Effect of Non Pharmacological Interventions on Pain and Skin Erythema Associated with Cellulitis

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Abstract

Background: in this study the researcher describes effect of applying non pharmacological interventions including cold application and on pain and skin erythema associated with cellulitis. **Purpose**: this study aimed to evaluate the effect of non pharmacological interventions on pain and skin erythema associated with cellulitis. **Design:** Experimental design was utilized in this study, at male and female medical departments in the New General Mansoura hospital, Dakahlia Governorate, Egypt. **Subjects**: A purposive sample included (64) patients diagnosed of cellulits, admitted to inpatient ward and willing to participate included in the study.Those patients are randomly divided into two equal groups (study& control); study group used non pharmacological intervention for 20 minutes two times per day for 5 consecutive days plus pharmacological treatment, while control group used pharmacological treatment only. **Tools:** Two tools were used to assess pain and skin erythema associated with celluitis. Visual Analog Scale (VAS), which is utilized to detect pain level. While skin erythema (inflammation regression) was assessed by measuring level of superior edge moved down by labeling superior edge by ink pen before starting study and after completing the study to calculate shrinked area (inflammation regression). **Results**: There was significant reduction regarding pain level and skin erythema (inflammation) surface area among study group compared to control group. **Conclusion/implication for future practice**: non pharmacological interventions could be combined with pharmacological treatment to reduce cellulitis pain and skin erythema. **Recommendations**: educational program to nursing staff about non pharmacological interventions as nurses can aid in pain management after good training by applying non pharmacological interventions for patients who have no contraindications.

Keywords: Cellulitis, non pharmacological interventions, cold application, pain, skin erythema.

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Introduction

Cellulitis is an acute inflammatory disease of the skin which is manifested by localized pain, erythema, edema, and warmth secondary to Staphylococcus aureus and streptococci skin infection and treated by antibiotics which are the usual drugs of choice (Inaoki et al., 2018).

They have an estimated annual incidence of 200 patients per 100 000 populations and account up to 10% of all hospital admissions and 2.3 million annual emergency attacks. Approximately 70% to 80% of the patients suffer from cellulitis of the lower limbs (Ortiz-Lazo et al., 2019). Being obese, smoker, diabetic, and a

history of cancer you are risk for getting cellulitis (Hannula-Jouppi et al., 2013).

Financial costs of cellulitis treatment have been estimated at $3.7 billion annually. A period of 5 days is generally recommended for treatment of patients with uncomplicated cellulitis (Ortiz-Lazo, et al., 2019).

Non-pharmacological interventions have many advantages as it is inexpensive, safe, plus, does not have any side effect cost saving and can be conducted easily and safely by nursing staff members (Bergomi et al., 2018).

Non pharmacologic or complementary interventions have been increasingly used especially in recent years, as they have a good effect on pain alleviation when they are applied alone or combined with pharmacologic treatment (Gumus et al., 2020).

However, patients describe cellulitis as a painful disease; certainly improper pain management causes stress for a lot of patients. The American Society for Pain Management Nursing (ASPMN) describes patients suffering from pain that they have a right to proper pain interventions. Furthermore, nurses should have evidence-based interventions to alleviate pain among patients suffering from cellulitis (Aktaş & Karabulut, 2019).

Pharmacological and non-pharmacological interventions could be combined with each other or not to alleviate pain level. Non-pharmacological interventions have many advantages in terms of alleviating the pain without applying chemical substances to the body and easily conducted by the nurses. Combination of non-pharmacological interventions with pharmacological treatment, have the promising effect to lower the severity of pain. Cold therapy is known to be an effective tool for pain relieve as it decrease the nervous stimuli (Demir & Khorshıd, 2010).

Most of the cold therapy needs physician' request. Nurses have the responsibility for preparing cold therapy under proper conditions. They have enough information and skills concerning effects and adverse-effects of cold therapy and proper technique because these applications can cause important undesirable sensations like tingling, cold burns, and skin injury when they are implemented improperly (Senol & Aslan, 2017).

