprehensiveness; and its applicability. Modifications were done likewise.

**Reliability** to check tools' reliability; a test was finished utilizing split half techniques; and Cronbach's alpha that measures the level of reliability for the whole form. Both strategies showed high reliability of the last form of the tools. (Alpha=.85).

# Pilot study:

A pilot study was applied on 10% of the total sample (6) patients. This aimed to ensure clearness, objectivity, relevance, and feasibility of tools. Adjustments were done likewise. Pilot study subjects were excluded from the study.

#### **Ethical considerations:**

Verbal consent was obtained from each participant before his / her incorporation into the study after explanation of the nature and aim of the study. Each participant has been instructed that participation is absolutely voluntary and confidential. Anonymity, privacy, rights and safety of participation would be assured from the beginning of the study through coding the data; also, each patient has been informed that she/he has the right to withdraw from the study at any time without giving any justifications and will not affected his/her treatment regimen.

#### **Procedure:**

The study was implemented through the following phases:

# Phase 1: preparatory phase

It includes reviewing related literature of the various aspects to the study' problem using, articles, periodicals, magazines, and textbooks. Theses was carried out to help the researcher in developing the study tools i.e. questionnaire and the rehabilitation program for burn patients.

#### phase2: Data collection and implementing phase:

The actual field work started from October 2018 up to March 2019. It started by interviewing the participant patients, who met the inclusion criteria individually by the researcher at the study setting. The researcher started by introducing himself for each study subject, clarification of the nature and purpose of the study were done. Verbal consent was taken to participate in the study, the researcher confirmed that the willingness of the patient to participate before implementing the program.

#### Assessment phase:

The aim of this phase was to assess the patient's socio-demographic data and patient current condition regarding burn injury as "types of burn injury, depth of burn, total body surface area; also, to assess the factors that can lead to burn joint contracture during hospitalization" by using tools I). It was completed within (20- 30 minutes) according to patient's level of education and understanding and completed patient sheet.

**Planning phase(for the study and control group)** preparation of the rehabilitation program. In this phase the researcher was gone through extensive literature review to prepare a rehabilitation program for patients who have partial thickness burn or full thickness burn at shoulder, elbow, hip, or knee joints. A colored booklet was designed and covered the following main contents (assessment of burn injury, proper positioning of burned body segments, appropriate splints and equipment and early active / passive exercise) as well as based on the assessment data of patient's needs.

Implementation phase(for the study group) in this phase the patient was interviewed individually/or with his/her

family before administration of the designed rehabilitation program. Each subject of study's sample was interviewed individually within 48 hours of his/her admission by the current study' researcher where by his turn explained the aim and nature of the study. Then, the researcher obtained an oral or written informed consent for the patients who were willing and accepted to participate in the study.

The data was collected starting with demographic and medical data "which filled from the medical record "one time". After that, the researcher conducted a teaching session (ranged between 2- 3 session each) according to patient's needs as well as his /her level of education and understanding. The program provided and covered the health teaching about burn injury; complications of burn injury; how to avoid burn joint contracture through (proper positioning of burned body segments, appropriate splints and early active exercise). Then, the researcher provided each patient (of the study group) a copy of the designed booklet. The duration of this session was completed within (30-40 minutes) according to patient's level of education and understanding. The teaching sessions were provided on two sessions where it conducted at the burn unit. The sessions of implementation phase were described as the following:

#### The first session:

It was carried out before administration of the designed rehabilitation program. The researcher examined active and passive range of motion of each affected joint of interest (shoulder, elbow, hip, or knee) using a goniometer for all patients. The duration of this session was completed within (15-20 minutes) according to patient's response and cooperation.

#### The second session:

It was completed by implementation and showing of the planned program. Appropriate positioning is the principal line and by a long one of the mostideal ways to keep away from contracture and dysfunction. Positioning starts quickly post burn injury from day one and maintained during the whole course of hospitalization until wound healing. Positioning carried out together with proper ROM exercises and accomplished through different modalities through utilizing pillows, headboard, and foam pads, or splints.

