Effect of Nursing Guidelines for Buttonhole Cannulation Technique of Arteriovenous Fistula on Reducing its Complications among Hemodialysis Patients

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Abstract

Background: End stage of kidney disease (ESKD) the last stage of renal failure and can develop from untreated chronic kidney disease. **The study aimed** to evaluate the effect of nursing guidelines for Buttonhole cannulation technique of arteriovenous on reducing its complications among hemodialysis patients. **Research design**: This research employed a quasi-experimental methodology. **Setting**: The study was conducted in Minia University at Nephrology and Urology Hospital at Hemodialysis Units. **Subjects of the study**: A purposive sample composed of sixty patients going for hemodialysis, study participants was classified equally for both study and control groups (thirteen for each one).**Tools of data collection** In order to conduct the current study, four data gathering methods were employed, including; A Structured interviewing questionnaire sheet, Pain assessment scale, Observational Checklist for Manifestation of infection and hematoma and assessment sheet for Laboratory investigation of kidney function. **Results**: the findings of the study indicated that 13.3% among the study group & 36.7% of the control group were had hematoma at 1st week of HD after the application of study guidelines, while 3.3% & 86.7% among both groups were had hematoma at the fourth week of HD after the application of study guidelines respectively. **Conclusion**: Buttonhole study guidelines was had positive impact on hemodialysis complications (pain, infection, hematoma, vital signs) for study group in first and fourth week in hemodialysis sessions in- comparison with control group. **Recommendations:** Increase awareness through nursing staff of hemodialysis patients and caregivers regard self-care related to vascular access and encourage patient participation in health education programs about evidence-based practice regard hemodialysis care at home.

Keywords: Buttonhole cannulation, Hemodialysis complications, Nursing guidelines.

Introduction:

A decline in the glomerular filtration rate (GFR) or kidney damage is referred to as chronic renal disease if it persists for three months or longer. (CKD). Premature death, higher healthcare costs, and a worse quality of life are all related to CKD. End-stage kidney disease (ESKD), the last stage of renal failure, can develop from untreated CKD. ESKD causes accumulation of uremic waste products and necessitates dialysis, kidney transplantation, or renal replacement therapy **(Peralta, et al., 2021).**

The most current estimate for the prevalence and incidence of dialysis in Egypt is from 2019, when it was estimated to be 0.61 per 1,000 and 0.192 per 1,000, respectively. In Egypt, the majority of dialysis patients in 2020 were male (58.7%), and half of them were 55 years of age or older. In patients receiving dialysis, glomerulonephritis was the predominant diagnosis in 3% of cases of ESKD, with hypertension accounting for 41% of cases and diabetes accounting for 14% **(Farag and El-Sayed, 2021).**

For Egyptian patients with end-stage renal disease, hemodialysis is the most frequently used form of therapy. In the Arab world, both acute and chronic renal failure are very common. Chronic renal failure affects 80 -120 people / million people (pmp) in Saudi Arabia and 225 people / million people (pmp) in Egypt **(Hafez et al., 2019).** In the Menoufia Governorate, the prevalence of ESKD is 483 cases / million people. The nearly all patients (36.6%) were in the age range of 50 to 60;the mean age is 53.18 x 13.26 years; men make up 61.6% of the population while women make up 38.4% **(El-Zorkany, 2017)**.

In traditional hemodialysis, the patient undergoes three to four sessions of hemodialysis per week, lasting between three and five hrs. each. Hemodialysis is recommended for certain patients five or six times in week for up to three hrs. each time. Other patients are given the order for nighttime hemodialysis, which is administered five to six times per week and lasts from six to eight hrs. in each session. Regardless of the hemodialysis technique, the blood circulation has to be attached to a dialysis machine through a vascular access. Traditional vascular access methods include arteriovenous fistulas, grafts, and catheters **(Mathews & Mathew, 2019).**

Hemodialysis (HD; 84% of patients) was the most common way to begin renal replacement treatment (RRT), followed by peritoneal dialysis (PD; 12% of patients), and preemptive kidney transplantation (4% of patients) **(Kramer et al., 2019)**.

A hemodialysis patient's survival depends on vascular access, and proper cannulation is essential to maintaining that access. Reduced cannulation attempts and needle manipulation are two of the greatest strategies for maintaining arterial access. By doing this, the risk of infiltration and damage to the vascular access vessel wall will be decreased. Due to the emergence of aneurisms, infiltrations, and vessel lining damage, many needle jabs increase the risk of vessel injury **(Vachharajani et al., 2020).**

Arteriovenus fistula can be tested for usage four weeks after construction and can be utilized for dialysis therapy between six and twelve weeks following creation. The patient's clinical state, vascular health, and the amount of time

before beginning hemodialysis determine which VA should be used. Hemodialysis (HD) access problems pose serious challenges to those receiving HD, the healthcare system, and particularly those with last stage renal illness. Chronic heart disease access problems, including as thrombosis, infection, and ischemia steal syndrome, aneurysms, venous hypertension, hematomas, heart failure, and protracted bleeding **(Rønning et al., 2022).**

The buttonhole technique is a cannulation technique where the AVF is cannulated in the same location, at the same angle, and at the same depth each time. By using the exact same location, a scar tissue tunnel track will be created. It is strongly advised that the procedure be carried out by the same cannulator until the track tunnel has been created **(Carroll et al., 2020).** It extends the life of the AVF, lessens discomfort, hematoma, infection, and infiltration risk, encourages self-cannulation, lowers the likelihood of hospitalization due to AVF problems, lowers the risk of needle stick injuries, and lowers the likelihood of aneurysm development. **(Oven & Scarlett, 2020) .**