Aim of the Study

The aim of this study is to evaluate the effect of non pharmacological interventions on pain and skin erythema associated with cellulitis.

Method

Design: Experimental design was utilized in this study.

Setting: This Study was conducted at the medical department in the New General Mansoura hospital, Dakahlia Governorate, Egypt.

3.3 Subjects: A purposive sample included (64) patients diagnosed of cellulits, and willing to participate included in the study.

Inclusive criteria: Adult male and female patients between 20- 60 years old, diagnosed with cellulitis upper limb, lower limb or trunk cellulitis.

Exclusive criteria: patients with communication disability such as blindness, deafness, and aphasia; not having received a psychiatric diagnosis in addition to, patients with complicated cellulitis such as

abscess formation, coexisting deep venous thrombosis, other skin diseases and wound infection were excluded from the study.

They were classified into study group and control group. The study group receives both pharmacological and non pharmacological treatment, while, control group received traditional pharmacological treatment only.

Sample size was statistically calculated by using the equation of **Steven Thimpsone** equation at 95% confidence power of the study, (**Dawson-Saunders and Trapp, 2001**).

$$n = \frac{N \times P(1-P)}{(N-1 \times (d2 / Z2)) + P(1-P)}$$

n=Sample size

N=Total society size (125 patients)

d=error percentage = (0.05)

P=percentage of availability of the character and objectivity= (0.1)

Z= The corresponding standard class of significance 95%= (1.96).

The sample size was calculated to be **64 patients**.

Tools of the Study

Two tools were used in the study for collecting data and assessing pain and skin erythema (inflammation) associate with cellulitis: Socio demographic characteristics of the participants such as name, age, sex, level of education& residence were obtained.

Visual Analog Scale (VAS), was utilized to assess pain level, is a 10-cm line in length ranging from 0 to 10; 0 refers no pain, and 10 refers the worst pain (**Senol & Aslan, 2017**).

Skin erythema (inflammation) was assess by measuring space of moved down by the superior edge of inflammation through labeling superior edge by ink pen before starting study and after completing the study to calculate inflammation regression (reduction or shrinking). The superior edge was utilized as it is easily to be assessed, while the inferior edge usually includes the foot and is difficult to be assessed.

Validity and reliability

The tools were ascertained by a panel of experts in medical (2 members) and nursing (3 members) for clarity, relevance, applicability, comprehensiveness and ease for implementation.

Realiability of the tool was conducted by Chronbach alpha test which showed 0.83.

Ethical consideration

Approval letter was taken from ethics committee, institutiona review board (IRP) at faculty of nursing, Mansoura university, approval number was Ref.No.0202. All patient data was considered as a secret with complete confidentiality, the patients informed that they have the right to withdraw any time during the study, and their withdrawal will not affect their care.

Oral consent was obtained from patients who accepted to participate voluntarily in this study after illustrating aim and nature of the study. A pilot study was conducted on 5 patients for testing the feasibility and applicability of the tool and it excluded from the study sample.

Necessary modification was done. Data related to socio-demographic characteristics and history of the disease was collected from patient hospital records, patient and /or relevant.

Data collection

Data collection extended over a period of six months started from the 1st of September, 2019 till the end of February 2020. The framework of the study was carried out according to 3 phases:-

Assessment phase included examining the patients with cellulitis on the 1st day of admission to detect site of cellulitis and level of superior edge by label superior edge by ink pen. The superior edge was utilized as it is easily to be assessed, while the inferior edge usually includes the foot and is difficult to be assessed. The researcher detected pain severity using visual analog scale (VAS) by asking the every patient to express pain severity as a number ranged from zero up to ten then record the result as pre test.

Implementation phase: The researcher prepared a lot of gel packs at the same size, from the same manufacturer, then kept them in the freezer at 10 ºC for 45-60 minutes, then the frozen gel pack was applied on the affected area of cellulitis for 20 minutes per session two session per day. The patients were advised to elevate cellulitis are 45 degree using 2 pillow. The study group was managed with cold therapy for 20 minutes two sessions per day for 5 consecutive days in addition to traditional pharmacological therapy.