Splints are planned and fabricated by researcher. Splints are tailored to help in keeping up the functional or anticontracture position of the harmed body parts. Splint is needed for patients who cannot maintain proper body position and/ or uncooperative patients. It worn continuously and taken off when dressing change, skin examination and practice exercises.

Keeping up passive and/or active range of motion exercise of intact and involved joints at least once a day was emphasized. During the treatment, duration, range and strength of individual treatment were acclimated to a protected limit according to changes of vital signs (heart rate, blood pressure, and respiration rate); in addition, an encouragement of the patient to participate in active movements. To minimize patient's suffering of pain i.e. exercises were practiced during wound dressing changes where possible.

#### **Evaluation phase**:

each patient in the study and control group as well was evaluated two times, first evaluation; immediately when patient was admitted to the burn unit, and examination of the patient active and passive range of motion using tool was carried out, then (II). Second evaluation; was done after wound healing, where the patient's condition was assessed for the factors that contribute to contracture (item 16, tool I). Then, active and passive range of motion of each impaired joint was assessed using goniometer (tool II).

#### Statistical analysis:

Data entry and data analysis were performed utilizing the package of social sciences "SPSS" version 21.0 (SPSS, Chicago, IL). The following statistical measures were utilized: Qualitative data were introduced as numbers and percentages. P-value of 0.05 was pre-set as level of significance. Descriptive statistics were generated for all variables, for nominal data frequencies and percentages were computed. For numerical data mean, standard deviation and the range were generated. Comparison of the different variables under study was done using the following test statistics: Student's t test for variables with continuous data. Chi-square test was used for comparison between variables with categorical data.

# **Results:-**

Table (1) illustrates frequency distribution of the study and control group according to their demographic characteristics. It represents that more than two third of the subjects were males (70%, 73.3%) with mean age ( $35.20\pm1.04$ ,  $37.93\pm11.9$ ) respectively of the study and control group. As regarding their marital status about three quarters (73.3%, 70%) were married respectively. The results also clarified that more than two thirds of the study and control group (70%, 76.3%), have Secondary school and before college enrollment education. This table also shows that (80%, 73.3%) of the study groups are living in rural areas. As can be seen from this table no statistical significance difference was put into evidence.

Variables	Study group (n=30)	Study group (n=30)		group	$\mathbf{X}^2$	P-Value
	Ν	%	Ν	%		
Gender	2.17	0.161				
Male	21	70	22	73.3		
Female	9	30	8	26.7		
Age					24.39	0.358
21 > 30 years	9	30	6	20		
30>40 years	11	36.7	9	30		
40> 50 years	5	16.7	8	26.7		
50-60 years	5	16.7	7	23.3		
M±SD	$35.20 \pm 12.04$		$37.93 \pm 12$	1.84		
Marital status					3.96	0.410
Single	7	23.3	6	20		
Married	22	73.3	22	73.3		
Divorced	0	0	0	0		
Widowed	1	3.3	2	6.7		
Occupation					0.76	0.343
Work	21	70	23	76.7		
Not work	9	30	7	23.3		
Level of education					5.18	0.819
Cannot read and write	5	16.7	4	13.3		
Read and write	9	30	6	20		
Secondary & before college	10	33.3	10	33.3		
College and above	6	20	10	33.3		
Place of residence					2.72	0.126
Urban	6	20	8	26.7		
Rural	24	80	22	73.3		

Table	(1):-	Frequency	distribution	of the study	v and control	l group	according	to their	demographic	characteristics.
	<					0		,		

Table (2) shows frequency distribution of the study and control groups according to their medical history. It is revealed that the majority of study subjects (90%, 93.3%) had thermal burnand(70%, 86.7%) had burn injury related to fire/flam respectively. Regarding burn percentage (40%, 43.3%) with percent of burn ranged from 20-29% respectively. Also, the table clarifies that half of the study group (50%) and about two third (63.4%) of the control group had both partial and full thickness burn.

