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Effects of Nursing Program about Vacuum-Assisted Closure Therapy versus Traditional Wound Dressing, a Comparative assessment on Patients' Outcomes

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Abstract:

Background: Nurses should have adequate training about appropriate dressing selection to enhance the quality of life for patients with chronic wound. **Aim**; To assess the effects of Nursing Program about Vacuum-Assisted Closure Therapy versus Traditional Wound Dressing, on Patients' Outcomes. **Method: Design;** Quasi-experimental (Pre-posttest), a comparative research design between both groups. **Setting:** The trauma departments and outpatients' clinic at Assiut University Hospital**. Subjects**: Total coverage of nurses (N.= 40) and a randomized 60 patients with (chronic wound), both groups nurses and patients were divided into two equal groups. **Tools: (I)** Nurses' interview questionnaire (demographic characteristics, knowledge, and observation checklist), **(II)**: Patients' assessment (personnel and clinical data) and **(III)**: Patients' outcomes sheet; Bates-jensen wound assessment scale and Wound-Quality of life scale. **Results**: A statistically significant difference between nurses' knowledge and practice pre and post-test. Also, between the traditional wound dressing and VAC therapy groups regarding their outcomes (wound healing and wound quality of life) with a positive correlation between them. **Conclusion:** The nursing program had a positive effect on nurses` knowledge, practice and on patients' outcomes who managed with VAC therapy were better than the other group who managed with the traditional wound dressing. **Recommendations:** Continuous instructions and in-service training programs in the trauma departments to improve nurses' knowledge and practice. Apply VAC therapy in managing chronic wound for a better healing and high quality of life.

Keywords: Traditional wound dressing, Vacuum-assisted closure (VAC) & Patients' Outcomes

Introduction:

Chronic wound, that fails to heal or respond to management more than that normally healing period about four weeks and becomes "stuck" in the phase of inflammation (**Bardhan et al., 2020)**. Chronic wounds also have an impact on patients' well-being, and they may reduce their quality of life. They are constituting a significant affliction on patients' daily activities and produce a massive financial ~~and~~ problems for the health care system **(Kapp et al., 2018).**

Teamwork includes nurses and medical staff needed to be confirmed about the proper wound managing and wound healing process**.** Increase nurse's awareness regarding the dressing products and indications of dressing selection skills are two main apparatuses in making a clinical decision and complete wound care **(Ones et al., 2018).**

Traditional dressings are indicated for the clean and dry wounds with mild exudate levels or used as secondary dressings. Since traditional dressings fail to provide a moist environment to the wound they have been replaced by modern dressings with more advanced formulations **(Dhivya, et al., 2015).**

Age-related differences in wound healing, as the elderly wounds can heal but they have a leisurelier in the process of healing particularly in difficult (chronic) wounds. Vacuum-assisted closure (VAC) is an alternate technique of management for chronic wounds, using a negative pressure for unprompted healing or reduced time of reconstruction. VAC includes debridement, suitable hemostasis and using a sterile foam dressing **(Agarwal et al., 2019).**

A negative pressure pieces as a sterile barrier and debrides the necrotic tissue from the wound bed in addition, it improves arteriolar dilation for the microcirculation, minimizes edema (fluid surrounding wound) to decrease colonization of the bacteria **(Nitin et al., 2020) & (Joshua et al., 2020).**

Role of the nurse should be highlighted since nursing profession has the knowledge and skills and managerial competencies to care for any type of wounds and injuries. As nurse is an essential part of the health team, and should assume the functions of

this area, for providing better results for the individual, collective scope and, consequently, in QoL. Health professionals should focus on health of people with chronic wounds, identifying changes in their level of well-being, quality of life and offering the necessary support to help them coping with the difficulties in their recovery (**Chaghari et al., 2017).**

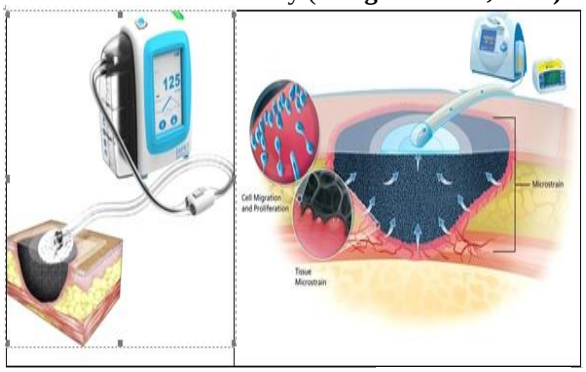

Fig (1), VAC therapy adopted from; **(Boyko et al., 2020).**

Significance of the study:

