



A Training Program for Caregivers Regarding Clients Using Vacuum Wound Therapy

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ABSTRACT

Background: Vacuum wound therapy is a dressing system that continuously or intermittently applies negative pressure across the surface of wounds that are acute, chronic, complex, or difficult to heal; this type of treatment has become one of the essential elements for the modern and comprehensive treatment of wounds. **Aim:** Evaluate the training program for caregivers regarding clients using vacuum wound therapy. **Design:** A quasi-experimental design was used. **Setting:** The study was conducted at outpatient emergency surgical clinic which affiliated to emergency hospital 185 at Cairo university hospitals **Sample:** Convenient sample that included all caregivers who have clients with limb traumatic wound using vacuum wound therapy at home (98 client and 98 caregivers). **Tools of data collection: An interviewing questionnaire sheet consists of five parts: Part I:** demographic characteristic of caregivers and clients. **Part II:** Past and previous history of the clients **Part III:** Clients home environment reported by caregivers. **Part IV:** caregivers' knowledge vacuum wound therapy and healthy diet. **Part V:** Caregivers reported practice regarding vacuum wound therapy. **Results:** total score Knowledge pre educational program was 60%, while post educational program it was 90% and total reported practice score was 30% preprogram, while post training program, it was 70%, with highly statistically significant differences between pre–and post-training program. **Conclusion:** It can be concluded that the educational program improved the informal caregivers' knowledge and reported practices vacuum wound therapy. **Recommendation:** there is need for further Training Program for Caregivers regarding Clients Using Vacuum Wound Therapy in different community settings in order to generalize the results.

Key word: Caregivers, Training program, Vacuum wound therapy.

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Introduction:

Traumatic injuries are the result of a wide variety of blunt, penetrating and burn mechanism. They include motor vehicle collisions, sport injury, falls, natural disasters and a multitude of other physical injuries which can occur at home, on the street, or at work and require immediate care [1].

The prevalence of injuries, 4.4 million injuries related death, unintentional injuries take the lives of 3.14 million people every year. Roughly 1 in 3 of these deaths result from road traffic crashes for adult people age 5- 29 years [2].

High risk traumatic wounds should be treated aggressively to prevent infections and the development of complicated wounds. High risk wounds are those that have an increased incidence of infection due to the type of wound, location, or the patient's underlying medical condition. Those wounds are associated with an increased morbidity, mortality, poorer patient quality of life, and greater costs [3].

Advanced therapy used for wound management as vacuum wound therapy or Negative pressure wound therapy is commonly called VAC therapy or Vacuum Assisted Closure. The therapy uses negative pressure to promote healing by: maintaining a moist wound healing environment while removing wound fluid that may contain proinflammatory mediators. Optimizing wound perfusion by decreasing periwound edema [4].

The therapy is very fast developing method of the wounds treatment. Using Vacuum wound therapy can be recommended in wide spectrum of clinical indications; this type of treatment has become one of the essential elements for the modern and comprehensive treatment of wounds .The therapy accelerates wound healing in chronic, acute and complex wounds [5].

Caregiving is an important public health issue that affects the daily living for millions of individuals. Family caregivers are required to take on tasks with no warning, no training and no experience. They may feel unprepared and unsure of what to expect or where to turn for help. family caregivers visit outpatient clinic twice / week with client for dressing and carry the machine also he responsible for arrange medical appointment, administering medication, taking care of wounds, , bathing, dressing , transportation from home to outpatient and conferring with doctors and specialists [6].

Significance of the study

According to statistical of emergency surgical clinic which associated to emergency hospital 185 which affiliated to Cairo University Hospitals that the total numbers of patients with Limb injuries were 4840 patients at 2019 while the number of patients using Vacuum wound therapy were 320 at 2019 (*statistical of Cairo University Hospitals , 2019*)

Wound care is the nursing duty and nurses are responsible for patients with vacuum wound therapy. Nurses need a particular level of knowledge and skills about how to apply this new modality to ensure optimum wound care Community health nursing play important role for people who require substantial nursing assistance, such as medication administration and

wound care. They provide help with activities of daily living; for example, bathing and dressing. Nurses provided care for sick individual and families where they lived, the emphasis of practice is acute and chronic coordinated and continuous services [7].

The aim of the study: to evaluate the training program for caregivers regarding clients using vacuum wound therapy through:

- 1) Assessing caregivers' knowledge and practice regarding vacuum wound therapy according to their needs
- 2) Planning and implementing training program for caregivers regarding clients using vacuum wound therapy
- 3) Evaluating effect of training program for Caregivers regarding clients using vacuum wound therapy.

Research hypotheses

To fulfill the aim of the study, the following hypotheses are formulated:

Caregivers' knowledge and practices will improve after training program session.

Research design:

A quasi-experimental design was used in the current study

Setting: The study will be conducted at outpatient emergency surgical clinic which affiliated to emergency hospital 185 at Cairo university hospitals

Sampling

Convenient sample 98 of caregivers who have clients with limb traumatic wound using vacuum wound therapy at home and caregivers at emergency surgical clinic at emergency hospital 185 for follow up six consecutive months

Tools of data collection:

The following tool will be used:

An interviewing questionnaire sheet consists of five parts as the following:

Part I:

It was included demographic characteristic of caregivers and clients:

- Demographic characteristic of caregivers such as age, sex, level of education, income, occupation, residence, living with client in home and relation with client.

-Demographic characteristic of clients such as age, sex, level of education, income, occupation, health insurance and number of family members.

Part II:

It was included past and previous history of the clients.

-Medical history of the clients related to the infected limb traumatic wound as well as presence of chronic disease as hypertension, diabetes mellitus and, kidney disease, smoking, site of injury, time of injury, used of vacuum and transportation .

Part III:

It was included clients home environment.

-Home environment of the clients as numbers of room and windows, sources of water, sewage disposal, lights, water heater and kind of floor.

Part IV:

It was included questionnaires to assess caregivers' knowledge: about identifying parts, benefits, uses and sources of information about initiation and disconnection of apparatus and

-Assess caregivers' knowledge: about nutrition for wound healing: as healthy food, important protein, vitamin A&cand important of zinc.

Part V:

- Practice report , to assess care givers reported practice regarding how to care about vacuum wound therapy at home such as suddenly disconnected the tubes, get rid from wound discharge collected at the jar of machine, cleaning parts of machine and disinfection of machine.

The total scoring of this sheet are 100%. Those who are scored less than 75% are considered unsatisfactory. The practice scores are more than 75 % are considered satisfactory.

Scoring System for Knowledge:

Knowledge tool consists of 16 questions, the correct and complete answer was given 2 scores; while correct but incomplete scored one; and an incorrect or didn't know was scored zero. Knowledge items' score were summed up and the total divided by the number of the items. These scores were converted into a percent score.

The total scores for questionnaires is 100 %. Those who scored less than 75 % are considered unsatisfactory. Scores between 75% and 90 % considered accepted knowledge. Satisfactory scores are more than 90 %.

Reported practice Scoring System :

The reported practice tools contain 32 questions, the done answer was scored 1, while not done scored 2, the scores of the items were summed up and the total divided by the number of all items giving a mean score. The total scoring of this sheet are 100%. Those who are scored less than 75% are considered unsatisfactory. The practice scores are more than 75 % are considered satisfactory.

Reliability:

It was conducted to appraise the reliability of the research study tools,

- Informal caregivers' knowledge, Cronbach's Alpha was 0.825.