Evaluation phase: Participants were reassessed 5 days after admission to redetect the severity of pain using the visual analog scale. In addition to, the researcher remarked the superior edge of inflammatory area to detect the distance of superior edge moved down to calculate inflammtion regression (shrinking or reduction). Shrinking of skin erythema was defined as the superior edge of inflammation moved inferiorly rather than continuing to expand or fixed in surface area. This is done by measuring level of superior edge moved down by labeling superior edge by ink pen before starting study and after completing the study to calculate shrinked area.

Data analysis

First, the researcher described the demographic characteristics of the patients participated in the study. Then the researcher used independent t test to determine whether there was mean difference between two sets of observations for both study and control groups.

Finally, the researcher investigated the mean difference between both of pain score and erythema with demographic characteristics.

Results

Table 1 displays demographic characteristics of the patients of the study. The 64 patients in the study varied with regard to characteristics Two thirds of the patients were female; four fifths were obese patients and live in rural areas, moreover, majority of patients suffering from chronic diseases.

Table 2 displays mean difference between two groups before and after intervention as it shows that there is significant reduction in pain score after intervention compared to pre intervention among study group. Also, there is significant increasing of erythema regression during post test compared to pre test among study group.

Table 3 displays relations between pain score and demographic characteristics of the patients; it is clear that there isn't relation between pain score and demographic characteristics of the entire sample.

Table 4 displays relation between inflammation regression and demographic characteristics of the patients the table shows that there isn't relation between erythema regression and demographic characteristics of the entire sample.

Table 1: Demographic Characteristics of the Sample (N=64).

Items	Case (n=32)		Control(n=32)	
	No	%	No	%
Gender				
- Male	13	40.63	9	28.13
- Female	19	59.37	23	71.87
Body weight				
- Obese	24	75	21	65.62
- Non obese	8	25	11	34.38
Residence				
- Rural	23	71.87	20	62.5
- Urban	9	28.13	12	37.5
Chronic diseases				
- Yes	21	65.62	19	59.37
- No	11	34.38	13	40.63

Table 2 Mean Difference between Two Groups before and After Intervention (N=64).

	Pre test		**Post test**	
	Case (32)	Control(32)	Case (32)	Control(32)
Pain	7.04 ± 1.74	6.95 ± 1.36	4 ± 1.27	4.91 ± 1.37
	$p = 0.852$	$t = 0.188$	$p = 0.025$*	$t = -2.328$
Inflammation reduction			5.52 ± 0.801	3.64 ± 1.31
			$p =$ 0.000**	$t = 5.862$

* Referes to significance, p less than 0.05

Table 3: Relations between Pain Score and Demographic Characteristics (N=64).

Pain	Pre test		Post test	
	Case (32)	Control(32)	Case (32)	Control(32)
Gender				
- **Male**	6.33 ± 1.93	6.8 ±1.92	3.77 ± 1.71	5.6 ± 1.67
- **Female**	7.50 ± 1.50	7 ± 1.23	4.14 ± 0.949	4.72 ± 1.27
	p = 0.12 t= -1.62	*p* =0.779 *t*= -0.284	*p* =0.517 *t*= -0.659	*p* =0.215 *t*=1.27
Body weight				
- **Obese**	7.1 ± 1.66	6.87 ± 1.31	4.1 ± 0.99	5.06 ± 1.23
- **Non obese**	6.75 ± 2.36	7.14 ± 1.57	3.5 ± 2.38	4.57 ± 1.71
	p = 0.72 *t*= 0.363	*p* = 0.67 *t* = -0.42	*p* = 0.402 *t* = 0.85	*p* = 0.445 *t* = 0.779
Residence				
- **Rural**	7.44 ± 1.68	7.2 ± 1.42	3.77 ± 1.30	5 ± 1.55
- **Urban**	5.6 ± 1.14	6.5±1.19	4.80±0.836	4.75 ± 1.03
	p =0.033* *t* =2.28	*p* =0.25 *t* =1.18	*p* =0.116 *t*= -1.64	*p* = 0.116 *t*= -1.64
Chronic diseases				
- **Yes**	7.37 ± 1.66	7.07 ± 1.54	3.75 ± 1.34	4.75 ± 1.22
- **No**	6.28 ± 1.799	6.77 ± 1.09	4.57 ± 0.97	5.44 ± 1.5
	p = 0.174 *t* =1.40	p = 0.62 t = 0.495	*p* =0.16 *t* = -1.45	p = 0.142 t = -1.52

Table 4: Relation between Inflammation Regression and Demographic Characteristics (N=64).