The chronic wounds complications increase the financial cost and personal problems that may affect patient outcomes. Many traditional chronic wound managements reported that they may need immediate irrigation to avoid delayed in wound closure, which is one main complication of the traditional wound dressing **(Martino et al., 2020).**

Studies from the Western population have shown the significant implication of vacuum-assisted closure (VAC) therapy among the patients with chronic wounds **(Vemulapalli et al., 2020).** This method reported a favorable result and recently it has been shown that VAC therapy reduces death and costs, as it considered the first choice of chronic wound management to ensure closure and high wound-related quality of life for those patients **(Pinto et al., 2020).**

In addition, nurses' experience in our institution regarding VAC therapy as a new method for wound control and treatment was minimal. Subsequently, the role of VAC therapy needs to be studied to establish the efficacy and safety of VAC in the management of chronic wound compared to the traditional wound dressing method.

Aim of the study:

This study aimed to assess the effects of nursing program about vacuum-assisted closure therapy versus traditional wound dressing, on patients' outcomes**. This through;**

- Assessing nurses' level of the knowledge and practice regarding managing of the chronic wound dressing by vacuum-assisted closure therapy and traditional wound dressing (pretest).
- Analyzing the result of the pretest to identify nurses' knowledge and practice needs regarding managing of the chronic wound dressing.
- Developing and implementing nursing program based on the identified needs for the nurse's group.
- Assessing the effect of nursing program on the nurses' level of knowledge and practice in dealing with chronic wound.
- Compare between the effects of wound management on wound healing and wound quality of life for patients managed with VAC therapy versus who manage with the traditional wound dressing.

Research hypotheses:

To fulfil the aim of the study, the following hypotheses formulated:

H0: No difference in wound healing and wound quality of life between the VAC therapy group and traditional wound dressing group after nursing program implementation.

H1: Nurses` knowledge and practice regarding wound management in trauma departments at Assiut University Hospitals will be improved after nursing program implementation.

H2: Wound healing and wound quality of life among the VAC therapy group will be better than traditional wound dressing group after nursing program implementation.

Operational definitions:

Nursing program: is the theoretical and practical education provided for nurses based on their needs assessment with the purpose to prepare them for their duties as nursing care professionals **(Alexander et al., 2015).**

Traditional wound dressing is using the products including gauze, lint, plasters, bandages (natural or synthetic) and cotton wool are dry and used as primary or secondary dressings for protecting the wound from contaminations **(Dhivya, et al., 2015).**

Vacuum-assisted closure (VAC) therapy is a type of wound therapy that helps wound heal more quickly. During the treatment, the VAC device decreases air pressure on the wound to promote healing process **(Sankalp et al., 2017).**

Patients' outcomes: in this study was targeted to be achieved after application of the nursing program measured through wound healing and wound related quality of life.

Patients and Method

Research design: Quasi-experimental (Pre-posttest), a comparative research design between both groups.

Setting:

This study conducted in the trauma departments and outpatients' clinic at Assiut University Hospital.

Subjects:

The nurses: a convenience sample including the total coverage of nurses worked in the trauma departments and outpatients' clinic (N=40).

The patients: a purposive randomized sample of 60 patients with (chronic wound) from both sexes. Those patients were divided into two equal groups. (30 patients) underwent VAC therapy management and (30 patients) underwent traditional wound dressing management.

Sample size

In this study sample size of the studied patients was calculated by using the epi- info program with a confidence level at 95% and the flow rate of patients 270 cases in 6 months so the sample was calculated to be 83 patients 23 patients drop out during the data collection, only 60 patients agreed to participate and completed the study period that divided into two groups in a randomized way according to the admission date.

Inclusion Criteria

Patients with chronic wounds and non-healing ulcers and crush injury.

Exclusion criteria:

- The patient aged <18 years old.
- The patient with diabetes mellitus, fistula, burns, untreated osteomyelitis, necrosis, malignancy, hemorrhagic or vascular disorders, malnutrition, dermatological disease (psoriasis), and immunosuppressive drugs receiving, as such conditions affect wound healing process.

Tools of data collections:

Three tools were used for data collection in this study

Tool (I): Nurses' interview questionnaire:

It developed by the researchers and consisted of three parts:

Part (1): Demographic characteristics of nurses: it includes age, gender, marital status, years of experience, and level of education.

Part (2): Knowledge assessment: it developed by the researchers to assess nurses' level of knowledge about both VAC therapy and traditional wound dressing (definition, indications, contraindications, complications, etc…).

Part (3): Observation checklist: it designed by the researchers to assess nurses' practice about the application of VAC therapy and traditional wound dressing procedure (steps of change dressing in traditional wound dressing and steps of attaching the VAC device).