- Informal caregivers' reported practice, Cronbach's Alpha was 0.835

Validity:

The content validity of the tools was tested by a jury of five experts in the field of Community Health Nursing to ascertain relevance and completeness; it was done before the pilot study. The content and face validity of the study tools were measured to evaluate the individual items as well as the entire tools used for the study as being relevant and appropriate to test what they wanted to measure. The experts were asked to evaluate individual items on the study tools in relation to their relevance and appropriateness. If the items adequately measure all dimensions of the construct, they give a percent to each. A score of 0.80 or better is generally considered to have good content validity. Face validity of the tools was 96 %

Pilot study:

A pilot study was applied on 10 % of the study sample to test clarity, applicability, and comprehensiveness of the study tools, as well as to estimate the time needed for data collection, and those participants were included in the main study sample because no modifications on the tools were required.

Ethical considerations:

The informal caregivers were informed about the aim and benefits of this study, and then an oral consent was obtained before starting collection data. Privacy was ensured throughout the study process. The study participants were assured that all data will be used only for research purposes and there were informed about their rights to refuse or withdraw at any stage with no harmful consequence

Field work:

- Formal permission to carry out the research was taken upon a letter issued from the Faculty of Nursing; Helwan University to medical director of Cairo university hospital and director of emergency hospital 185. The letter contains the research aim, content, and schedule of the program.

- Data collection preparation was a period of six months from the beginning of October 2021 to the end of March 2022.

- The researchers applied the educational program for Caregivers regarding Clients Using Vacuum Wound Therapy at outpatient clinic which affiliated to emergency hospital 185. District, 2 days/week (Sundays & Tuesday) from 10.00 a.m. to 1.00 p.m., each session took from 45-60 minutes. Each studied setting was visited 5 times.

- The researchers conducted the educational program for informal caregivers at the outpatient waiting area

An educational program containing of four stages:

1. Assessment stage: - At the beginning, the researchers greeted the informal caregivers, then introduced themselves for the studied sample as well they explained the aim of this study, and they filled in the tools of demographic data and applied of the pretest questionnaire to

determine Caregivers regarding Clients Using Vacuum Wound Therapy At the end of each session the researchers informed the study sample about what will be provided at the next visit.

2. Planning stage:

An educational program was developed and implemented for appraising the consequences of the educational program designed for Caregivers regarding Clients Using Vacuum Wound Therapy. The educational program content are:

- caregivers' knowledge such as: Meaning Uses, Benefits, initiation and discontinuation of vacuum wound therapy.
- caregivers' knowledge related healthy diet such as: Healthy food, Components of healthy food, Important of proteins, Types of proteins, Foods are rich in protein ...etc
- caregivers' reported practices as: for Caregivers regarding Clients Using Vacuum Wound Therapy as: operating vacuum wound therapy , remove jar of vacuum wound therapy, regarding get rid of discharge, clears the tube when it blocked clean parts of vacuum wound therapy, When are you clean parts and disinfecting parts of vacuum wound therapyetc.

3- Implementation stage: The educational program took 6 months in 6 sessions. Each session takes from 45-60 minutes. The researchers initiated by a summary about what was provided at the previous session, and cleared the goals of the new session, taking in to consideration the use of clear and simple language.

- Several teaching methods were used as: brainstorming, and discussion. They were using brochures,. The researchers also use a booklet and distributed it to all studied sample. At the end of every session, the researchers the caregivers about the content that will be provided at the next session, and determined the time

4- Evaluation stage: This stage was taking one week after educational program implementation through using the same pre-educational program questionnaires

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using Statistical Package for the Social Sciences, (SPSS), version 20, (SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category, the comparison between two groups and more was done using Chi-square test (χ^2). For comparison between means of two groups of parametric data of independent samples, student t-test was used. For comparison between means of two related groups (before and after data) of parametric data, paired t-test was used. For comparison between more than two means of non-parametric data, Kruskal-Wallis (value) was calculated. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $p < 0.05$ for interpretation of results tests of significance [8]

Results:

Part I: Family caregivers and clients demographic characteristics (Tables 1,2),(Figure 1,2,3,4,5,6,7,8).

Table (1): Frequency distribution of family caregivers demographic characteristics (N=98).

Demographic characteristics	No	%
Marital status		
Single	1	1.0
Married	84	85.7
Widow	5	5.1
Divorced	8	8.2
Occupation		
Employee	40	40.8
Profession	11	11.2
Student	5	5.1
House wife	23	23.5
Hand craft	9	9.1
Not working	10	10.3
Residence		
Rural	50	51.1
Urban	48	48.9
living with client in home		
Yes	95	96.9
No	3	3.1
Relation with client		
Sun	5	5.1
Father	10	10.3
Mothers	20	20.5
Brothers	10	10.3
Other relative	15	15.3

Table (1) indicates that 85.7% of caregivers were married while 1.0% were single. Regarding occupation 40.8% of them employee while 5.1% were students. Regarding to place of residence 51.1% of them live in rural area while 48.8 live in urban. 96.9% of caregivers living with client at home while 3.1% didn't live with client. Regarding relation to clients 20.5% the mothers gives care for clients while 5.1% of them their sun.

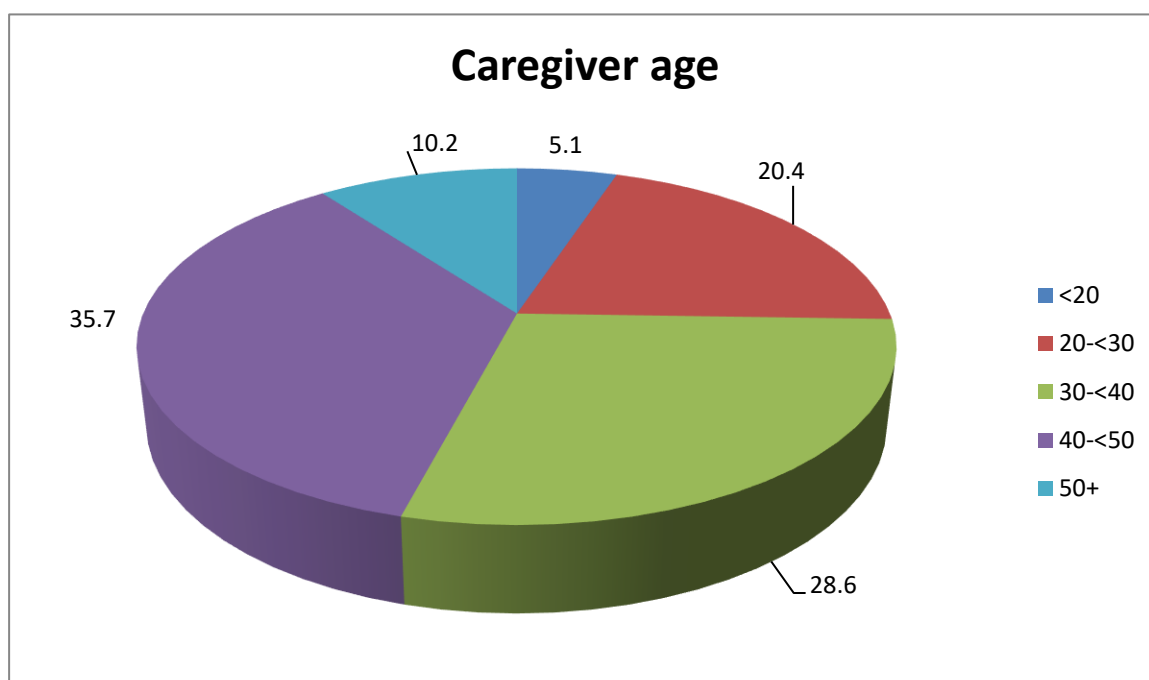


Figure (1) percentage distribution of family caregiver's age (n = 98).