Significance of the study

Numerous issues might arise, including bleeding, infections, and aneurysms. The current study will be applied to assess the effect of using nursing guidelines for buttonhole cannulation technique to reduce arteriovenous complications **(Wasse et al., 2020).**

More important, data from the Dialysis Outcomes and Practice Patterns Study (DOPPS) show that, while suboptimal vascular access is linked to increased mortality in the United States with a relative risk of 1.23, it is associated with hospitalizations for HD patients at a rate of 44% in the United Kingdom. The technique used to implant needles might significantly affect the frequency of some of these problems **(Rayner et al., 2004).**

The researcher's opinion in the current study is to use the Buttonhole cannulation technique instead of the common routine hospital technique for arteriovenous access, which is called the Rope ladder technique, and compare both techniques regarding their complications' occurrence with patients. It is essential to utilize a plan to extend the viability of vascular access since it is still the single biggest barrier to effective HD. The researcher observed that while working as a preceptor for internship faculty students for more than three years in hemodialysis units.

Aim of the study

Evaluate the effect of nursing guidelines for Buttonhole cannulation technique of arteriovenous on reducing its complications among hemodialysis patients.

Research Hypothesis:

The patients who used buttonhole cannulation guidelines had fewer complications (infection, redness, diffuse swelling, hotness, exudate from fistula).

Research Design:

The goal of this study was achieved by using a quasi-experimental research design (study and control groups).

Setting of the study:

The current study was conduct on Hemodialysis units at Minia University's Hospital for Nephrology and Urology were used for the research.

Subjects of the study:

A purposive sample composed of sixty patients undergoing hemodialysis Study participants was classified equally and was selected related to certain inclusive and exclusive criteria classified into two groups study and control (30 for each one). The sample size was selected according to the following equation **(Gravetter et al., 2020):**

$$N = \frac{t^2 \quad x \quad p\,(1-p)}{m^2}$$

$$N = \frac{(1.96)^2 \quad x \quad 0.04\,(1-0.04)}{0.05^2}$$

$$N = 0.05^2$$

Description:

N = required sample size

t = confidence level at 95 % (standard value of 1.960)

p = estimated prevalence of vascular access complications at Minia University Nephrology and Urology Hospital 2017 (0.04)

m = margin of error at 5 % (standard value of 0.050)

Inclusion Criteria:

Patients with chronic kidney disease undergoing haemodialysis who are:

- ✓ Willing to contribute in the study.
- ✓ Between age group of 18years- 65 years
- ✓ Underwent HD through an AV fistula for more than 6 months.
- ✓ Newly diagnosed haemodialysis patients as a study group.
- ✓ Arteriovenous fistula (AVF) in the upper arm.
- ✓ Patients are free from complications regarding arteriovenous fistula.

Exclusion Criteria:

Patients with chronic kidney disease undergoing hemodialysis who are:

- ✓ Having diabetic neuropathy.
- ✓ Having psychiatric or neurological problem.
- ✓ Having recent fistula occlusion.
- ✓ Having cognitive impairment.

Tools:

Fourth Tools were used for data collection as the following:

1. **1st tool:**

A Structured interviewing questionnaire sheet was developed by the investigator to collect the necessary information about patients via literature review. It consists of two parts:

Part I: socio-demographic data as age, marital status, education level, occupation, and place of residence.

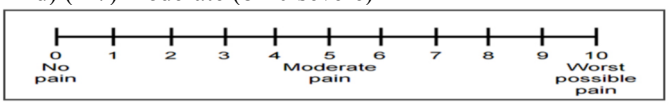
Part II: Patient's Medical Profile: It includes have chronic disease, site and type of arterial vascular fistula, and vital signs.

Part III: Laboratory investigation of kidney function as creatinine, s. urea, potassium, phosphors, sodium, calcium, and blood culture. This sheet was collected by the investigator according to hospital policy (one time per month) for measuring such as laboratory investigations by investigator.

2nd Tool: **Numerical Pain Intensity Scale** developed by **Galer and Gammaitoni (2003)**. It was utilized to assess the patient pain level during insertion and removal buttonhole cannulation.

Scoring System:

It was ranged and classify from (zero no pain) (1-3 mild) (4-7) moderate (8-10 severe)



2. Third Tool: **Observational Checklist**

This tool prepared by investigator after extensive literature to assess manifestation of complications regard arteriovenous cannulation. It was included two parts as following.

Part I: Manifestation of infection as redness, diffuse swelling, hotness and exudate from fistula.

Part II: Specific manifestation regard hematoma as onset of hematoma, color changes, bruising to the skin, localized swelling, and site of hematoma.

Scoring System:

The rank of this tool was ranged from one (1) means present complications or zero (0) means absent complications. Total scoring was classified less than or equal 60% means (not occurrence of complications) more than 60% means (occurrence of complications).

Fourth tool: assessment sheet included two parts regard:

Part I: Laboratory investigation of kidney function as creatinine, s. urea, potassium, phosphors, sodium, calcium, and blood culture. This sheet was collected by the investigator according to hospital policy (one time per month) for measuring such as laboratory investigations by investigator.