Scoring system:

Regarding the knowledge assessment: the total questions were 20 questions; one mark was given for the correct answer and zero for the incorrect answer. Those who obtained less than (50%) considered a poor knowledge level and above considered a satisfactory knowledge level while the total knowledge scores were 20 grades (**Onianwa et al., 2017).**

Regarding the nurses' performance: the total steps where 50, 2 marks were given for each correct performing step, 1 grad for incomplete correct step and zero for the incorrect step. Those who obtained less than (50%) considered unsatisfactory practice level and above (50%) considered a satisfactory practice level, while the total checklist of performance were calculated 100 grades (**Onianwa et al., 2017).**

Tool II: patients' assessment:

It was designed by the researchers based on the current national and international literature and it consisted of two parts:

Part (1): Patients' Personal Characteristics: it includes age, gender, marital status, occupation, and level of education.

Part (2): Patients' Clinical data: it includes medical diagnosis, previous disease, chronic diseases, causes of the wound and type of dressing used.

Tool III: Patients' assessment outcomes: It consisted of two parts;

Part (1): Bates-Jensen wound assessment Scale (BWAT) (Bates-Jensen et al., 2010): It is a comprehensive discriminative tool aimed to assess the wound deterioration severity for four weeks follow up after the nursing program implementation.

- This contained assessment of wound' characteristics as; size, depth, edges, necrotic tissue type, amount of necrotic, exudate amount & type, surrounding skin edema, induration, granulation, color and epithelialization tissue.

Scoring system:

It consisted of 13 items graded on a scale from 1 to 5. Score of 1indicates progress toward healing while a score of 5 indicates the absence of healing or wound deterioration. The cumulative (BWAT) scores vary from 13 to 65.

In classification: 13–20 = minimal severity, 21–30 = mild severity, 31–40 = moderate severity and 41–65 = extreme severity.

Part (2): Wound- Quality of life (QOL) questionnaire (Augustin et al. 2017):

It aimed to assess the wound-related quality of life among patients with chronic wounds for four weeks follow up after the nursing program implementation. It composed of 17 items, the items were assigned to subscales as follows: Subscale (1) 'Body': Items 1 to 5, Subscale (2) 'Psychological': Items 6 to10, Subscale (3) 'Everyday life': Items 11 to 16 while the item 17 belonged to a financial.

Scoring:

Each item was coded on a scale from 0 to 4 Likert scale (0='not at all' to 4='very much').

Where a low score of "0" indicates enhanced high wound quality of life while a score of "4" indicates wound quality of life deterioration.

The nursing program:

It was prepared by the researchers based on reviewing the recent literature and opinion of the surgical and nursing experts and bases on the nurses' needs and requirements. It was designed in a simplified Arabic language and was supported by photo illustrations and colored pictures. It comprised two parts.

1. **Knowledge part;** included VAC therapy and traditional wound dressing, their indications, contraindications, nursing instructions before, during and after the procedure **(Serena et al., 2021).**
2. **Practical part;** included the standardized steps of both VAC therapy **(Williams, 2020)** and traditional wound dressing **(Pilehvar-Soltana hmadi et al., 2018).).**

Content validity and reliability:

The validity of the present study' tools was checked by (5) expert professors in the field of nursing and surgical whom reviewed them for its relevance, clarity, comprehensiveness, applicability and easiness. Minor modifications required correction were carried out accordingly.

The Reliability of **tool I** (Nurses' interview questionnaire) was confirmed by Alpha (α) Cronbach test (0.95). The interrater reliability of **tool III (part 1)** (Bates-Jensen wound assessment Scale (BWAT)); its internal consistency calculated via the Cronbach α was 0.85. The internal consistency of **(part 2)** (Wound- Quality of life (QOL) questionnaire) global score and subscale 1 "Body" was high with Cronbach's alpha = 0.91, Internal consistencies of subscales 2 "Psychological" and 3 'Everyday life' was also acceptable with 0.83 and 0.71 for financial sub item.

A pilot study:

The pilot study carried out during July (2019) and last for one month on 10% of the total subjects (4 nurses and 6 patients). Subjects involved in the pilot study were including within the actual study sample because no modifications of data collection tools were done.

Method:

Administrative approval:

An approval from faculty of nursing, Assiut University was taken. Hospital permission from the head of trauma departments was taken after clarification of the aim and nature of the study.

Ethical consideration:

The study followed the principles of **Helsinki (1996)** declaration for medical research. The proposal of the current research was approved from the ethical committee in the faculty of nursing. There was no risk for study subject during application of the research. Informed consent obtained from the patients who are willing to participate in the study after explaining the nature and purpose of the study. Nurses & patients had the right to refuse to participate and/or withdraw from the study without any rational and at any time to maintain anonymity.