Figure (1) indicates that, 35.7 % of them the age between 40<50 years, the mean age \pm SD were 37.7 ± 10.4 while 5.1% of them were < 20 years.

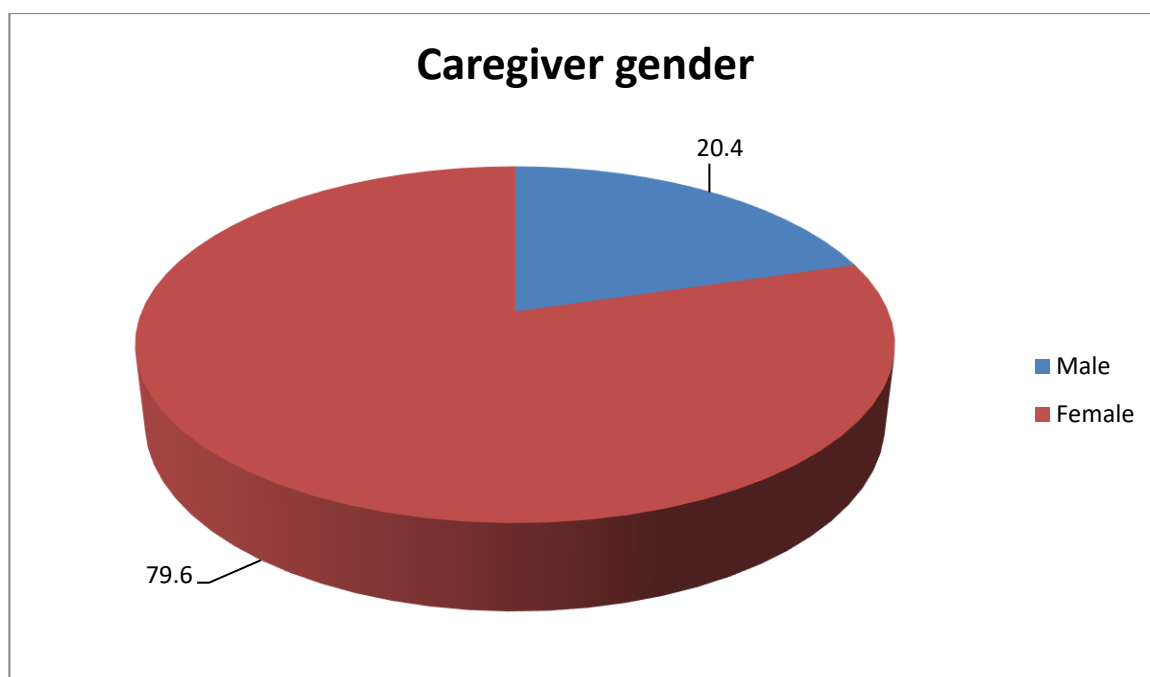


Figure (2) percentage distribution of family caregiver's gender (n = 98).

Figure (2) Illustrates that 79.5% of them were females.

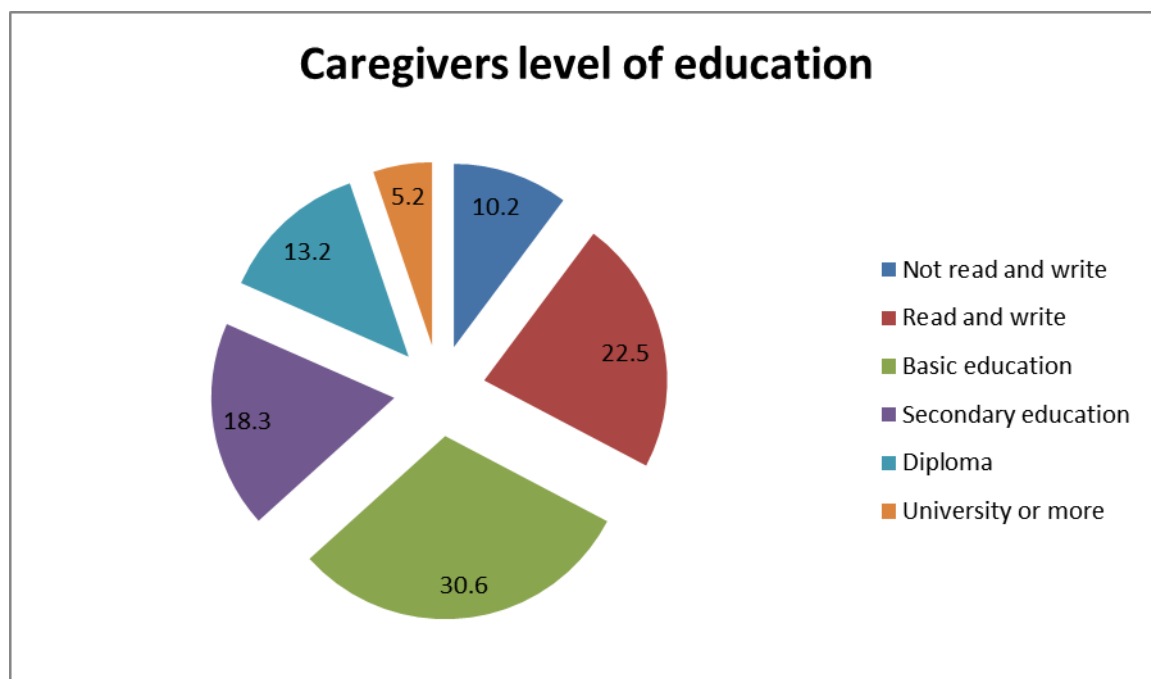


Figure (3) percentage distribution of family caregiver's education levels (n = 98).

Figure (3) mention that 34.6% of them had diploma.