Nursing Guidelines for buttonhole cannulation technique:

Guidelines for nurses were created in 2016 by SIGN at facilities in the UK with substantial experience with buttonhole cannulation to lessen several arteriovenous problems. These suggestions try to list and summarize the seven-item best practice for buttonhole cannulation of arteriovenous fistulae. Such as 1- Use a 15-gauge sharp needle for 10 consecutive hemodialysis sessions, 2- Use a blunt needle when the buttonhole track could be seen, 3- Avoid applying too much pressure to plug the buttonhole when resistance is encountered, 4- Carefully and firmly assess the patient's pain threshold prior to cannulation. teaching hemodialysis patients how to care for fistulas ،5- disinfection the buttonhole exit area (inlet and outlet) 6- To make each scab easier to remove, soak two swabs in sterile normal saline for 10 to 15 minutes. To gently and carefully remove the scab, use a different sterile needle. and teaching hemodialysis patients how to care for fistulas **(Nissenson & Fine, 2016)**

Study Procedure (Field work)

Field work or procedure included three phases preparatory, implementation, and evaluation

Preparatory phase

Books, periodicals, and the internet were combed through to find the latest, most relevant research on the study problem from around the world. Patients on hemodialysis were used to assess the feasibility of the proposed study's infrastructure. Prototype test. Additionally, the pilot study's purpose is to assess the feasibility and usefulness of implementing research instruments into hospital practice in order to include patients who were initially excluded from the study population. It was carried out in March 2018 to check the usefulness, clarity, and completeness of the tools. In order to test and assess the applicability of the instruments that were utilized in the study, a pilot study was applied on 10% equivalent to six patients from all participating subjects after receiving ethical approval and authorization to enter the setting regions. These subjects were included in the research sample without any modifications being made. The nursing faculty's ethics committee gave its approval. Oral consent was gained from patients, the investigator received permission from the director of the Minia University Nephrology and Urology Hospital to conduct the study, and participants were made aware of their right to refuse to participate at any time and the confidentiality of their data

Constant validity To determine the extent to which the instruments being used measure what is supported to measure, the content validity was conducted. The produced tools were evaluated by a jury committee made up of five academic specialists in the thesis subject (staff of medical and surgical nursing at faculty of nursing Minia (no.= 2) and Assiut University (no.= 3)). Each expert provided a thorough evaluation of the tools' content and face validity because they are all active participants in their respective environments. The majority of the jury committee (100.0%) agreed that the existing research tools were reliable and pertinent to the study's objectives.

Reliability of instruments was done for the first, second, third, and the fourth tools were tested for internal consistency by using Cronbach's' alpha test that indicated strong and good reliable tools were 0.907, 0.687, &.715 respectively.

Implementation phase

Researchers began collecting proposed study. Once patients were admitted to the hemodialysis units, once permission was obtained to proceed with the department, the study was conducted. The investigator explained the aim of the study to the participant groups, including potential benefits and discomforts during their participation. Patients attended for hemodialysis sessions three days a week. At this time, the investigator was selected simultaneously for both groups (control and study group). The investigator obtained oral consent from the participant sample after the first tool was fulfilled through interview. This tool took about 15–20 minutes according to patients' tolerance, and every patient was allowed to ask any question to clear up any misunderstanding.

The data collection period lasted 10 months and started with collection from March 2018 to January 2019. The interviewer introduced herself to the patient at the outset in order to establish rapport. Interviewees were briefed on the study's goals and methodology before being asked to fill out a consent form and questionnaire.

The investigator started data collection from the control group first. Then, when the investigator completed data collection from the control group, he would start the same data collection from the study group in similar sequences as mentioned with the control group except that studied guidelines were implemented by the investigator at the end of collection of the first tool.

The buttonhole cannulation technique was used for the study group nursing guidelines. The investigator used evidence-based guidelines to implement the buttonhole cannulation technique on the study group of patients, who were all fully informed about the importance and benefits of the buttonhole. A numeric pain scale **(Second Tool)** was used to assess the patient's pain level at the end of the first week (after three consecutive hemodialysis sessions) and after four weeks. The investigator then used the observational checklist (**Third Tool**): onset of hematoma, assessed signs of infection, presence of hematoma, and site of hematoma; **fourth tool: assessment sheet** which included patient laboratory investigation at the end of the first week (this means after three consecutive hemodialysis sessions) and after four weeks. The control group used routine nephrology buttonhole cannulation technique by staff nurses. Vital signs assessed pre, during and after hemodialysis session **(tool one part II)**, patient's pain level was assessed by using a numeric pain scale **(Second Tool)** at the end of the first week (this means after three consecutive hemodialysis sessions) and after one month. The investigator then used the Observational checklist (**Third Tool**): assessed onset of hematoma, signs of infection, presence of hematoma, and site of hematoma, **fourth tool: assessment sheet** which included patient laboratory investigation and hemodialysis complications at the end of the first week (this means after three consecutive hemodialysis sessions) and after one month

Evaluation phase

The investigator used four tools to assess the effect of the guidelines

Statistical data

The IBM version of the Statistical Package for the Social Sciences (SPSS) 25.0 was used for the statistical analysis (SPSS!5.0 Command Syntax Reference.2006. SPSS inc, Chicago). At the coding and data entry phases, quality was checked. Descriptive statistics were used to display the data, including mean and standard deviation (SD) for quantitative variables, and frequencies and percentages for qualitative variables. The sample size was sufficient for a Fisher exact test of the correlation between two qualitative variables. T-test was used to compare two different variables. Visualizations of the data were created as Excel graphs

Result

Table (1): Percentage distribution of participated groups regarding their data of socio-demographic characteristics (n = 60)

Data of Socio-demographic characteristics	Study group (n= 30)		Control group (n= 30)		X^2 / fisher test	*P*-value
	No.	%	No.	%		
Age/Year						
18- <30	10	33.3	8	26.7	4.222	.238 NS
30- < 42	8	26.7	8	26.7		
42- <54	6	20.0	12	40.0		
54- 65	6	20.0	2	6.6		
Mean ± SD	39.2 ± 13.5 years		39.1 ± 11.3 years			
Marital status						
Single	5	16.7	8	26.7	3.420	.329 NS
Married	17	56.7	10	33.3		
Divorced	4	13.3	7	23.3		
Widow	4	13.3	5	16.7		
Educational level						
Illiterate	12	40.0	6	20.0	3.586	.488 NS
Read and write	4	13.3	4	13.3		
Primary education	4	13.3	6	20.0		
Secondary education	5	16.7	5	16.7		
University	5	16.7	9	30.0		
Occupation						
Employ	8	26.7	12	40.0	5.127	.163 NS
Farmer	3	10.0	7	23.3		
Free work	6	20.0	2	6.7		
Housewife	13	43.3	9	30.0		
Residence						
Urban	8	26.7	15	50.0	3.455	.063 NS
Rural	22	73.3	15	50.0		

NS = not statistically significant.