Table (2):- Frequence	cy distribution of the st	idy and control gro	oups according to the	ir medical history.
	2	2 0	1 0	2

Variables	Study group (n=30)		Control group (n=30)		X <sup>2</sup>	P-Value
	Ν	%	Ν	%		
Diagnosis	4.32	0.633				
• Fire/flam burn injury	24	80	26	86.7		
Scald burn injury	3	10	2	6.7		
Chemical burn injury	2	6.7	2	6.7		
Electrical burn injury	1	3.3	0	0		

Type of burn		0.23	0.888			
• Thermal burn	27	90	28	93.3		
Chemical burn	2	6.7	2	6.7		
• Electrical burn	1	3.3	0	0		
Percent of burn		5.79	0.447			
• 10-19 %	11	36.6	9	30		
• 20-29 %	12	40	13	43.3		
• 30-39%	5	16.7	7	23.4		
• 40-50%	2	6.7	1	3.3		
Depth of burn					4.85	0.303
• Partial thickness burn (2nd degree)	12	40	10	33.3		
• Full thickness burn (3rd degree)	3	10	1	3.3		
Both partial and full thickness burn	15	50	19	63.4		

**Table 3** shows frequency distribution of the study and control groups according to factors contributes to burn joint contractures related to physical exercise and pain during hospitalization. It clarifies thatall of study group (100%) and more than half (56.7%) of the control group went on physical exercises sessions. In relation to time of starting physical exercises, more than two thirds (66.7%) of the control group went on physical exercises sessions after one days of admission, on the other hand, (46.7%) of the control group (100%) have regular physical exercises sessions after more than three days of admission, also, all of the study group (100%) have regular physical exercises sessions while, the majority (93.3%) of the control group have no regular physical exercises sessions. While, (100%) of the study group were on regular physical exercises sessions every day. No Statistical difference was found between the two groups regarding related factors that contributes to burn joint contractures during hospitalization. All of the study and control group experienced pain during physical exercises sessions, and didn't receive analgesics before physical exercises sessions, as no schedule regular analgesic before procedures.

Table (3):- Frequency Distribution of the Study and Control Groups According to Factors Contributes to Burn Jo	oint
Contractures Related to physical Exercise and pain during Hospitalization.	

Variables	Study gr	oup	Control	group	$\mathbf{X}^2$	P-Value
	( <b>n=30</b> )		( <b>n=30</b> )			
	Ν	%	Ν	%		
Physical exercises sessions						
• Yes	30	100	17	56.7		
• No	0	0	13	43.3		
Time of starting physical exercises sessions					1.29	0.731
<ul> <li>After one day of admission</li> </ul>	20	66.7	0	0		
<ul> <li>After two days</li> </ul>	10	33.3	2	6.7		
• After three days	0	0	1	33		
• More than three days	0	0	14	46.7		
Regular physical exercises sessions						
• Yes	30	100	2	6.7		
• No	0	0	28	93.3		
Frequency of regular physical exercises session	ons				0.84	0.657
<ul> <li>Every day</li> </ul>	30	100	0	0		
<ul> <li>Ever two days</li> </ul>	-	-	1	3.3		
<ul> <li>Every three days</li> </ul>	-	-	1	3.3		
Experience of pain during physical exercises	sessions					
• Yes	30	100	30	100		
• No	0	0	0	0		
Taking regular analgesic before physical exe	rcises					
• Yes	0	0	0	0		
• No	30	100	30	100		

**Table 4** represents frequency distribution of the study and control groups according to factors that contributes to burn joint contractures related to positioning and splinting during hospitalization. It showsthat all of study group (100%) informed a proper position of the affected joint, and only (70%) follow the learned instructions. Compared with more than two thirds (66.7%) of the control group didn't know about the proper position of the affected joint, also most of the control group (80%) did not follow the instructions.

In addition, one third (30%) of the study group had splint during their hospitalization, while most of the control group (83.3%) had not. Regarding duration of hospital stay, the results show near to two third (60%, 56, 7%) were hospitalized more than three weeks respectively. Moreover, no statistically significant difference was found as regards proper positioning' instruction, splinting, and length of hospital stay.