Data collection (fieldwork) procedure:

An explanation of the purpose of the research was done to the directors of Assiut University hospital and trauma departments. The researcher gave the directors of the outpatients' clinics a copy of the official letter and schedule of the selected samples.

It was done by pretest, the researcher started to collect data from 1st of July 2019 to 31 of December 2019. The total period for data collection was (24 weeks) about 6 months period.

Data collection done through the following phases:

I: Preparatory phase:

- Needed administrative permissions obtained, assessment of the study setting for the possibility of meeting nurses and patients for assessment and implementation of the nursing program.
- The researcher developed tools **(I&II)** after reviewing the related literature.
- At the first interview, researchers introduced themselves to initiate line of communication, and then explained the nature & purpose of the study.
- Time of data collection decided according to the studied sample time in the morning shift after coordination between the researcher managers of the departments and outpatients' clinics.
- Data collection conducted in the dressing rooms in both trauma departments and outpatient's clinics. This arrangement was done with the head of the trauma departments to save all equipment needed for both VAC therapy and traditional wound dressing.

II: Implementation phase:

Regarding the nurses:

- The researcher started data collection from the studied nurses about (4-5) nurses per day twice weekly. They interviewed personally for an hour (as a pre-test). To fill the questionnaire's items **(Tool I)**. While, the nurses were on their duty time, it took about 15 minutes while the observation checklist filled by the researchers and took about 45 minutes, this assessment performed in both the trauma departments and outpatients' clinic**.**
- The nursing program content met the nurses' needs and their levels of understanding and based on national and international resent literature.
- The content of the nursing program discussed with the nurses in three sessions: one theoretical session and two practical sessions.

- The number of nurses in each session was different according to the availability of the nurses (4-5nurses). Each session time ranged from 30 to 40 minutes.
- The researchers explained the theoretical part, using PowerPoint and colored brochure to clarify the knowledge regarding the VAC therapy and traditional wound dressing. They demonstrated the practical part, using a training Manichean and playing teaching videos on the personal laptop of the rescuers. Using the real equipment for both VAC therapy and traditional wound dressing standardized procedure to put the nurses in the real situation.

Regarding the patients:

Before the application of the nursing program on patients the researchers assessed patients' personal and clinical data (**Tool II**) and their outcomes using (**Tool III**) to take the baseline data (pre-test). It took about 30 minutes, about 3-4 patients per day/ twice weekly.

III- Evaluation phase:

Regarding the nurses:

- Immediately after application of the nursing program, the researchers evaluate the nurses' performance (as a post-test) using the previously mentioned tool **(I)** it took about an hour for both the trauma and outpatients' clinic nurses.
- The final-colored printed copy was given to each nurse participate in the study and the head nurses.

Regarding the patients:

- Both groups were followed up twice weekly for 4 weeks during their admission (as a post-test) in the trauma departments and after their discharge during their weekly visits at the outpatients' clinic, using **Tool III** (BWAT) and Wound-QOL" questionnaire and the evaluation took about 20 minutes to assess their outcomes.

Statistical design:

The collected data were tabulated and statistically analyzed to evaluate the differences between the groups under the study using frequencies and percentages, mean ± SD using (SPSS) version (26). T-test, Chi-square tests, One-way ANOVA test and Pearson correlation test used in the relationship between variables. The significant P. value equal < (0.05).

Results

Table (1): Distribution of the studied nurses' demographic characteristics (N. =40).

Items	Group	
	N. =40	%
Gender:		
Female	40	100.0
Age:		
18 to < 25	23	57.5
25 to ≤ 35	15	37.5
> 35	2	5.0
Mean ± SD	**24.5±3.9**	
Education level:		
Diploma education	23	57.5
Technical Institute	11	27.5
Bachelor	6	15.0
Experience level:		
1 to < 3 years	26	65.0
3 to < 5 years	6	15.0
5 to ≤ 10 years	1	2.5
> 10 years	7	17.5
Mean ± SD	**4.4±3.9**	
Marital status:		
Single	23	57.5
Widow	1	2.5
Married	15	37.5
Divorced	1	2.5
Training for wound management:		
No	40	100.0