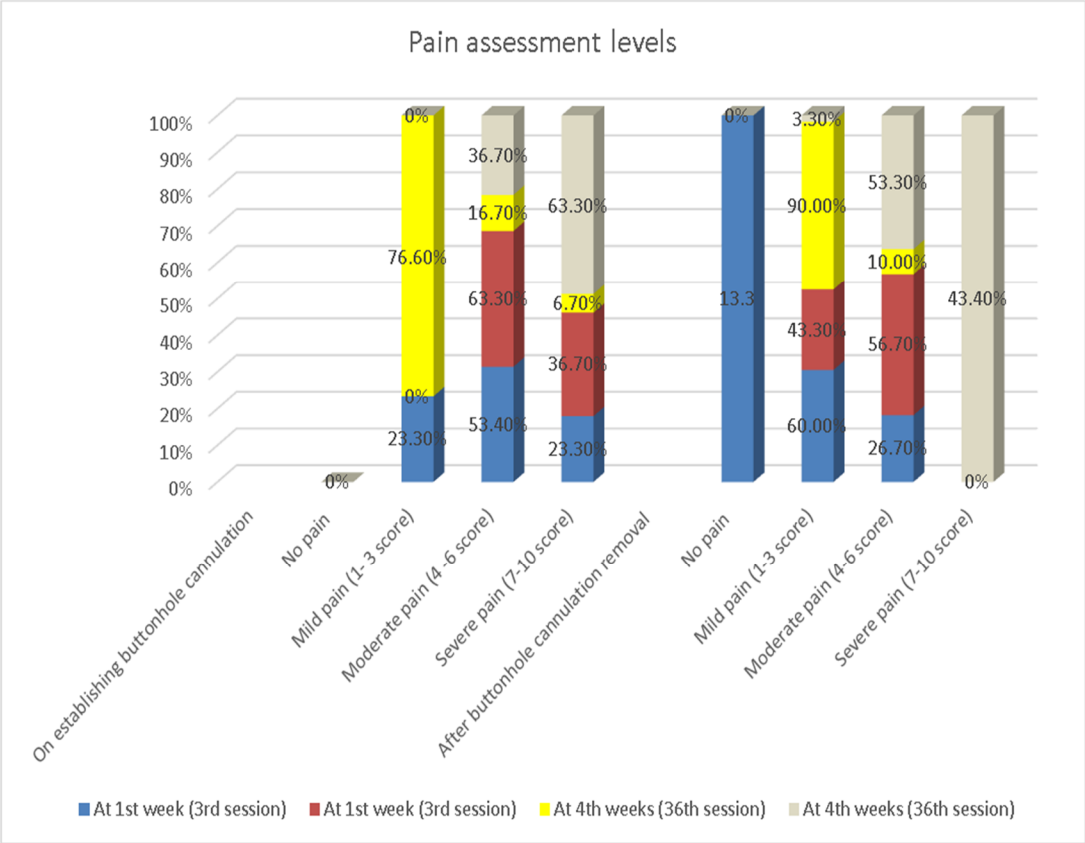
Table (1): observed that the average of age among participated groups was nearly similar percentages (39.2 ± 13.5 years, 39.1 ± 11.3 years) respectively. Regarding marital status, it was founded that 56.7% of the study group and 33.3% of the control group were married. Concerning educational level, it was noticed that 40.0% of the study group was illiterate and 30.0% of the control group was university. Finally, regarding occupation and residence, the highest percentage (43.3% and 73.3%) of the study group was housewives and lived in rural areas respectively. There was no statistically variation between both groups in relation to their socio-demographic data.

Table (2): mean average and standard deviation of vital signs measurements for participated groups throughout four-weeks during hemodialysis sessions) post applications of study guidelines (n = 60)

Vital signs	Pre-hemodialysis sessions		During hemodialysis sessions		post hemodialysis sessions	
	Study (n= 30)	Control (n= 30)	Study (n= 30)	Control (n= 30)	Study (n= 30)	Control (n= 30)
	$X \pm$ SD	$X \pm$ SD	$X \pm$ SD	$X \pm$ SD	$X \pm$ SD	$X \pm$ SD
Temperature	36.1 ± 5.6	36.5 ± .3	36.7 ± .3	37.5 ± .9	36.9 ± .4	37.3 ±.3
Z (*P* – value)	1.757 (.084)		**2.435 (.018)***		**3.508 (.02)***	
Heart rate	74.5 ± 6.6	74.2 ±6.7	78.4 ±8.7	82.6±14.4	77.4 ± 6.6	79.4±9.3
Z (*P* – value)	1.186 (.240)		**3.307 (.002)****		**3.508 (.001)****	
Resp. rate	20.4 ± 2.5	21.0 ±2.9	21.8 ± 3.7	23.8 ± 5.3	22.3 ±3.6	24.2±2.0
Z (*P* – value)	1.486 (.148)		**3.659 (.001)****		**3.879 (.002)****	
Systolic Bp	120.7±13.1	120.4±13.7	125.2±11.6	130.1±12.1	120.7±11.4	126.7±11.8
Z (*P*-value)	1.997 (.0641)		**3.098 (.003)****		**3.947 (.002)****	
Diastolic Bp	84.9 ±4.7	84.8 ± 4.9	85.3±5.7	87.4 ± 6.1	83.7±7.2	85.1 ± 7.2
Z (*P* – value)	1.688 (.097)		**3.147 (.02)***		**3.715 (.003)****	