Variables	Study group (n=30)		Control group (n=30)		X <sup>2</sup>	P-Value	
	Ν	%	N	%			
Patient' knowledge for proper position of t	0.08	0.677					
• Yes	30	100	10	33.3			
• No	0	0	20	66.7			
Patient following the learned instructions	0.87	0.571					
• Yes	21	70	6	20			
• No	9	30	24	80			
Splinting during hospitalization					0.12	0.551	
• Yes	9	30	5	16.7			
• No	21	70	25	83.3			
Length of hospital stay					0.79	0.672	
• Two weeks	1	3.3	0	0			
• Three weeks	11	36.7	13	43.3			
• More than three weeks	18	60	17	56.7	1		

**Table (4):-** Frequency distribution of the study and control groups according factors that contributes to burn joint contractures related to positioning and splinting during hospitalization.

**Table 5** shows range of motion limitation by joint muscle action for the study and control groups (active range of motion exercise) post program intervention. It revealed that near half (47%, 54%) of the study and control group respectively were suffering from mild limitation with active range of motion with a highly statistically significant difference between the two groups regarding severity, and frequency of range of motion limitation for affected joints.

**Table (5):-** Range of motion limitation by joint muscle action for the study and control groups (Active range of motion exercise) post program intervention.

Joint		Study group/ No of affected joint 198			Control group / No of affected joint 174				X <sup>2</sup>	P- Value	
		Full	Mild	Moderat	Sever	Full	Mild	Moderat	Sever		
		rang		e	е	rang		e	e		
Shoulde	Flexion	0	12	5	0	0	8	4	2	8.9	.036*
r										6	
	Extensio	2	9	6	0	0	8	6	0	9.1	.043*
	n									3	
	Abductio	1	14	2	0	0	7	5	2	12.	.003*
	n									1	
	Adductio	9	8	0	0	7	7	0	0	7.1	.068
	n									8	
Elbow	Flexion	3	19	6	0	0	12	11	3	8.6	.042*
										6	
	Extensio	23	2	3	0	10	15	1	0	5.1	.076
	n									8	

	Supinatio	15	8	0	5	8	16	0	2	9.5	.000*
	n									6	*
	Pronation	15	8	0	5	8	16	0	2	9.5	.000*
										6	*
Hip	Flexion	0	1	0	0	0	0	0	0		
	Extensio	0	1	0	0	0	0	0	0		
	n										
	Abductio	0	1	0	0	0	0	0	0		
	n										
	Adductio	0	1	0	0	0	0	0	0		
	n										
Knee	Flexion	0	6	1	0	0	3	3	1	8.1	0.047
										1	*
	Extensio	4	3	0	0	2	2	3	0	8.7	0.038
	n									2	*
Total		72	93	23	10	35	94	33	12	8.6	0.036
		(36.4%	(47%	(11.5%)	(5.1%	(20.1%	(54%	(19%)	(6.9%	6	*
		)	)		)	)	)		)		

**Table 6** revealsrange of motion limitation by joint muscle action for the study and control groups (passive range of motion exercise), it shows that more than two thirds (68.2%) of the study group had full passive range of motion; while only about one third (31%) of the control group had full passive range of motion. While, one quarter of the study group (25.7%) have mild limitation of range of motion compared with more than half (54%) of the control group. The result clarifies a highly statistically significant difference between study and control group X2= 7.57; P at 0.034\*

Table (6):- Range of motion limitation by joint muscle action for the study and control groups (passive range of motion exercise).

		Study group/ No of affected joint 198				Control group/ No of affected joint					
		Full rang	Mild	Moderate	Sever	Full rang	Mild	Moderate	Sever	$-\mathbf{X}^2$	P-Value
Shoulder	Flexion	7	9	1	0	1	9	3	1	6.35	0.036*
	Extension	7	10	0	0	2	8	4	0	6.94	0.031*
	Abduction	9	8	0	0	1	9	3	1	8.23	0.026*
	Adduction	16	1	0	0	7	7	0	0	9.44	0.022*
Elbow	Flexion	19	8	1	0	7	12	4	3	7.86	0.039*
	Extension	23	5	0	0	11	14	1	0	8.55	0.042*
	Supination	21	2	0	5	10	14	0	2	8.26	0.038*
	Pronation	21	2	0	5	12	12	0	2	8.26	0.038*
Hip	Flexion	0	1	0	0	0	0	0	0		
-	Extension	1	0	0	0	0	0	0	0		
	Abduction	0	1	0	0	0	0	0	0		
	Adduction	1	0	0	0	0	0	0	0		
Knee	Flexion	5	2	0	0	1	4	2	0	6.76	0.043*
	Extension	5	2	0	0	2	5	0	0	6.58	0.041*
Total		135	51	2	10	54	94	17	9	7.57	0.034*
		(68.2%)	(25.7%)	(1%)	(5.1)	(31%)	(54%)	(9.8%)	(5.2%)	1.51	0.001