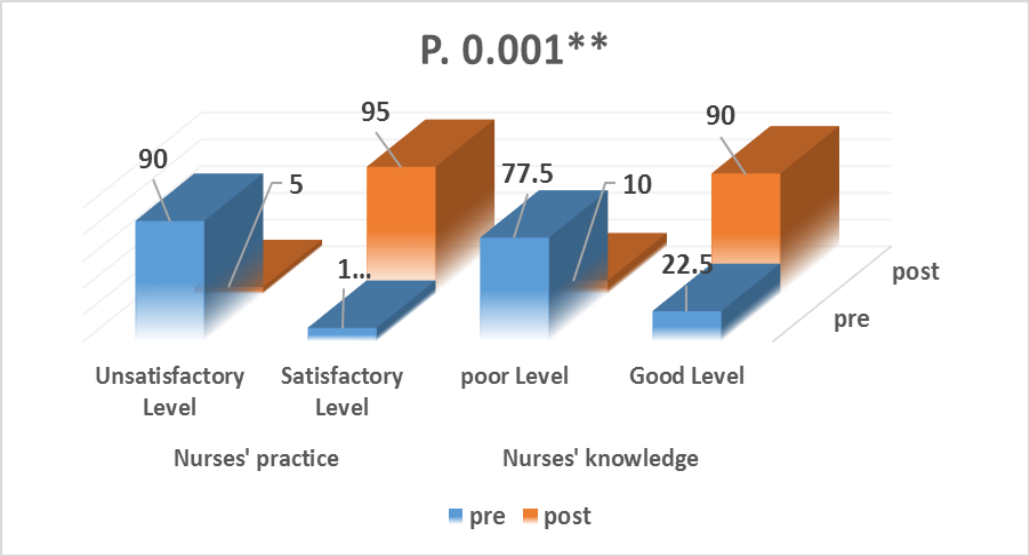

Figure (1): Distribution of the studied nurses' total performance (knowledge and practice) levels (N. =40).

Table (2): Comparison between VAC therapy and traditional wound dressing groups regarding their demographic characteristics (N. = 60).

Items	VAC therapy		Traditional wound dressing		P. value
	(N.=30)	%	(N.=30)	%	
Age:					
18 ≤ 55	16	53.3	15	50.0	0.561
> 55	14	46.7	15	50.0	
Mean ± SD	**53.8±9.6**		**52.8±10.2**		
Gender:					
Male	25	83.3	27	90.0	0.745
Female	5	16.7	3	10.0	
Marital status:					
Single	7	23.3	10	33.3	
Divorced	1	3.3	2	6.7	0.619
Married	18	60.0	13	43.3	
Widowed	4	13.4	5	16.7	
Level of education:					
Illiterate	2	6.6	5	16.7	
Read and write	8	26.7	10	33.3	0.632
Secondary education	17	56.7	13	43.4	
High education	3	10.0	2	6.6	
Occupation:					
Employee	10	33.3	9	30.0	
Farmer	12	40.1	15	50.0	0.790
Student	4	13.3	3	10.0	
Housewife	4	13.3	3	10.0	

Independent sample t test ** Statistically significant differences (p ≤ 0.05)*

Table (3): Relation between VAC therapy and traditional wound dressing groups regarding the mean wound healing scores for 4 weeks (N. =60).

Follow up	VAC therapy group (N.=30)	Traditional wound dressing group (N.=30)	P-value
	Mean ± SD	Mean ± SD	
1st Week	37.5±2.2	36.9±2.4	0.0.317
2nd Week	31.1±6.1	36.8±5.7	0.0001*
3rd Week	21.4±4.2	36.3±7.3	0.0001**
4th Week	13.9±0.8	30.6±7.1	**0.0001****
P. value	**0.001****	0.067	

One-way ANOVA test ** Statistical significant differences (p<0.05)*

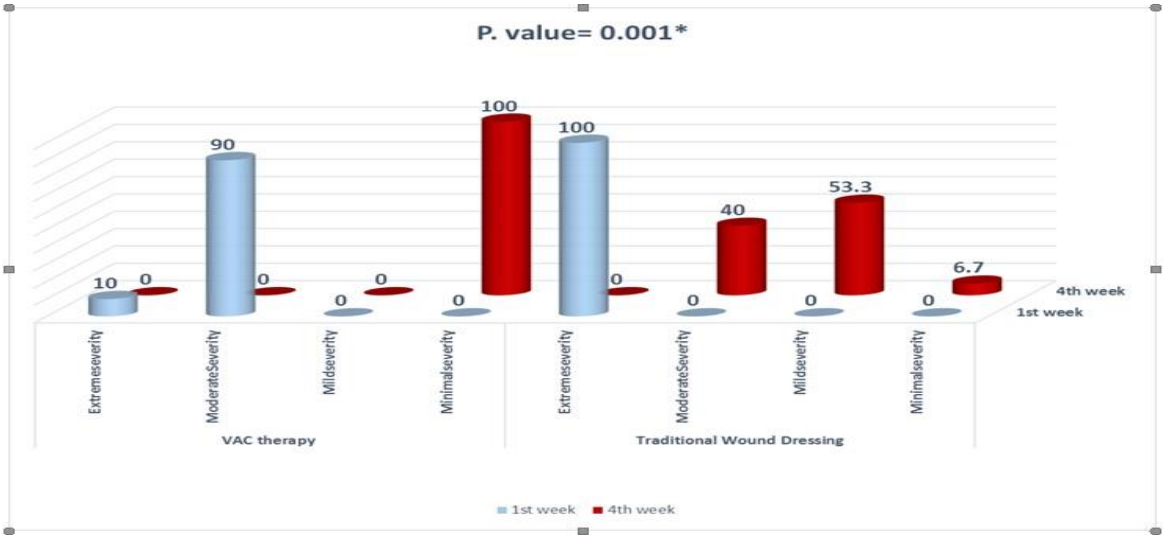

Fig (2): Relation between VAC therapy and traditional wound dressing groups regarding the wound deterioration severity levels for 4 weeks of follow up (N.=60).