* *P* – value ≤ 0.05 ** *P* – value ≤ 0.01 ***N.B****. vital signs were checked three times/ day / every session*

Table (2) this table showed that no statistically significant differences between participated groups in relation to their mean average vital signs measurements pre-hemodialysis session. But there are a statistically significant difference between participated groups among them during and post hemodialysis sessions regard their temperature which *P – value ≤ 0.05* while there were a highly significant differences regard heart rate, respiratory rate and blood pressure measurements among participated groups during and post HD sessions post application of study guidelines which *P* – value ≤ 0.01 respectively.



N.B.. first week (3rd HD session) and after fourth weeks (36th HD session) (n = 60).

Figure (1): comparison between Percentage distribution of participated groups regarding their pain levels when they establishing and removal of hemodialysis cannulation throughout first and fourth week from application of study guidelines (n = 60).

The above **figure** presented that there were a statistically significant differences during first week of hemodialysis among both groups regard their pain levels when they were established buttonhole cannulation after application of study guidelines while no statistically significant differences in pain levels among same groups in the same week when they were removed buttonhole cannulation which *P* – value ≤ 0.05. Also, there were a highly statistically significant differences regard pain levels among both groups when they were established and removed buttonhole cannulation during fourth week of hemodialysis after application of study guidelines which *P* – value < 0.0001 & 0.0001 respectively.

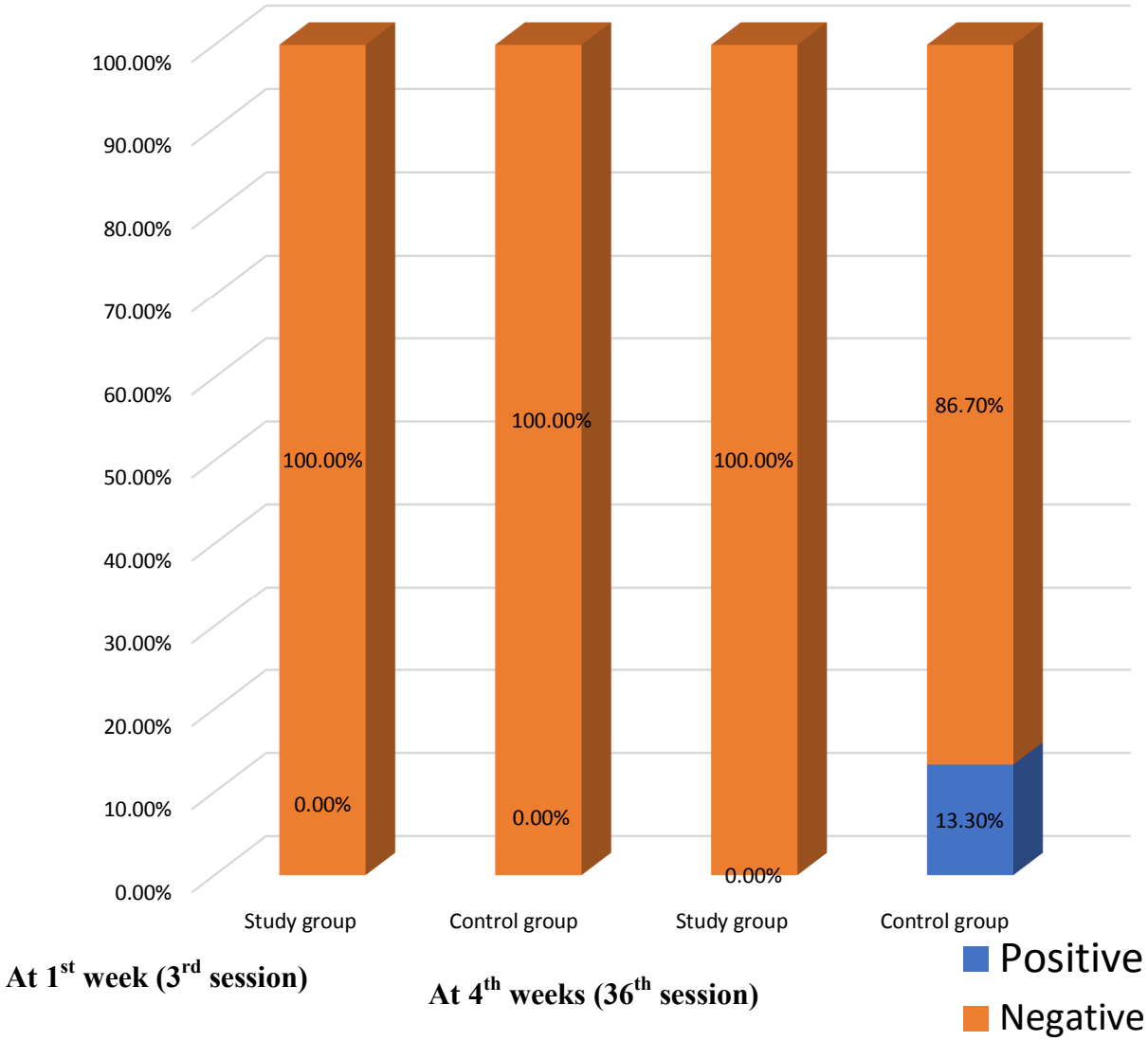
Table (3): Comparison between percentage distribution of participated groups regarding occurrence of infection throughout first and fourth week from application of study guidelines (n = 60).