**Table 7** shows contracture severity and frequency by joint among study and control groups / active range of motion. It reveals a statistically significant difference between study & control group regarding contracture severity and frequency of active range of motion (X2= 8.66; P= 0.036). Nearly three quarter (73.8%) of the total study group had mild contracture compared to (67.6%) of the control group. While, less than one quarter (18.2%) had moderate contracture compared with about one quarter (23.7%) of the control group.

	Contractu		P					
Affected joints	Study gr contractur	roup/total nur re (126)	nber of	Control g	X <sup>2</sup>	P- Value		
<u>.</u>	Mild	Moderate	Sever	Mild	Moderate	Sever		
Shoulder	43	13	0	30	15	4	9.34	0.038
Elbow	37	9	10	59	12	7	8.24	0.029
Hip	4	0	0	0	0	0		
Knee	9	1	0	5	6	1	8.42	0.042
Total	93 (73.8%)	23 (18.2%)	10 (8%)	94 (67.6%)	33 (23.7%)	12 (8.7%)	8.66	0.036

 Table (7):- Contracture Severity and Frequency by Joint among Study and Control Groups / Active Range of Motion- ROM).

**Table 8** shows contractures' severity by joint for the study and control groups (passive range of motion), it clarifies highly statistically significant difference regarding contracture severity and frequency of passive range of motion (X2 =7.57; P= 0.034). Most of the study group (81%) had mild limitation of passive range of motion; compared to more than three quarter (78.3%) of the control group.

Table (8):- Contractures' severity by joint for the study and control groups (passive range of motion -ROM).

	Contract		$\mathbf{X}^2$	<b>P-Value</b>				
	Study group /			Control gro				
	No of contractures (63)			No of contra				
Joint	Mild	Moderate	Severe	Mild	Moderate	Severe		
Shoulder	28	1	0	33	10	2	7.74	0.028*
Elbow	17	1	10	52	5	7	8.23	0.039*
Hip	2	0	0	0	0	0		
Knee	4	0	0	9	2	0	6.67	0.042*
Total	51	2	10	94	17	9	7.57	0.034*
	(81%)	(3.2%)	(15.8%)	(78.3%)	(14.2%)	(7.5%)		

# **Discussion:-**

Burn is the main source of death and inability in the first four decades of life and the third most normal reason for death generally. Burn comprises the second most common reason of trauma-related deaths after vehicular accidents(Goel& Shrivastava, 2010). Burns stay as one of the most widely recognized injury around the world; burns are a significant, worldwide general medical condition, resulting in an expected 195,000 deaths yearly. Survival is no doubt the quick concern; it is the restoration to pre-injury condition, and return to society which becomes significant for the patient and the treating team (Rajan, Tyagi, Dvivedi& Rawat, 2018).

An extensive burn is the most destroying injury an individual can maintain but then desire to survive. Burns establish one of the most reasons of morbidity and mortality around the world. A healed burn patient may be left with scars have fluctuating levels of functional and aesthetic components. Burn injuries cause lifelong physical and mental scarring, result in pain and impacting psychological wellness, quality of life, capacity to get back to work and subsequent mortality (Kartal, Altunel&Bayramgurler).

Severe burn injuries offer many unique challenges for nurses. The main aim is to prevent such contractures which lead to disfigurements, disabilities, and affect patient's quality of life. One of the crucial roles of the nurse especially those nurses working at burn units is to prevent joint contracture after burn injuries: the current study was carried to

investigate the effect of nursing rehabilitation program on minimizing post- burn joint contracture among patients with partial thickness and/or full thickness burn injuries.

The results of the current study come in accordance and support the research hypothesis where burnt patient who were received the nursing rehabilitation program experienced minimal joint contracture and demonstrated a better range of motion exercises. As can be seen from the study findings no statistically significant difference was put into evidence between study and control group, **as regards to socio-demographic and medical data**.