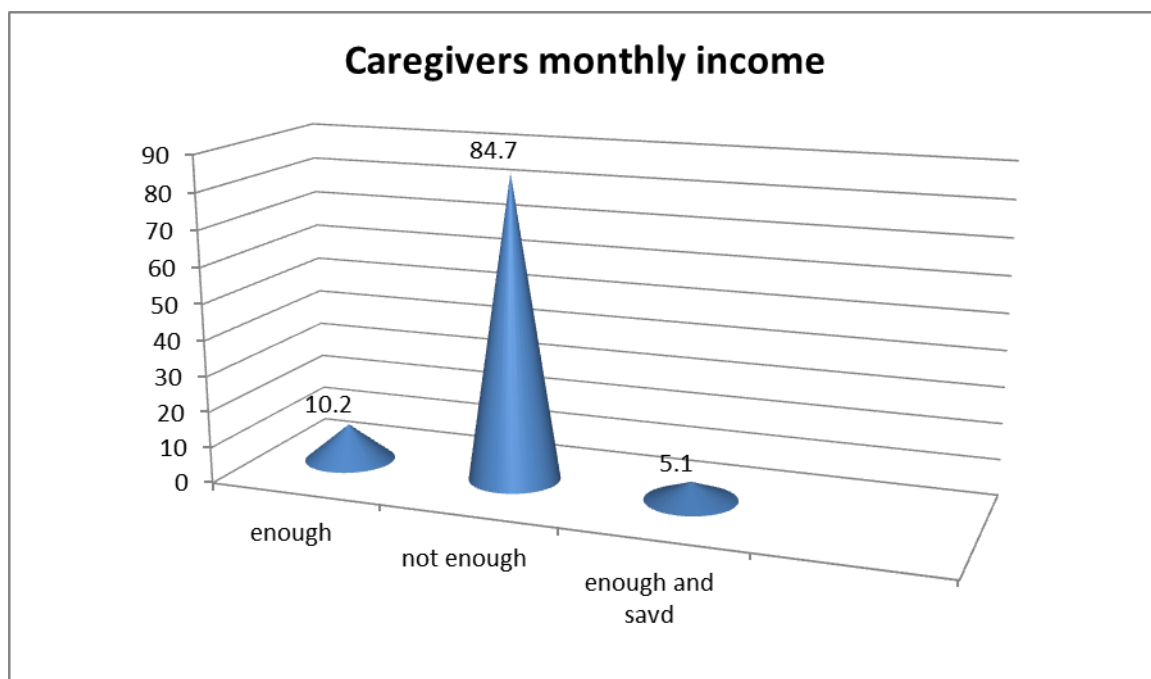


Figure (4) percentage distribution of family caregiver's income (n = 98).

Figure (4) indicates that 81.6% of them didn't have enough income while 3.1% of them were enough and save income.

Table (2): Frequency distribution of clients demographic characteristics (N=98).

Demographic characteristics	No	%
Level of education		
Not read and write	10	10.2
Read and write	22	22.5
Basic education	30	30.6
Secondary education	18	18.3
Diploma	13	13.2
University or more	5	5.2
Marital status		
Single	2	2.2
Married	83	84.6
Widow	5	5.1
Divorced	8	8.1
Occupation		
Employee	50	51.1
Profession	10	10.2
Student	5	5.1
House wife	10	10.2
Hand craft	20	20.4
Not working	3	3.0
Residence		
Rural	50	51.0
Urban	48	49.0
Monthly income		
Enough	10	10.2
Not enough	83	84.6

		7
Enough and saved	5	5.1
Have health insurance		
Yes	18	18.4
No	80	81.6
Family numbers		
<3	2	2.2
3<6	83	84.6
6<9	5	5.1
>9	8	8.1

Table (2): shows that 30.6% of clients were basic education while 5.2% of them were university or more educated. Regarding to marital status 84.6% of them were married while 2.2% of them were single .Regarding occupation, 51.1% of clients were employee while3.0% of them not worked. Regarding to place of residence 51.0 % of clients live in rural area while49.0 of them live in urban area. Regarding income, 84.7 % of clients didn't have enough income while 5.1 of them have enough and saved income. Also , 81.6% of them didn't have health insurance while 18.4% of them have heath insurance. Regarding the family members, 84.6% of them from 3<6 persons while 2.2% of them <3 persons.

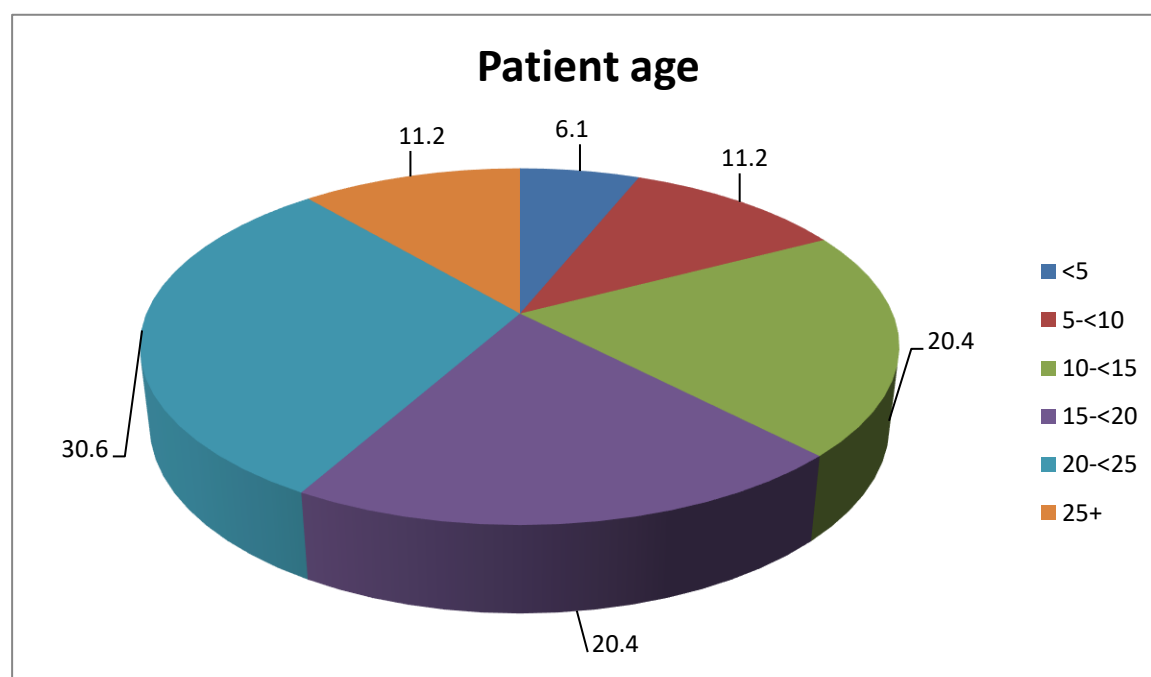


Figure (5) percentage distribution of clients age (n = 98).

Figure (5) indicates that, 30.6 % of them the age between 20< 25 years, the mean age \pm SD were 16.7 ± 6.8 while 6.1% of them were< 5 years.

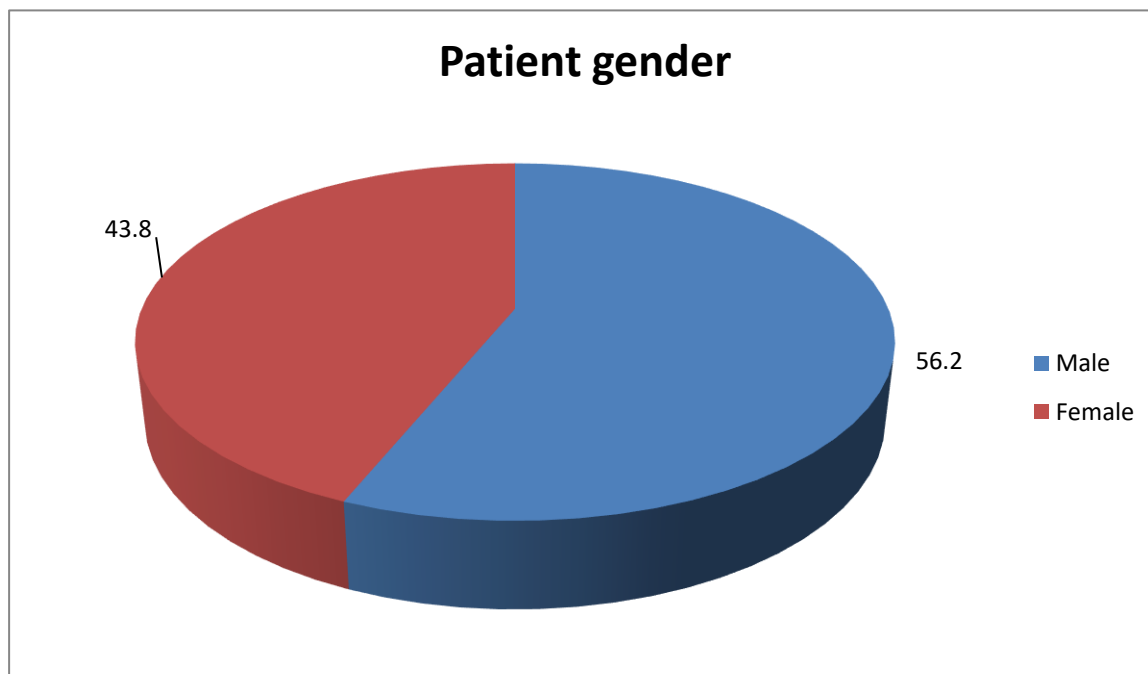


Figure (6) percentage distribution of clients gender (n = 98).