Table (4): Relation between the VAC therapy and traditional wound dressing groups regarding the means of their wound QOL scores for 4 weeks of follow up (N.=60).

Weeks	VAC therapy group			Traditional wound dressing group			P-value
	physical	Psychological	Everyday life	physical	Psychological	Everyday life	
	Mean ± SD			Mean ± SD			
1st Week	5.3±0.8	6.8±0.7	5.3±0.9	15.2±0.8	12.3±0.9	13.6±0.9	0.0001**
2nd Week	4.7±0.9	6.3±0.6	4.9±0.8	14.6±1.2	11.3±1.1	13.2±1.5	0.0001**
3rd Week	3.5±0.7	2.3±0.9	3.4±0.9	9.8±1.8	9.9±1.6	8.2±1.7	0.0001**
4th Week	2.3±0.9	2.7±0.8	2.6±0.8	6.3±2.9	7.5±2.6	6.7±2.8	0.0001**
P. value	**0.001****			0.067			

One-way ANOVA test ** Statistically significant differences (p < 0.05)*

Table (5): Relation between the wound deterioration severity levels among VAC therapy and traditional wound dressing groups with their demographic characteristics (N. =60).

Items	Traditional wound dressing group (N.=30)								P-value	VAC therapy group (N.=30)								P. value
	Minimal Severity N.= 0		Mild severity N. =10		Moderate severity N. =13		Extreme severity N. =7			Minimal Severity N.= 9		Mild severity N. =21		Moderate severity N.= 0		Extreme severity N. =0		
	N.	%	N.	%	N.	%	N.	%		N.	%	N.	%	N.	%	N.	%	
Age:																		
18 ≤55	-	-	10	100	3	23.1	2	28.6	**0.049***	9	100.0	7	33.3	-	-	-	-	**0.032***
> 55	-	-	-	-	10	76.9	5	71.4		-	-	14	66.7	-	-	-	-	
Gender:																		0.116
Male	-	-	10	100	13	100	4	57.1	**0.012***	9	100	16	76.2	-	-	-	-	
Female	-	-	-	-	-	-	3	42.9		-	-	5	23.8	-	-	-	-	
Marital status:																		**0.031***
Single	-	-	8	80.0	2	15.4	-	-		6	66.7	1	4.8	-	-	-	-	
Divorced	-	-	-	-	2	15.4	-	-	**0.001***	-	-	1	4.8	-	-	-	-	
Married	-	-	2	20.0	8	61.5	3	42.9		3	33.3	15	71.4	-	-	-	-	
Widowed	-	-	-	-	1	7.7	4	57.1		-	-	4	19.0	-	-	-	-	

Chi-square test & On-way-ANOVA test ** Statistically significant differences (p ≤ 0.05)*

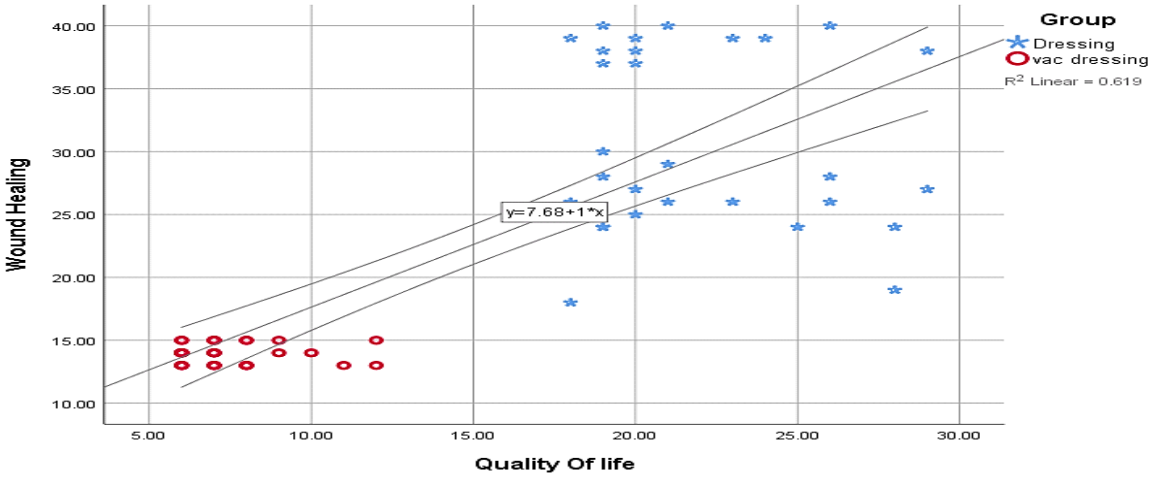

Fig (3): Correlation between wound deterioration severity and wound quality of life among the studied patients.