The current study revealed that the age of burn patients ranged from 20 to 60 years; more than two third of the study subjects were in middle age with mean age 35.20±12.04. More than two third of the subjects were males. This might be explained as; it's the age of productivity when they are generally active and are exposed to hazardous situations both at home and work. This finding is in agreement with that of **Singh**, **Kapoor**, **Singh & Gupta**, (2015) who done a prospective study of 314 burn patients and showed that maximum number of patients were in the age group of 21- 40 years, as well near to two third of the studied subjects were males. In addition, **Miller et al.**, (2006) referred to the National Burn Registry which reported that among 142, 318 burn patients more than two thirds of the studied populations were males. **Daffue et al.**, (2018)Faisal et al., (2016) & also in line with **Gupta et al.**, (2011) who stated in his study " A clinico-epidemiologic study of patients with burn injuries at a tertiary care hospital in Punjab, India " out of patients, more than half were males and less than half were female. findings supported byAlavi et al., (2012) &Honnegowda et al., (2019) who reported that the mean age of patients were more than thirty-one.

These results disagree with a study conducted at the burn unit of Al Ahrar Hospital in Zagazig city, Sharkia Governorate by **Magdy et al.**, (2016) entitled as "An interventional study to decrease healthcare associated burn wound infections in the burn unit of Al Ahrar Hospital in Zagazig city, Sharkia Governorate". This revealed that more than half of studied patient was female

As revealed in this study, it is noteworthy to illustrate that the higher incidence of burn injuries occurs among illiterates and less educated patients as well as the effect of the work place and place of residence which also increased the incidence of burn injuries. As shown in this study about one third of the studied subjects were from the category of secondary and before college level of education, most of the studied subjects were living in rural area. This may be attributed to lack of safety measures and poor housing conditions of most of houses in rural areas.

These findings are similar to the study done by **Mistry**, **Pasisi**, **Chong**, **Stewart and She** (2010) who studied socioeconomic deprivation and burns, and established that the rate of admissions to burn units are expanded in extent with diminishing financial status, as those with the most available resources are presented to burn risks like poor housing quality (a household with no isolated kitchen), absence of smoke alarms, cigarette smoking, household overcrowding and low educational level. In addition, **Sarbazi et al.**, 2019 who studied Epidemiology and the survival rate of burn-related injuries in Iran reported that the extent of burn rate among the rural population of Iran is higher than among the urban population. Due to their lower possibility of access to treatment facilities, and mortality rate resulting from burns is higher among rural patients than urban patients and lack of awareness about self-precautions from burn hazardous at home.

As well, the **World Health Organization**, (2018) studied of burns and demonstrated that people living in low and middle- income nations (as in rural region) are at higher danger for burns than individuals living in high-income countries as burn casualties commonly come from poor families in rural regions. Moreover **Shankar**, **Naik and Powar**, (2010) who concentrated on epidemiological investigation of burn injuries admitted in two clinics of North Karnataka were accounted for that the majority of the burn patients were from rural areas.

As regards to medical data and patient diagnosis, the current study indicates that the majority of the study subjects were caused by thermal burn injuries in form of fire/flame. This may be attributed that most of the patients from rural areas using traditional methods and ovens in their daily cooking and practices. This finding is supported by **Sarabahi et al.**, (2012) who studied principles and practice of burn care and revealed that thermal injury is the commonest cause of burns that caused by flame, scalds and contact with hot liquids and hot objects and the same author showed that flame burns account for over 80% of the total burn patients in India. Also, **Schaefer, Szymanski** (2019) who studied Burn Evaluation and Management proposed that thermal burns are the most common type of burn injuries.

Moreover, **Faris and Al Naser (2019)** who studied Epidemiological characteristics of burn injuries in Iraq: A burn hospital-based study and found that most of patients were burned by flame and about quarter of them were burned by hot fluid. On the other hand, The American Burn Association (ABA) National Burn Repository 2019 reports that, overall, flame burns are still the majority of injuries in the USA.