Figure (6) indicates that 56.2 % of them were males.

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Demographic characteristics	No	%
Level of education		
Not read and write	10	10.2
Read and write	22	22.5
Basic education	30	30.6
Secondary education	18	18.3
Diploma	13	13.2
University or more	5	5.2
Marital status		
Single	2	2.2
Married	83	84.4

		6
Widow	5	5.1
Divorced	8	8.1
Occupation		
Employee	50	51.1
Profession	10	10.2
Student	5	5.1
House wife	10	10.2
Hand craft	20	20.4
Not working	3	3.0
Residence		
Rural	50	51.0
Urban	48	49.0
Monthly income		
Enough	10	10.2
Not enough	83	84.7
Enough and saved	5	5.1
Have health insurance		
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No	80	81.6
Family numbers		
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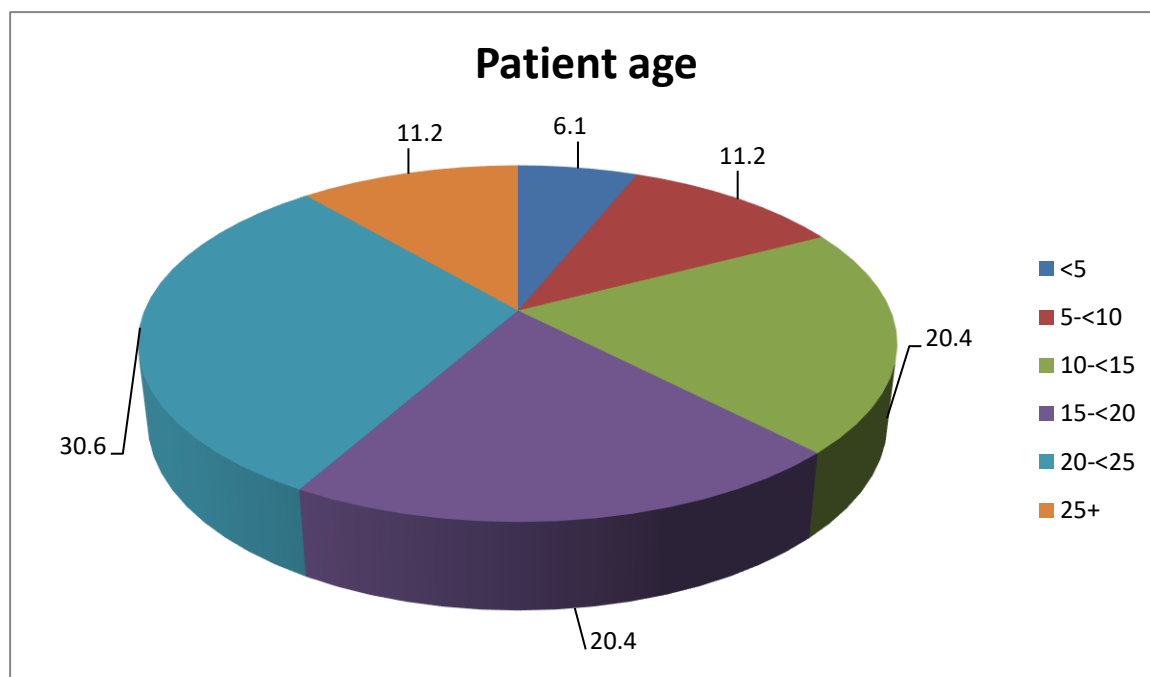


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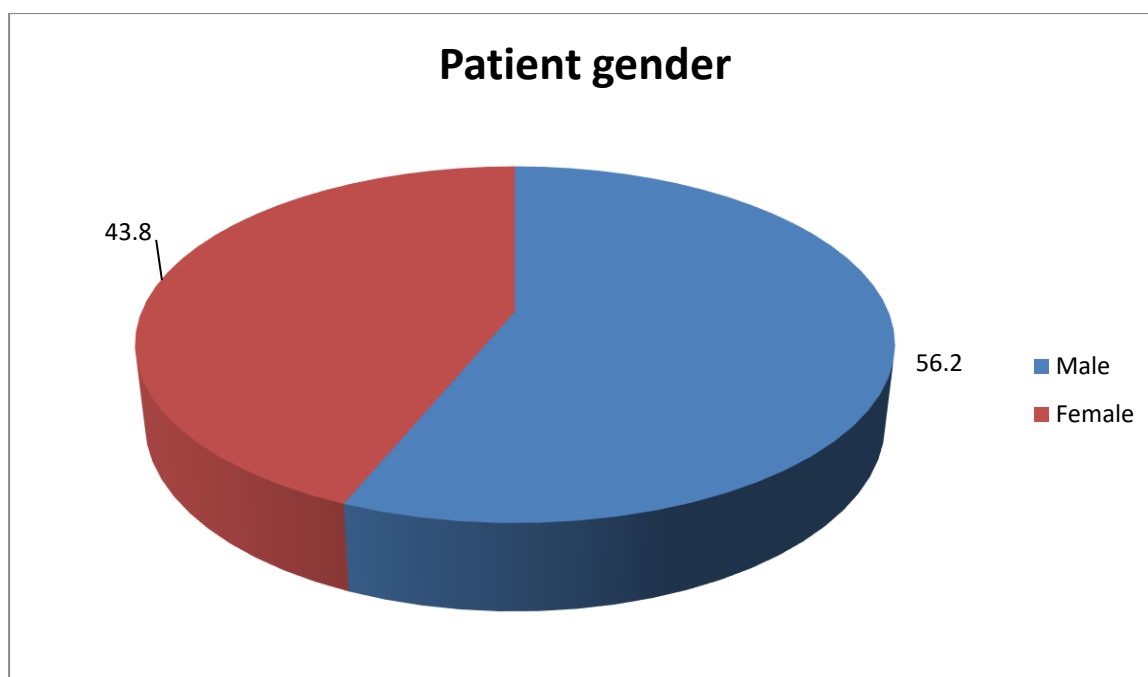


Figure (8) percentage distribution of clients gender (n = 98).

Figure (8) indicates that 56.2 % of them were males

Part II: Medical history of the clients

Table (3): Frequency distribution of clients medical history (N=98).