Table (1): Shows that mean age of nurses were **(24.5±3.9 years old**), all nurses were females, more than half of nurses were single, had a diploma degree and from one to less than three years' experience. Finally, no nurses had training for wound management before (57.5, 57.5, 65, 57.5 and 100% respectively).

Figure (1): Enumerates that there was a statistically significant difference between nurses' total knowledge and practice level pre and post nursing program application with p-value = 0.0001**.

Table (2): Displays that there was no statistical significance difference between the VAC therapy and traditional wound dressing groups regarding their demographic data except within the age groups. The mean of age was (52.8±10.2, 53.8±9.6) years old in the both groups. Most of the studied patients were male, married, secondary education, farmer, all did not have any chronic diseases in both groups.

Table (3): Expressions that there was a statistically significant difference between the VAC therapy and traditional wound dressing groups related to mean wound healing scores for 4 weeks of follow up with p-value (0.0001***). Also, the table shows that the VAC therapy group improved after the 4th week of follow up.

Figure (2): Discloses that there was a statistically significant difference between the VAC therapy and traditional wound dressing groups related to wound deterioration severity levels for 4 weeks with p-value (0.0001*). The figure revealed that the number of patients with minimal severity increased among the VAC therapy group (100%) than the traditional wound-dressing group (6.7%) after the 4 weeks of follow up.

Table (4): Shows that there was a statistically significant difference between the VAC therapy and traditional wound dressing groups related to wound quality of life at the 4th week of follow up after the nursing program application with p-value (0.0001**). There was a great improvement in the studied patients' QOL after application of the nursing program.

Table (5): Shows that there is a statistically significance relation between wound healing severity among the traditional wound dressing group and their demographic characteristics related to their age groups, gender and marital status, with p- value (0.049*, 0.012*, and 0.001* respectively). This table also shows that there was a significance relation between the VAC therapy group with their demographic characteristics mainly related to their age groups and marital status, with p-value (0.032* and 0.031*respectively)**.** The results added that there was no statistical significance relation between both VAC therapy and traditional wound dressing group with patients educational level and occupation**.**

*****The table also, showed that there was no statistical significance difference between the studied patients' wound quality of life and their demographic data after four weeks of nursing program implementation.

Figure (3): Shows that there was a positive correlation and improvement in the wound quality of life by improving the patient's wound deterioration severity levels among the studied patients, with Pearson correlation coefficients (r. 0.525* and p. = 0.001*)

Discussion:

Vacuum-assisted closure (VAC) therapy, through a negative pressure to the wound bed so, fluid is

removed, granulation tissue is promoted to form, and wound healing is facilitated (**Ciliberti, 2016)**.

Regarding to the studied nurses' demographic characteristics, the results of the study presented that that mean age of nurses was (24.5±3.9), all nurses were females, and more than half of nurses were single, had a diploma degree and experienced less than three years. According to The researcher opinion nurses with less years of experience may require maximum additional training programs to overcome their minimal experience. It observed that all of nurses do not receive any training programs regarding wound care. This might be due to that the hospital did not have staff development program.

This match with **Bahza, (2013)** findings as he reported that most of the nurses working in the surgical departments were females with nursing diploma and did not receive any in crevice training regarding wound dressing previously. But, **Welsh, (2018)** mentioned that the three thirds of the nurses' experience ranged from 5 to 10 years that may be due to that the administrators selected the older age nurses to be able to perform mainly tasks in the trauma unit effectively

The current study founded that most studied nurses had unsatisfactory level of knowledge and practice before implementation of nursing training program. According to the researchers' opinion that poor knowledge and practice level may due to lack of available Arabic language source for the graduated nurses to continues education and update their level of performance. This area of performance is important in order to deliver optimal care to those patients and to minimize adverse effects of the wound and length of stay.

In present study after implementation of the nursing program, more than half of nurses' performance were improved. This might relate to the fact that the nurses had a strong desire to acquire new knowledge as more than half of nurses were single and have spare time to learn. In this aspect, **Lindsay et al., (2017)** conveyed that organization must establish standards to guide practitioners in carrying out safe and actual care.