**Regarding extent of burn injury**, the current study demonstrated that more than one third of the studied subjects having TBSA ranged from 20-29%, followed by one third with TBSA ranged from 10-19%. This may be interpreted by the most subjects injured by flames; resulted in the extent of the burn rate exceeds 10% to 50%. This finding is consistent with that of Othman and Kendrick (2010) who studied epidemiology of burn injuries in The East Mediterranean Region and reported that the TBSA for patients who admitted to burn unit ranges from (1-100%). While, the mean TBSA burnt in all age's ranged from (10-48%).

These finding was supported by **Chien et al.**, (2003) who reported that the mean percent total body surface area (%TBSA) for adults was (19%). Also, the previous finding was supported by Hosseini et al., (2017) who stated about two-third of the patients were male. The majority of burns were less than thirty percentage of total body surface area. Also, the findings of the present study agree with a study conducted by Khadem-Rezaiyan et al., 2020 who studied Epidemiology of severe burns in North-East of Iran: How is the burn size different in a developing country from developed ones? And observed that most patients were admitted with a 20–29% of burnt total body surface area (TBSA).

**Concerning degree and depth of burn**, the current study revealed that one half of the studied subject had both partial and full thickness burn injuries as this is one of the study criteria and also, contractions considered from the major clinical complications with deep dermal and full thickness burns which initiate the deficiency of joint mobility and dysfunction in everyday activities. In addition, TBSA and burn depth were noted to be associated with contracture advancement. These findings are in agreement with findings of **Li**, **Yao**, **Tan**, **Zhou**, **Li**, **Wu**, **and Luo** (2017) who concentrated on Epidemiology and outcome analysis of 6325 burn patients: a five-year retrospective study in a major burn center in Southwest China and found that patients with full-thickness burns accounted for 40.1% of all patients; these burns were primarily caused by flame and illustrated that flame burns were the most widely recognized reason of full-thickness burns.

In addition, **Goel and Shrivastava (2010)** who studied post-burn scars and scar contractures and recommended that, post-burn scars are unavoidable even with the best of treatment because they rely on the depth of burn injury. Except for the superficial dermal burns, all deeper burns (2nd degree deep dermal and full thickness) heal by scarring. This scarring must be limited by different physical therapy measures and plastic surgerieshowever not dispensed with totally.

Concerning to chronic illness before hospitalization, the current study revealed that the majority of the studied subjects were free from any chronic illness. That's because of the study results proven that more than two third of the studied subjects were from adult middle-aged group. This result is supported by **Baldwin**, **Kaneda and Amato**, (2011) who studied chronic diseases do affect youth and this could provide an explanation for those chronic diseases as diabetes, heart disease, cancer, lung disease or stroke are less common among young adult people. Also, these finding supported by **Maghsoudi et al.**, (2008) who stated that the lowest percentage of burns patients had diabetes. Also, in an agreement with result **Dolp et al.**, (2019) who mentioned that the lowest percentage of burn patients admitted between 2006 and 2016 have diabetes mellitus

# In attempt to identify factors contributing to burn joint contracture

**Regarding pain with exercise,** the current study revealed that the vast majority of the subject were complained of pain with physical exercises sessions. From the researcher point of view, all patients admitted to burn unit complained of severe procedural pain after wound dressing and physical exercises. The majority of the subjects had thermal burn injury, in addition no pain killers given to patients before procedures (no regularly scheduled analgesics). So, all patients had intense procedural pain, as well as a possible explanation of this severe pain that partial thickness burns characterized by a high pain intensity especially after procedures such as physical exercises. In addition, a contracture may occur as the patient with pain likely prefers a flexed position for comfort.

This finding is supported by Lemon et al., (2011) who studied nursing care of patients with burn and showed that the patient experiences excruciating pain with extensive superficial and all partial-thickness burns. Intense pain is

also experienced during wound care and physical therapy. Speaking the same language, **Norman and Judkins** (2004) who studied pain in the patient with burn and clarified that thermal burn injury caused one of the most painful and disfiguring forms of trauma.