Medical history	No	%
Suffer from any chronic diseases		
Yes	43	43.8
No	55	56.2
**In case of yes what types of disease(n=43)		
Hypertension	15	34.8
Diabetes	20	46.5
Heart disease	5	5.1
Kidney disease	3	3.0
Other	0	0.0
Smoking		
Yes	55	56.2
No	43	43.8
Injury place		
Leg	55	56.2
Hand	3	3.0
Leg & hand	40	40.8

Medical history	No	%
Time of injury		
<4 week	23	23.4
4<8 week	30	30.7
>8 week	45	45.9
Used of vacuum		
< 1 week	20	20.4
1-4 week	30	30.7
4<8 week	40	40.8
> 8 week	8	8.1
What is transportation used		
Ambulance	5	5.1
Taxi	50	51.1
Public transportation	13	13.1
Private care	30	30.7

Table (3): mentions that 43.8% of clients suffer from chronic diseases. Also, 46.5% of them complain from diabetes while 3.0% of them complain from kidney disease. Regarding smoking, 56.2% of clients were smokers. Regarding injury place, 56.2% of client's injury affects their legs. Regarding to time of injury >8 wks. 40.8% of them used the **vacuum** > 8 wks.and 51.1% of patient transportation to the hospital by taxi .

Part III: Clients home environment

Table (4) Frequency distribution of clients home environment (N=98).

Home environmental	No	%
Numbers of room		
1 room	30	30.6
2 room	50	51.1
3 rooms or more	18	18.3
Numbers of windows		
1 windows	50	51.1
2 windows or more	48	48.9
Status of windows		
Safe & open	40	40.

		8
Safe & closed	38	38. 8
Broken and not safe	20	20. 4
Water source		
Tape	80	81. 6
Water pump	10	10. 2
Shared tape	5	5.1
Water tank	3	3.1
Good sanitation		
Yes	53	54. 1
No	45	45. 9
Light in each room		
Yes	55	56. 2
No	43	43. 8
If yes , what are kind of light (n=55)		
Gasoline bulb	0	0
Light bulb	40	42. 2
Window	15	27. 2
Water heater		
Available	60	61. 2
Not available	38	38. 8
Kind of floors		
Tile flooring	60	61. 2
Cement floor	20	20. 4
Ceramic	15	15. 3
Marble	3	3.1

Table (4): shows that, the home environmental of the clients, regarding to numbers of room, 51.1% of them were 1 room and 1 window, 40.8% of them were the windows safe & open, Also, 81.6% water source by tape. In relation to good sanitation there were 53% and 55% were light source. Regarding water heater, 61.2% of clients were water heater. Regarding kind of floor, 61.2% of them were tile flooring.

Part (IV): Family Caregivers knowledge regarding vacuum wound therapy and healthy diet for wound healing. . (figure 9).

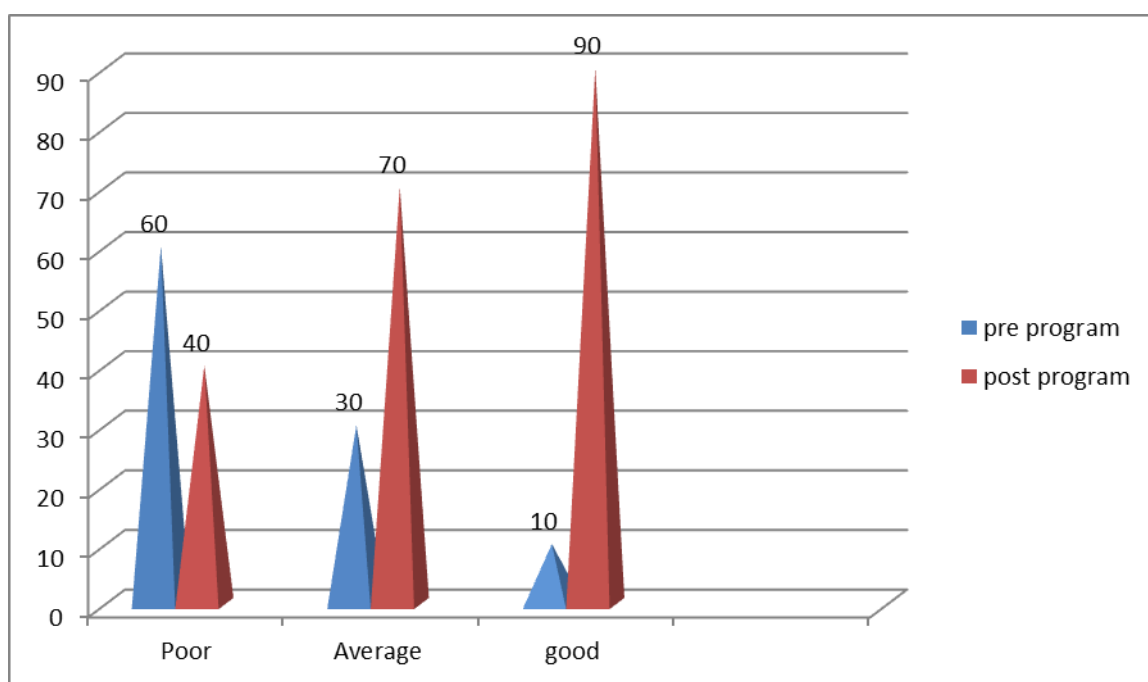


Figure (9): Frequency distribution of caregivers according to total correct knowledge regarding vacuum wound therapy pre, and post health educational program (n=98).

Figure (9) illustrate that, caregivers total correct knowledge score about vacuum wound therapy , it was found that before program implementation 60% of caregivers had poor knowledge score. On the other hand 90% of caregivers had good knowledge score at immediate post health education program implementation.

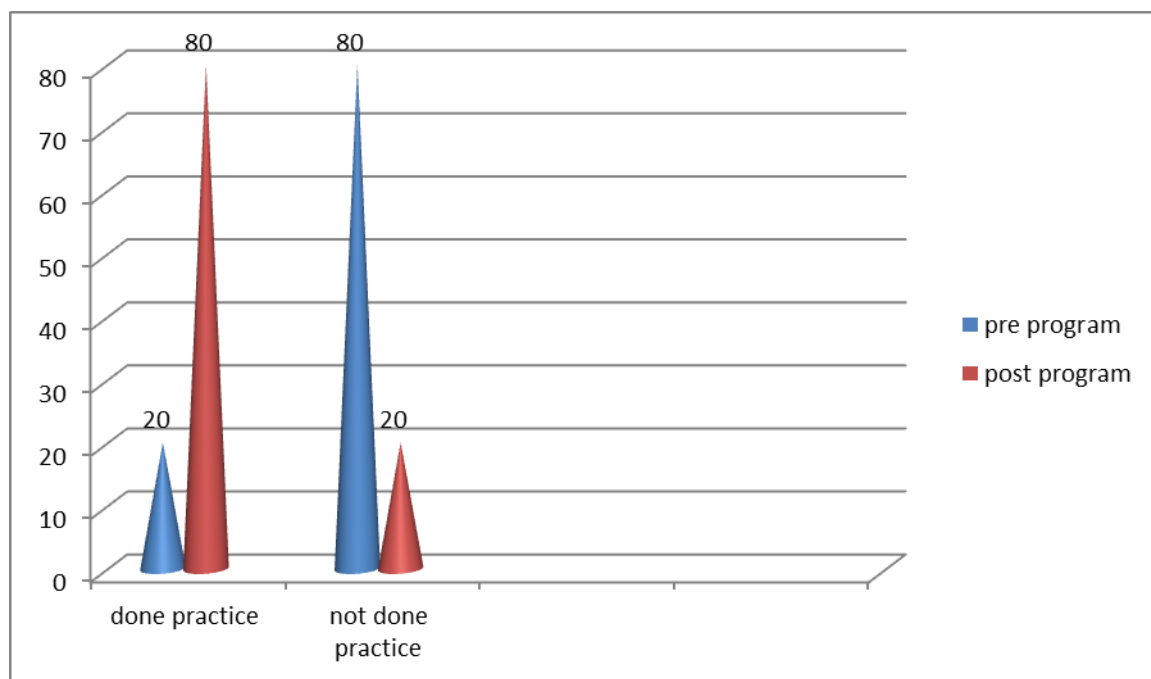


Figure (10): Frequency distribution of caregivers according to total done practices about steps of cleaning and disinfection vacuum wound therapy (n=98)

Figure (10),: Reveals that, improvement of caregivers done practice post health education program more than the pre and post the program regarding steps of cleaning and disinfection vacuum wound therapy from 20% to 80%

Part (VI): Table (6): Relation between total score of correct knowledge and caregivers general characteristic pre, and post health education program (N=98).