Regression	Case (32)	Control(32)
Gender		
- **Male**	5.44 ± 0.95	3.7 ±1.08
- **Female**	5.57 ± 0.71	3.62 ± 1.39
	p = 0.72 *t* = - 0.36	*p* = 0.91 *t* = 0.106
Body weight		
- **Obese**	4.06 ± 0.966	5.46 ± 0.866
- **Non obese**	2.67 ± 1.54	5.80 ± 0.282
	p = 0.015* *t* = 2.65	*p* = 0.458 *t* = -0.75
Residence		
- **Rural**	5.43 ± 0.6	3.41 ± 1.48
- **Urban**	5.84 ± 1.35	4.07 ± 0.817
	p = 0.32 *t* = -1.004	*p* = 0.258 *t* = - 1.16
Chronic diseases		
- **Yes**	5.45 ± 0.617	3.35 ± 1.44
- **No**	5.68 ± 1.165	4.10 ± 0.965
	p = 0.529 *t* = - 0.64	*p* =0.187 *t* = -1.36

Discussion

In this study the researcher evaluate the effect combination of non pharmacological intervention on cellulitis and skin erythema regression (reduction). Treatment duration for 5 days is usually sufficient, but may continue out to 10 days if the cellulitis is not improved (Harrison et al., 2018).

Regarding cellulitis pain

This result showed that there was significant reduction of pain score among case group after cold application compared to case group who received pharmacological treatment only. This result was similar to, (Senol & Aslan, 2017) who mentioned that a cold therapy decreased pain severity. Also, (El-Saidy, et al., 2018) reported that marked alleviation in pain in the study group managed by cold therapy for 20 minutes compared to another group. **In my opinion,** non pharmacological treatment distracted the patients' attention which helped to decrease pain level.

The current study showed that no significant difference among obese and non obese patient concerning pain level. This finding was similar to (Cranendonk et al., 2020) who mentioned that no differences between groups were observed in patient-reported scores for pain. **In contrast**, (Theofiles et al., 2015) mentioned that pain associated with cellulitis in obese patients is associated with increased rates of treatment failure compared to those with normal body weight. **In my point of view,** this non significance returns to nerve endings who responsible for pain sensation located in the skin but the obesity concerned with amount of fat located under the skin.

This study revealed significant reduction of pain and inflammation among study group, this finding was in line with (Kosior & Reich, 2018) who reported decrease of skin erythema among intervention group more than control group. .I**n contrast,** (Davis et al., 2017) reported that there was no significant value of 5 days of cellulitis management.

Concerning inflammation regression (reduction)

The current study revealed significant increasing of inflammation regression (shrinking) among control group after intervention **in contrast**, (Cranendonk et al., 2020) reported minimal differences after treatment. **In my opinion,** this is due to vasoconstrictor effect of cold application which decreased blood flow to the skin and decreased inflammation

The participants of case group had history of chronic diseases more than control one; this result was in the line with (Cannon et al., 2018) who reported that Compared with matched controls, cases were more likely to have a history of co morbid diseases.

The control group patients included more obese patients compared to control group, this finding agreed by (Cannon et al., 2018) who mentioned that case group included more obese patients compared to control group.

Conclusion

Based on the result finding, it is clear that combination of non pharmacological interventions with pharmacological treatment had a noticeable and desirable effect on managing cellulitis pain and erythema regression.

Recommendations

Educational program to nursing staff about non pharmacological interventions as nurses can aid in pain management after good training by applying non pharmacological interventions for patients who have no contraindications.

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Conflict of interest

No

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