This result is in harmony with the results of **Amer, (2019)** who found that nurses' level of knowledge did not increase correspondingly to their decrease of experience duration.

Regarding to the studied patients' demographic characteristics, their mean ages were (52.8±10.2, 53.8±9.6) years old in both groups. It is observed that traumatic chronic wounds are more frequent among young people with an active working life. The study found that most of patients were males, married, secondary education, and farmers.

These study findings were supported by **Raj et al., (2016)** in the study entitled "Evaluation of vacuum assisted closure therapy for soft tissue injury in open musculoskeletal trauma" as they found that the patients' ages were from 18 to ≤ 55 years old. But this not in the same line with **Hussein et al., (2020)** who conveyed that most of the trauma patients aged 60 years old and above.

Generally, the present study found no statistical significance difference was found between both groups regarding their demographic data. This was important to ensure comparability of the two groups and indicate successful randomization of the two groups. This confirmed by **Boonchoo et al., (2019).**

The current study reported that the number of patients with minimal severity increased among the VAC therapy group than the traditional wound dressing group after the 4 weeks of follow up with a statistically difference between both groups.

According to the researchers' opinion explaining that VAC therapy provides a sterile, controlled environment that can lessen the duration of wound healing for perfect soft tissue coverage and can used as an alternate method for treating trauma injuries of soft tissue. According to **Whitehead et al., (2016)** who described in their study of "Economic evaluation of Vacuum Assisted Closure Therapy for the treatment of diabetic foot ulcers" in France that VAC therapy was a dominant intervention when compared with traditional dressings.

This also confirmed by **Vijayan et al., (2015)** in the study of " Efficacy of Modified Vacuum Assisted Closure in Wound Healing" which proven that comparing to the conventional moist betadine dressings with vacuum assisted therapy regarding, the granulation tissue, clearance of the infection, wound healing, length of hospital stay, and cost effectiveness lead to improve their quality of life.

The current study illustrated that the wound-related quality of life among studied patients improved among the VAC therapy group after the nursing program implementation than the traditional wound dressing group. This may be explained as the trauma patients with chronic wounds had numerous factors may influence wound quality of life (QOL). Following the current study, the results of **Flack et al., (2018**) reported an improvement in the wound quality of life among patients after vacuuming assisted closure therapy. Another significant mechanism was considered by **Costa et al., (2018)** who revealed that patients treated with VAC therapy experienced more quality of life than any type of wound management. While, in contrast **Dhayat et al., (2019)** who concluded that the patient with VAC device had low QOL that traditional wound dressing due to presence of the negative pressure device that causes a great resistance of the activities of their daily living.

There was a relation between the VAC therapy group with their demographic characteristics mainly related to their age groups, gender, and marital status.

The present study revealed that adult patient's group who aged from 18 to ≤ 55 years old experienced a significant improvement in wound severity among the VAC therapy group than traditional wound dressing group after the nursing program application than the elderly group patients who aged more than 55 years old. This may be due to delay of wound healing process during aging process, because of decrease collagen and vascularity.

Attia et al., (2020) explaining that age-related changes had an impact on the wound healing process through reduced skin elasticity, collagen, and age-related diseases so wound healing impaired.

Within this context, **Ahmedy et al., (2020)** reported that the wound causes problems in their activities of daily living and financial difficulties; since they must be absent from work, which leads to financial losses, impairment of Qol and feelings of loss of social identity.

Finally, the present study proved that there was a great enhancement in outcomes of the studied patients' regarding the wound-related quality of life by enhancing the patient's wound deterioration severity after the nursing program application. The researcher opinion that the patients with chronic wound experience poor QoL compromising their ability to work, carry out housework, perform personal hygiene activities and participate in social/recreational activities. The present study enhances the patients' wound healing that lead to improve their wound QOL after application of the nursing program.

In this context, **Joaquim et al., (2018)** concluded that people with chronic wounds experience alterations in body image, mobility impairments, self-care deficit, inability to perform activities of daily living, pain, and discomfort, leading to negative impacts on quality of life, so enhancing wound healing had appositive effect on improving quality of life among patients with chronic wound.

Conclusions:

- Nurses` knowledge and practice concerning VAC therapy and traditional wound dressing improved after the implementation of nursing program.
- Patients' outcomes (Wound healing and wound-related quality of life) among the patients managed with VAC therapy were better than traditional wound dressing with a positive correlation the nursing program applications.

Recommendations:

- Using VAC therapy in all types of wound for better wound healing and a high wound quality of life.
- Replication of this research on a larger probability sample from other geographical areas.

Declaration of conflict of interests:

The authors declare that there is no conflict of interest.

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