General character	Total score of correct knowledge						X ²	P
	Pre- program			Post -program				
	Poor %	Average %	Good %	Poor %	Average %	Good %		
Age								
<20	70	20	10	20	30	50	*16.538	0.0
20<30	65	20	15	15	15	70		
30<40	60	30	10	15	20	65		
40<50	70	20	10	10	20	70		
>50	75	15	10	15	15	70		
Gender								
Male	70	20	10	10	20	70	*17.774	0.0
Female	75	15	10	15	20	65		
Single	60	30	10	15	20	65	*20.882	0.0
Married	70	20	10	10	20	70		
Divorces	65	20	15	15	15	70		
Widow	50	30	20	15	15	70		
Level of educational								
Not read write	80	10	10	20	20	60	*21.684	0.0
Read write	70	20	10	15	20	65		
Basic education	60	30	10	15	20	65		
Secondary education	50	30	20	15	15	70		
Diploma	70	20	10	20	30	50		
University more	50	20	30	10	10	80		
Occupation								
Employee	70	20	10	20	30	50	*23.782	0.0
Profession	65	20	15	15	15	70		
Student	60	30	10	15	20	65		
House wif	70	20	10	10	20	70		
Hand craft	75	15	10	15	15	70		
Not worki	50	20	30	10	15	80		
Residence								
Rural	80	10	10	40	10	50	*21.332	0.0
Urban	60	30	10	15	20	65		
Monthly income								

Enough	65	20	15	15	15	70	*20.552	0.0
Not enough	50	30	20	15	15	70		
Enough saved	50	30	20	15	15	70		
Living with client in home								
Yes	65	20	15	15	15	70	*22.361	0.0
No	60	30	10	15	20	65		
Family relation								
Sun	70	20	10	20	30	50	*23.346	0.0
Fathers	65	20	15	15	15	70		
Mothers	60	30	10	15	20	65		
Brothers	70	20	10	10	20	70		
Other relation	75	15	10	15	15	70		

This **Table (6)** Showed that statistical significant relation was observed between caregivers general characteristic and total correct knowledge regarding vacuum wound therapy , P = 0.001.

Table(7) : Relation between total score of done practice and caregivers general characteristic pre, and post health education program (No=98)

General characteristic	Total done practice about steps of cleaning and disinfection vacuum wound therapy				X ²	P
	Pre- program		Post -program			
	no	%	no	%		
Age						
<20	20	20.4	78	79.6	*29.354	0.001*
20<30	30	30.6	68	69.4		
30<40	25	25.5	73	74.5		
40<50	30	30.6	68	69.4		
>50	20	20.4	78	79.6		
Gender						
Male	30	30.6	68	69.4	*28.946	0.001*
Female	40	40.8	58	59.2		
Marital status						
Single	30	30.6	68	69.4	*33.347	0.001*
Married	35	35.8	63	64.2		
Divorces	20	20.4	78	79.6		
Widow	25	25.5	73	74.5		
Level of educational						

Not read and write	20	20.4	78	79.6	*24.448	0.001*
Read and write	30	30.6	68	69.4		
Basic education	25	25.5	73	74.5		
Secondary education	30	30.6	68	69.4		
Diploma	20	20.4	78	79.6		
University or more	40	40.8	58	59.2		
Occupation						
Employee	30	30.6	68	69.4	*25.37	0.001*
Profession	35	35.8	63	64.2		
Student	20	20.4	78	79.6		
House wife	15	15.4	83	84.6		
Hand craft	20	20.4	78	79.6		
Not working	15	15.4	83	84.6		
Residence						
Rural	20	20.4	78	79.6	*24.355	0.001*
Urban	35	35.8	63	64.2		
Monthly income						
Enough	25	25.5	73	74.5	*22.373	0.001*
Not enough	15	15.4	83	84.6		
Enough and saved	40	40.8	58	59.2		
Living with client in home						
Yes	35	35.8	63	64.2	*25.376	0.001*
No	20	20.4	78	79.6		
Family relation						
Sun	15	15.4	83	84.6	*21.377	0.001*
Fathers	30	30.6	68	69.4		
Mothers	40	40.8	58	59.2		
Brothers	20	20.4	78	79.6		
Other relative	15	15.4	83	84.6		

This **Table (7)** Showed that statistical significant relation was observed between caregivers general characteristic and total done practice regarding vacuum wound therapy , P = 0.001.

Table (8):Correlation between total score of knowledge and total done practice of caregivers regarding vacuum wound therapy pre; and post of health educational program (N=98).

Items	Total score of correct Knowledge			
	Pre program		Post program	
	r	P value	r	P value
Done practices about steps of cleaning and disinfection vacuum wound therapy	0.27	0.007*	0.177	0.001*
Done practice regarding vacuum wound therapy	0.037	0.658	0.171	<0.005*

Table (8) displays that there is a positive association between caregivers total knowledge score , total done practice regarding steps of cleaning and disinfection vacuum wound ,and total score about vacuum wound therapy. As reflected when improved caregivers knowledge lead to improved caregivers done practice at post program $p < 0.005^*$.

Discussion

Vacuum wound therapy is a therapeutic technique, which facilitates the healing of acute and chronic wounds, while preventing the occurrence of infection. It is often used when other treatments have been unsuccessful in chronic wound healing. It is a non-invasive, non-pharmacological wound closure system, which aids healing through the use of localized sub-atmospheric pressure, which is placed on the area. A sealed dressing is placed over the wound and attached to a suction pump and drainage tube, which works in removing interstitial fluid and mechanical deformation of the tissue Mohamed et al.(2020) [8].

Regarding marital status of caregivers.

The current study revealed that the majority (85.7%) of caregivers were married. This result was supported with Tang et al., (2021)[9] who conducted study entitled "understanding family caregiving for individuals with injury after a road traffic crash" in Taiwan, who mentioned that 75.5% of studied sample were married **As regarding to caregivers gender**, the current study illustrates that more than three quarters(79.5%) of them were females. This study agreement with study done by Kong et al. (2019)[10] in Malaysia about " factors effect on health, work and social activities". who mention that 50.1% of studied sample were females. The researcher point of view, the females provide care and emotional support to their families.

In relation of level education, the present study illustrates that one third (35.7%) of caregiver were diploma. This study matched with study done by Huang et al., (2021) [11] in china "investigation of the status and influence factors of caregiver's life on caring for patients with chronic wound", who found that 33.7% of participant were diploma.

The researcher point of view may be lack of awareness about important of learning and low income and poverty lead to this result.