Signs of infection	At 1st week (3rd session)				Fisher exact *P*-value)	At 4th weeks (36th session)				Fisher exact (*P*-value)
	Study (n= 30)		Control (n= 30)			Study (n= 30)		Control (n= 30)		
	No.	%	No.	%		No.	%	No.	%	
Occurrence										
Yes	4	13.3	9	30.0	2.455 (0.117)	1	3.3	27	90.0	45.268 (.0001**)
No	26	86.7	21	70.0		29	96.7	3	10.0	
Manifestations of infection										
Redness	4	13.3	9	30.0	0.480 (0.488)	1	3.3	20	66.7	26.447 (.0001)**
Diffuse swelling	3	10.0	6	20.0	1.176 (0.278)	0	.0	21	70.0	32.308 (.000)**
Hotness	4	13.3	9	30.0	0.480 (0.488)	1	3.3	20	66.7	23.154 (.0001)**
Exudate from fistula	2	6.7	2	6.7	0.000(1.00)	0	.0	19	63.3	27.805 (.0001)**

not mutually distributed NS= not statistically significant * P – value ≤ 0.05 ** P – value ≤ 0.01

The above table showed that the majority (86.7% & (96.7%)) of the study group was had not local infection around buttonhole cannulation at the first week and at the fourth week respectively of HD sessions post application of study guidelines. while (70.0%) of the control group had not local infection around buttonhole cannulation at the first week but the majority (90.0%) among them were had infection in same location at the fourth week. On the other hand, the table showed that, no statistically significant differences in first week of HD sessions among studied groups regard infection manifestations in converse there was highly statistically variation between the two groups regard same previous manifestations at fourth week of HD sessions from application of the study guidelines which P – value ≤ 0.01.

Figure (2): Comparison between participated group regarding their blood culture test interpretation during HD sessions at first and fourth weeks post application of study guidelines (n = 60).



The above figure illustrated that the participated groups had negative blood culture in the 1st week of the HD sessions post application of study guidelines But in the fourth week of the HD sessions none of study group (0%) and 13.3% of the control group had positive blood culture from application of study guidelines .

Figure (3): Comparison between participated group regarding presence of specific HD complications " hematoma " among them during HD sessions at first and fourth weeks post application of study guidelines (n = 60).

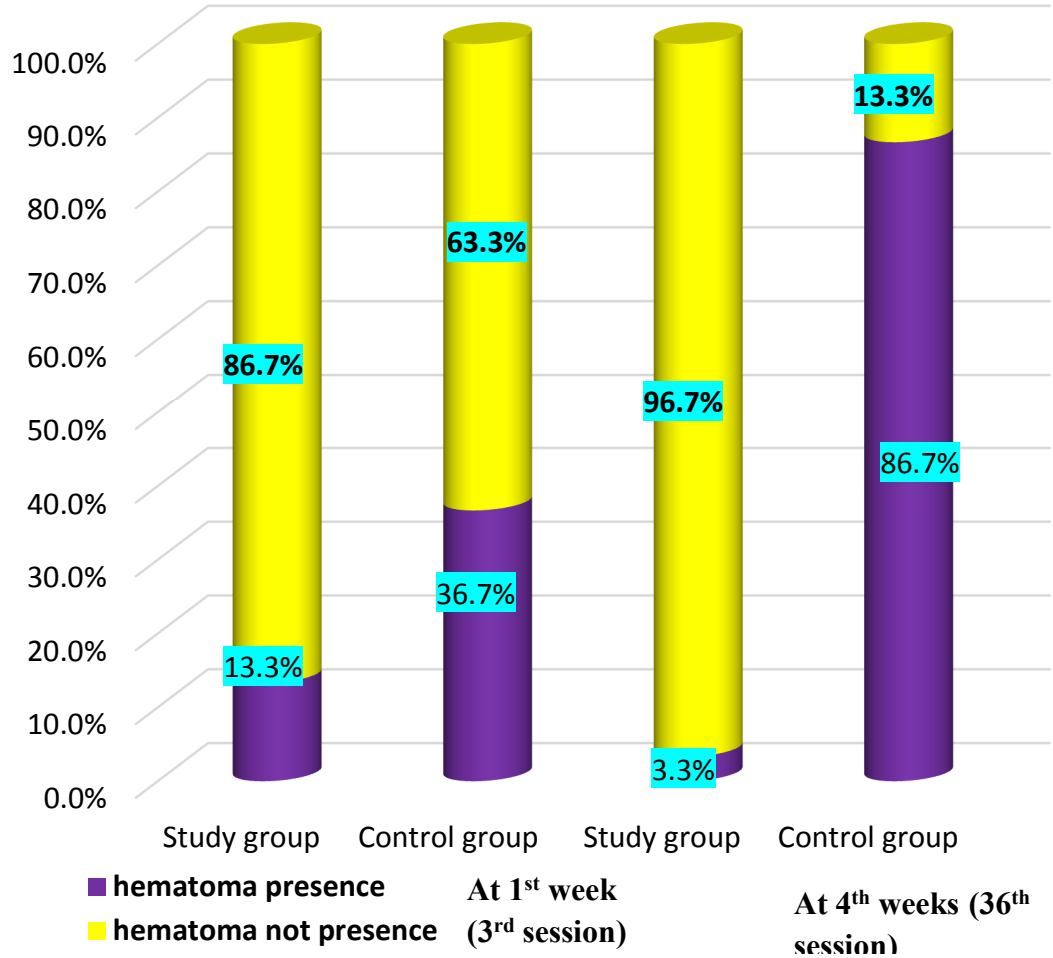


Figure (3): This figure presented that 13.3% among the study group & 36.7% of the control group were had hematoma at 1st week of HD after the application of study guidelines, while 3.3% & 86.7% among both groups were had hematoma at the fourth week of HD after the application of study guidelines respectively .