In addition, Luo, Cao, Zhong, Chen, Cen (2019) who studied Adjunctive virtual reality for procedural pain management of burn patients during wound care or physical exercise: A systematic review and meta-analysis of randomized controlled trials and focused on burn patients experience one of the most extreme and excruciating kinds of pain, particularly during the regular and continued dressing change and physical exercises. As well, **Summer, Puntillo, Miaskowski, Green and Levine, (2007)** who studied burn injury pain: the proceeding with challenge, and pointed out that procedural pain is the most probable and most intense kind of pain to be untreated.

As regarding to length of hospital stay; the findings of the current study showed that more than half of the studied subjects were stayed more than three weeks in the hospital. That's why the researcher explains that study subjects are suffering from partial to full thickness burns, which healed throughout 21 days or more for healing in addition to the difference on the length of hospital stay between patients depending on various factors such as age, cause of burn, and degree of burn and also wound healing process. This finding is inconsistent with **Li,Yao**, **Tan**, **Zhou**, **Li**, **Wu**, **and Luo** (2017) who studied Epidemiology and outcome analysis of 6325 burn patients: a five-year retrospective study in a major burn center in Southwest Chin who found that Overall, the median length of stay was 17 days. In the same line this study agreed with **Saaiq& Ashraf**, (2014) who stated that hospital stay of patients ranged from one to thirty-seven days with a mean of seven days.

The results of the current study had shown that about one third of subjects had burn injury in elbow joint, being the most frequently involved joints with burn injury followed by shoulder joint. Also, the findings of the current study represented that the elbow was the most frequently contracted joint, followed by the shoulder. This is related that more than half of the studied subjects were had burn injury in the upper part of body as most activities of daily living, instrumental activities, and occupational tasks are more implied by upper extremities.

The findings of the present study are in line with **Rizzo, Silver and Frontera (2014)** who studied Essentials of Physical Medicine and Rehabilitation and stressed that contractures are most common at the shoulder, elbow, hip and knee. This is consistent with **Goverman et al., 2017** who studied Adult Contractures in Burn Injury: A Burn Model System National Database Study and found that the hand, elbow, and shoulder being the most frequently involved joints.

In accordance with our results **Flintham& Callaghan**, (2005) support this finding as they stated that exercises were effective on improvement of joint movement and improvement of skin movement. These results were in line with **Zoubine et al.**, (2007) who reported that physiotherapy program in patient with hands burn considerably reduced complications of burning particularly contracture. This finding agrees with **Grisbrook et al.**, (2012) as they showed that effect of exercise education on patients with burns had positive effect on promotion of physical health level and also improvement of their life quality. Likewise, **Ardebili et al.**, (2014) supported the result as they demonstrated that significant improvements in range of motion and hand function balance from admission to discharge. In deed **Rreca, Hysena (2015)** focused on the significanceof physical exercises and splinting, accomplishing great outcomesin preventing contracture, further developingrange of motion, muscle strength and great restorative outcomes.

# **Conclusion:-**

In light of the current study findings. It could be seen that the recurrence and seriousness of contracture features the need and significance of positioning and physical exercises during the intense hospitalization, which challenge the burn care to find new and better methods of avoiding contracture after burn injury. Moreover, one ought to consider that the appropriate preparation of rehabilitation, restoration to pre injury status and return to society are the goal that the researcher hopes to accomplish.

# **Recommendations:-**

# In the light of the results of the present study, the following recommendations are suggested:

1. Follow guidelines that recommend demonstrating scheduled analgesic before painful procedures; such as wound dressing and physiotherapy as well as before sleeping time at night according to severity of pain.

- 2. Daily assessment of patient physical conditions as rehabilitation progress, based on the patient medical condition.
- 3. Closely monitor skin condition for any signs of infection as these can delay wound healing and consequently contributing to contracture.
- 4. A booklet with all important information about burn management to avoid joint contracture for each patient with major burn injury.

# **Recommendations:-**

### Geared toward the research:

- 1. Measuring impact of early rehabilitation program as an important intervention for minimizing contracture in sever burn patients.
- 2. Apply research on assessing the impact of contracture severity on quality of patient life and function.
- 3. Assessment of the effect of length of hospital stay on severity and frequency of contracture.
- 4. Apply future research on Assessment of factors that contributing to joint contractures with severe burn injury.
- 5. Further researches are needed with large sample size for generalization of the results to population with major burn injuries.

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