Regarding caregivers income, the current study illustrates that the majority (81.6%) of caregiver didn't have enough money. This study contradictive with study done by Biliunaite et al. (2020) [12] in Lithuania about "Informal caregiver support needs and burden". Who saied that 40.7% of them have enough income. The researcher point of view this difference in result because Egypt were developed country and low standard of living for the individual.

Regarding demographic characteristics of clients

In relation to level education of clients, the current study denoted that nearly one third (30.6%) of client were basic education. This study conversed with study done by David et al. (2020) [13] in India about " exploring the lived experience of socioeconomic and quality of life outcomes in post-discharge trauma patients" . who mentioned that 57% of participants were high school educated. The researcher point of view this difference may be increase awareness of individuals about education level in India.

In relation to clients age, the current study illustrates that one third(30.6 %) of them the age between $20 < 25$ years, the mean age \pm SD were 16.7 ± 6.8 . This study conversed with study done by Mrema & Dida (2020) [14] in Tanzania "A Survey of Road Accident Reporting and Driver's Behavior Awareness Systems" who found that 63% of them aged between 31-40 years. According to references nearly 50% percent of injuries occur in young persons aged 15 to 44years old.

Regarding client gender, the study illustrates that more than half(56.2%) of clients were male. This study matched with the study done by Hassan et al. (2022) [15] "Study of Road Traffic Accidents Cases admitted to Ain Shams University Hospitals during Years 2017 and 2018 about " in Egypt the researcher found that the 87.7% of them were male. The researcher point of view in study result may be due to this may be that males are more seeking to earn money for their social welfares and almost of drivers were males and more exposed to roads and road traffic accident (RTAs) than females

Regarding family caregivers knowledge regarding vacuum wound therapy.

The current study revealed that there were improvement in family caregiver knowledge regarding meaning of vacuum wound therapy as only half(51.1%) of family caregiver knew the meaning of vacuum wound therapy in pretest while in posttest the majority(91.8%) of them knew meaning of vacuum wound therapy. As well as less than half (45.9%)the family caregiver

knew the uses of vacuum wound therapy in pretest while in posttest the majority (93.8%) their knowledge was improved.

In additional family caregiver mentions the benefit of vacuum wound therapy from one third(35.7%) in pretest to the majority(86.7%) knew the benefit of machine in posttest. Also, one third (38.7%) of them knew initiation of device in pretest while the majority(96.7%) of them knew the initiation in post test.Furathermor, more than third(40.8%) of family caregiver know discontinuation of device in pretest, while the majority(86.7%) of them knew in posttest. The current study shows statistical significant improvement in caregivers knowledge level at the post health educational program- test, than that of pre –test in all knowledge items, $P = 0.001$.

There no external sources of funding for this study about training program for caregivers about vacuum wound therapy. The current studs was first study provide training program for caregivers about vacuum wound therapy. This study matched with study done by Mohamed et al. (2019) [9] " Effect of Training Program on Performance of Nurses Caring for Patient with Negative Pressure Wound Therapy" in Egypt . The researcher found that total knowledge score of nurse had fair knowledge 65% regarding vacuum wound therapy before educational program and this percentage were increased to 97.4% in post educational program.

The researcher point of view almost of study discuss efficacy of vacuum wound therapy, difference between the therapy and conventional dressing and education program for nurses no studies for caregivers. It was new culture of technology and unfamiliar treatment for wound care at home.

Concerning family caregivers knowledge regarding nutrition for wound healing, The current study showed that less than one third (30.7%)of family care givers in pretest answered correctly healthy food to body , while more than three quarter (78.1%) of them improve their knowledge in post test.Also one third (35.7%) of them knew the component of healthy diet in pretest while the majority(81.6%) of them mention the component of healthy diet in posttest.

. The researcher point of view, highlighting the lack of awareness as one of the causes of poor knowledge about important healthy diet for wound healing post-operative, but after health education of patients knowledge were improved.

In additional this study supported by Mustafa et al. (2019) [16] in Kenya "Nutritional Status and Wound Healing among Patients with Burn Injury". Who said that 35.5% had very low nutritional knowledge about healthy diet for their children The training and counseling received by caregivers were conducted mainly through health talks given by health workers when one attended the health facility. Caregiver knowledge were improved .

Regarding Caregivers reported practice regarding vacuum wound therapy

This study shows statistical significant improvement in caregivers done practice regarding vacuum wound therapy at the post health educational program- test, than that of pre-test in all practice items, $P = 0.001$. The study harmony with study done by Mohamed et al. (2019) [17] about "Effect of Training Program on Performance of Nurses Caring for Patient with Negative Pressure Wound Therapy". who showed that progress in the total practice score of nurses after the program's application with statistical significant difference between before and after the program's application. The current study was first study provide training program for caregivers about vacuum wound therapy.

Regarding relation between the study variables

The current study Showed that statistical significant relation was observed between caregivers general characteristic and total correct knowledge regarding vacuum wound therapy, $P = 0.001$. this study agreement with study done by Foutouh (2019) [18] in Egypt about "Knowledge and Practice of Family Caregiver for Clients Using Vacuum Wound Therapy for Infected Limb Surgical Wound" who mentioned that relation between total knowledge scores demographic characteristics of family caregivers and home environment, there was positive statistically significant relations between total knowledge of family caregivers and their age, $p=0.02$.

Also there was a positive statistical significant total practice and their job, $p=0.08$. Also there was positive statistically significant relation between total knowledge of family caregiver's and their education level, $p=0.07$

The current study Showed that statistical significant relation was observed between caregivers general characteristic and total done practice regarding vacuum wound therapy, $P = 0.001$. This study matched with study done by Foutouh (2019) [18] in Egypt about "assessment of knowledge and practice of family caregivers about use vacuum wound therapy" who reported that relation between total practice scores demographic characteristics of family caregivers,

In additional there was positive statistically significant relations between total knowledge of family caregivers and their age, $p=0.02$. There was a positive statistical significant total practice and their job, $p=0.08$. Also there was positive statistically significant relation between total practice of family caregiver's and their education level, $p=0.07$.

The current study displays that there is a positive association between caregivers total knowledge score, total done practice regarding steps of cleaning and disinfection vacuum wound therapy and total score about vacuum wound therapy. As reflected when improved caregivers knowledge lead to improved caregivers done practice at post program $p < 0.005^*$. This study matched with study done by Kuan et al. (2020) [19] in Taiwan about "wound care knowledge and practice technology use in the home environment" who found that there was positively correlation with wound care knowledge and practice $r = .132$ and $p = 0.01$. The researcher point of view, improved done practice may be due to implementation of education program to caregivers

Conclusion

On the light of results of the current Study and answers of the research questions, it could be concluded that: 90% of caregivers had satisfactory levels of total knowledge while 60 % of them had unsatisfactory levels of total knowledge regarding vacuum wound therapy. 80% of female health care providers had adequate level of reported practice, while 20% of them had inadequate level of reported practice. there is a highly statistically significant relation between caregivers total knowledge and their demographic characteristics. There is no statistically significant relation between ' total practice and their demographic characteristics, which highly statistically significant relation . Also, there is positive correlation between total knowledge and total reported practice toward vacuum wound therapy.

Recommendations

“On the light of the current study findings the following recommendations are suggested:

- Applied the study in other site that include all caregivers for generalization.
- Advice for education program, especially caregivers about vacuum wound therapy with other organizations and institutions to improve knowledge and practice.
- Further training Program for Caregivers regarding Clients Using Vacuum Wound Therapy in different community settings in order to generalize the results.

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