Table (4): comparison between Percentage distribution among participated groups regarding onset and skin color changes with hematoma at 1st and 4th week after application of the study guidelines (n = 60).

Hematoma	At 1st week (3rd session)				Fisher exact *P*-value)	At 4th weeks (36th session)				Fisher exact *P*-value)
	Study		Control			Study		Control		
	No.	%	No.	%		No.	%	No.	%	
Onset of hematoma										
Hyper acute <24	2	6.7	3	10.0		1	3.3	3	10.0	
Acute 1-3 days	2	6.7	2	6.7	3.245	0	.0	6	20.0	2.736
Early sub-acute 3- 7 days	0	.0	2	6.7	(.05*)	0	.0	14	46.7	(.005*)
Late sub-acute > 7 days	0	.0	4	13.3		0	.0	3	10.0	
Skin Color change after hematoma										
Blue	0	.0	0	.0		0	.0	4	13.3	
Purple	0	.0	1	3.3	……	0	.0	3	10.0	2.182
Yellow	0	.0	2	6.7		1	3.3	2	6.7	(.001**)
Brown	0	.0	0	.0		0	.0	2	6.7	
Bruising to the skin	0	.0	4	13.3	……..	0	.0	26	86.7	…….
Localized swelling	4	13.3	4	13.3	.000 (1.000)	0	.0	26	86.7	…….

NS= not statistical significant * *P* – value ≤ 0.05 ** *P* – value ≤ 0.01

N.B. *first week (3rd HD session) and after fourth weeks (36th HD session) (n = 60).*

The above table showed that 6.7%&6.7% of study group was had hematoma within 24hrs or throughout first three days after cannulation (1st week) post application of study guidelines but 13.3% among control group was had hematoma after seven days from cannulation. on the other hand at the fourth week from HD regard previous category the table showed that 3.3% among study group still were had hematoma within 24hrs post application of study guidelines but 46.7% among control group still was had early sub-

acute hematoma that started from 3 to 7 days so There were statistically variations among the two groups regarding onset of hematoma at first and fourth week in HD sessions P – value ≤ 0.05 respectively.

Table (5): Comparison between mean average scores among participated groups of kidney function test interpretation at first and fourth weeks post application of study guidelines (n= 60).

Investigations	At 1st week (3rd session)		At 4th weeks (36th session)	
	Study (n= 30)	Control (n= 30)	Study (n= 30)	Control (n= 30)
	X ± SD	*X* ± SD	*X* ± SD	*X* ± SD
S. Creatinine	9.4 ± 1.96	10.0 ± 2.1	6.6 ± 1.7	10.8 ± 1.9
Z (*P* – value)	1.112 (.271)		8.841 (.0001**)	
S. Urea	164.9 ± 46.8	185.2 ± 70.3	120.2 ± 33.1	194.8 ± 54.3
Z (*P* – value)	1.310 (.195)		6.418 (.0001**)	
Potassium	4.8 ± 1.1	4.9 ± 1.1	3.7 ± .6	7.2 ± 9.8
Z (*P* – value)	.493 (.624)		2.963 (.05*)	
Phosphors	5.2 ± 1.1	4.8 ± .89	3.8 ± .6	5.4 ± .7
Z (*P* – value)	1.392 (.169)		9.454 (.0001**)	
Sodium	148.9 ± 7.7	150.8 ± 11.6	139.7 ± 5.9	151.0 ± 4.8
Z (*P* – value)	.777 (.440)		8.161 (.0001**)	
Calcium	8.9 ± 1.4	8.5 ± .9	10.1 ± 1.1	8.1 ± .9
Z (*P* – value)	1.254 (.215)		7.891 (.0001**)	

NS= not statistical significant * *P* – value ≤ 0.05 ** *P* – value ≤ 0.01

N.B. *first week (3rd HD session) and after fourth weeks (36th HD session) (n = 60).*

The table above was showed that there were no statistically significant differences in HD efficiency among participated groups as indicated in all items of their kidney functions test interpretation mean averages at 1st week of HD sessions post application of study guidelines which *P* – value ≤ 0.05 but at the 4th weeks of HD sessions there was a highly statistically significant difference which *P* – value ≤ 0.01 between same groups regard their kidney function test interpretation post application of study guidelines.

Discussion

Divergent opinions continue to exist on the cannulation method for hemodialysis vascular access. The kind of cannulation technique utilised in clinical practise is frequently determined by the standard of dialysis, overall patient safety, and a patient's personal experience with dialysis. The three methods—rope ladder, area, and buttonhole—that are often employed as hemodialysis vascular access are (**Vachharajani et al., 2020**)

Regarding the Percentage distribution of participated groups regarding their socio-demographic data, the present study showed that the mean age among study and control groups was nearly similar percentages (62.9 ± 2.1 years, 61.8 ± 2.0 years) respectively. As regard to marital status; it was founded that more than half of studied group and one third of control group were married. Due to more than thirty-three percent of study group age from 18-30 years, and less than fifty percent of control groups age ranked between 42-54 years and sample was taken randomly. This result were confirmed by **Staaf et al., (2021)** who reported that more than fifty percent of the studied sample were more than 53 years old and more than half them were married.

Regarding level of educational; the current study illustrated that more than o thirty-three percent of studied group were illiterate while more the one quarter of control group had university, due to they live in rural areas who prefer work than education and due to low socioeconomic status. Also this finding in the same line with **Lyman et al., (2020)** who demonstrated that about one third were no write and more than one quarter had bachelor degree. This finding come inconsistent with **Gerasimoula et al., (2015)** who stated that more than one third of people had completed their elementary education, fewer than one third had completed their secondary education, more than one quarter had earned a bachelor's degree, and less than ten percent had a master's degree.

The present study showed that less than fifty percent of studied group while less than one third of control group was housewife. This result was normal because the current study illustrated that more than thirty-three percent of studied group were illiterate while more the one quarter of control group had university. This finding come in the line with **Zeid and Aly, (2020)** who reported that more than tho fifth of the studied sample were house wife.

The current study results showed that there was a highly statistically variation between study and control groups during and after hemodialysis sessions in which there were increase in normal level in all vital signs parameter in the control group than study group due to the study group used effective current study nursing guidelines and there was a regular follow up of vital sign before, during and after session. This result were confirmed by **Owens et al., (2019)** who reported that less than ten percent of the patients suffered hypotension, less than one third of them had hot flashes, less than one third had tachycardia, and less than one fifth had tachypnea.

The present study showed that, there were a statistically significant differences during first week of hemodialysis among both groups regard their pain levels when they were established buttonhole cannulation after application of study guidelines. Also, there were a highly statistically significant differences regard pain levels among both groups when they were established and removed buttonhole cannulation during fourth week of hemodialysis after application of study guidelines due to nursing approach during buttonhole cannulation for patient with hemodialysis had affected on pain levels. This result were confirmed by **Jared and Rajki, (2019)** who reported the mean pain level scale before cannulation site establishment was 3.48 0.87, whereas the mean pain level scale after cannulation site establishment was 2.44 1.04.

Concerning to the experience of pain the current study showed that after fourth week of dialysis session three quarter of the study group compared to zero percent of the control groups had mild pain on establishing buttonhole cannulation respectively and the majority versus less than tenth of study and control groups had mild pain on removed buttonhole

cannulation respectively with highly statistically variations. This result cone in accordance with **Arab et al., (2017)** who concluded that without any intervention, both patient groups had moderate degrees of discomfort during fistula needle insertion, however after intervention, there was a substantial difference between the two groups.

The current study showed that no statistically variation in first week of HD sessions among studied groups regard infection manifestations in converse there was highly statistically significant difference between both groups regard same previous manifestations at fourth week of HD sessions from application of the study guidelines, due to The use of aseptic technique and appropriate cannulation methods, the timing of fistula and graft cannulation, and early evaluation of immature fistulae are all factors involved in current study nursing guidelines that may protect from infection and may extend the survival of permanent accesses of dialysis This finding in accordance with **Morgans et al., (2021)** who reported that the following the study's guidelines helped hemodialysis participants avoid infection.

This result was contradicted by **Christensen et al., (2018)** reported that staphylococcal colonization of the buttonhole tract and asymptomatic bacteremia are widespread in hemodialysis patients, suggesting a significant risk for access-related infections in patients undergoing buttonhole cannulation. The good attention to the nursing recommendations may have contributed to this outcome.

The current findings mentioned that there was a highly statistically variation between them after one month which control group had more occurrence of hematoma than study group. Due to nurses experiencing lower pressure during insertion when using a sharp needle and the buttonhole track being perceived as a round hole with healed scabs, dull needles of the same length and gauge might be substituted. Two buttonhole tracks will develop with a scab covering them after approximately 10 consecutive sharp needle insertions at the same AVF location. It was a sign that buttonhole tracks were being created at the time and that blunt needles may be utilized for more hemodialysis sessions. Use a dull needle of the same size throughout to lessen the possibility of traumatizing the buttonholes that have already formed.

Those findings in accordance with **El et al., (2019)** reported that less than fifth of the studied sample had hematoma and less than tenth had infected fistula site. This finding inconsistent with **Jared and Rajki, (2019)** who reported that less than two third of the studied sample had hematoma formation and more than one third had aneurism development in the group who not receive the intervention .

The current study showed that, there was a highly statistically significant difference which P – value ≤ 0.01 between same groups regard their kidney function test interpretation post application of study guidelines. This may be related to the laboratory investigation was affected by the effectively of the session and the patient adherence to nursing guidelines that applied pre, during and post hemodialysis session through The track was established after ten consecutive hemodialysis sessions using a 25-mm long 15G sharp needle inserted on the AVF at a 20°–30° angle by the same nurse. A blunt needle of the same length and gauge could be used to enhance the efficiency of hemodialysis because it maintains a good distance between two needles when the buttonhole track was imagined to be a round hole with healed scabs and nurses noticed reduced pressure on insertion when using sharp needles. This result come in the line with **Christensen et al., (2018)** who reported that there is no statistical significance changes between the result of laboratory investigation and the technique of insertion. This finding contraindicated with **Bakarman et al., (2019)** they enumerated that all laboratory tests showed no significant changes between the intervention and control group before the educational program for Hemodialysis **(**HD) patients.

Conclusion

Based on the results of the present study we can conclude that:

Buttonhole study guidelines were had positive impact on hemodialysis complications (pain, infection, hematoma, vital signs) after fourth weeks for study group in comparison with control group.

Recommendations:

The researchers come up with the following recommendations For Patients :

- Increase awareness through nursing staff of hemodialysis patients and caregivers regard self-care related to vascular access and reporting about any warnings signs of hemodialysis complications
- Encourage patient participations in health education programs about evidence based practice regard hemodialysis care at home.

For hemodialysis department and nurses :

- Nurses and department supervisors must use advanced study guidelines of different methods of cannulation of arteriovenous fistula which based on evidence based practices.
- Encourage nurses to perform education as apart as their roles by organizing educational sessions in hemodialysis center
- Design programs about importance of patient s safety measures and other advanced issues for hemodialysis which will be teached by department supervisors

For further studies :

- Re –apply of the current study on larger sample size and more duration to achieve generalizable result on other setting.

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