

Cutaneous Stimulation: its Effect on pain Relieving among Hemodialysis Patients

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Abstract

Pain management in the purview of all health professionals especially nurses and it is an important component of comprehensive nursing care. Nursing effort should be made to assess and manage acute pain inflicted by insertion of needle in arteriovenous fistula among hemodialysis patients. **Aim:** This study was carried out to examine the effect of cutaneous stimulation on pain relieving at arteriovenous fistula puncture site among hemodialysis patients. **Setting:** The study was carried out at Hemodialysis units in Menoufia University hospital and Shebin El- Kom teaching hospital. **Sample:** A random sample of forty hemodialysis patients in Shebein El-Kom Teaching hospital and twelve hemodialysis patients in Menoufia University hospital who had arteriovenous fistula. **Tools:** three tools were utilized to collect the data. **Tool I :** An interviewing questionnaire to assess sociodemographic and medical data. **Tool II :** Abbey pain scale to assess objective pain behaviour. **Tool III :** 0-10 numeric pain scale to assess subjective pain. **Results:** revealed that 55.8% of studied sample had moderate objective pain score before applying cutaneous stimulation, while after the application 67.3% of them had mild objective pain during second visit and 65.4% had no pain during the third visit. Also the subjective pain among the studied sample was either moderate or severe before applying cutaneous stimulation, while after application, 46.2% of them had mild subjective pain during second visit and 51.9% had no pain during the third visit. **Conclusions:** Cutaneous stimulation is effective in reducing arteriovenous fistula puncture objective and subjective pain scores among hemodialysis patients. **Recommendations:** Cutaneous stimulation should be carried out routinely for managing arteriovenous fistula puncture related pain among hemodialysis patients.

Keywords: Effect, Cutaneous stimulation, pain and Hemodialysis.

1. Introduction

Bones can break, muscles can atrophy, gland can loaf and even the brain can go to sleep without immediate danger to survival but should the kidney fail, all these organs are distributed. This statement underlines the importance of kidneys to our life⁽¹⁾. Renal failure is a gradual and progressive loss of ability of the kidneys to concentrate the urine, conserve electrolytes or excrete waste products. It is a devastating medical, social and economic problem for both patients and families⁽²⁾. The goals of treating patients with renal failure are to stabilize internal environment, control fluid and electrolyte imbalance, prevent infection and bleeding and control blood pressure⁽³⁾. But no perfect substitute for one's own kidneys. However this kidney is the only organ whose function can be replaced for indefinite period by artificial means. Technological advances in the care of renal failure patients provide several renal replacement therapies such as hemodialysis, peritoneal dialysis, hemofiltration and transplantation^(4,5).

Dialysis is a temporary or permanent process that artificially replaces the excretory function of the kidney from the body and to correct serious electrolyte and fluid imbalances⁽⁶⁾. Hemodialysis (HD) is most frequently used renal replacement therapy. One of the vital aspects of hemodialysis is the establishment and maintenance of adequate blood access. Without it, hemodialysis can not be done. One of the major routes is the internal arteriovenous fistula (AVF)^(6,7).

In September 2008, the world health organization (WHO) estimated that nearly 80% of the population in the world has either insufficient or no access to moderate or severe pain treatment. Every year millions of people around the world suffer from pain without sufficient treatment. Patients undergoing HD are repeatedly exposed to pain from approximately 300 puncture per year to their AVF due to insertion of large gauge needle into the fistula⁽⁸⁾. Pain is unpleasant sensory and emotional experience associated with actual or potential damage of tissue with physiological or psychological responses⁽¹⁾.

When pain was surveyed, it was found that 90% of adult expressed pain because of needle based procedure. Pain inflicted by insertion of large cannulae into AVF on regular HD is a significant cause of concern for both

children and adult patients. Although AVF puncturing causes pain, local anesthesia is not frequently used due to concerns of vasoconstriction, burning sensation, scarring and infection^(9,10)

Ricci and Kyle listed strategies for pain management to include pharmacological and nonpharmacological intervention. The nonpharmacological approaches are essential component of pain relieve that include relaxation technique, visual imagery, behavioral- cognitive strategies and biophysical interventions such as massage, pressure, and cutaneous electrical nerve stimulation through either heat or cold application. Although most of nurses have a commitment in pain reduction, fewer of them work for alleviation. Effort on pain management from health professionals at all department levels should be implemented as an important measure toward changing ineffective pain management practices⁽⁵⁾.

Cutaneous stimulation is defined as stimulation of the skin and underlying tissues for the purpose of decreasing undesirable signs and symptoms such as pain, muscle spasm or inflammation. It also referred to as peripheral technique; describe any form of stimulation of the skin with the goal of pain relief. There are many different methods of cutaneous stimulation such as pressure, massage, heat, and/ or cold application. Research evidence show that cutaneous stimulation is an independent nursing intervention that advocated relieving pain and the nurse in practice is qualified to give it accurately⁽¹¹⁾.

The cutaneous stimulation is best explained by the gate control theory in minimizing pain. It can be clubbed with acupressure to the large intestine energy meridian to increase its effectiveness^(12,13). The large intestine energy meridian pathway is bilateral and begins in the surface of skin at the root of the index fingernail. It crosses through the arm and hand then the outward end of shoulder blade. After that the meridian leaves the skin surface to connect with the lower part of the lung and transverse colon. It then returns to the skin surface at a point under the chin. It follows the lower row of dental roots passing them to the upper line of the teeth roots crossing the front of the mouth to emerge on the skin surface and facial point next to the nostrils⁽⁷⁾. The large intestine meridian is an acupressure point located on the back side of the hand between the thumb and index finger which is used dominantly to relive pain of shoulder, arm, rigidity of the neck and scapula and eye disease. The most effective site of cutaneous stimulation is contralateral to the pain^(12,13).

Studies have also thrown light on the fact that cold therapy (cryotherapy) is one of the effective cutaneous stimulation techniques in alleviating pain. Cryotherapy is defined as the use of a substance that applied to the body to decrease tissue temperature⁽¹⁴⁾. It was clarified that cryotherapy is used for treatment of pain by slowing nerve conduction rate and blocking nerve impulses through lowering the temperature over the affected area. It also relaxes muscles, decrease capillary permeability by vasoconstriction and slow cellular metabolism. It can be applied topically, percutaneously or surgically. The cold application can be delivered by cold packs, ice massage or spray⁽¹⁵⁾.

The nurse have important role in providing right patient care by helping and teaching patient how to apply cryotherapy. The nurse also should work with the patient during the application starting from preparation, application with continuous observation for the patients' tolerance to the procedure. Moreover she should teach patient the self application of this therapy⁽¹⁶⁾.

This study was therefore undertaken to examine the effect of cutaneous stimulation on pain relieving at arteriovenous fistula puncture site among Hemodialysis patients.

2. Aim of the Study

The aim of the present study was to: Examine the effect of cutaneous stimulation on pain relieving at arteriovenous fistula puncture site among Hemodialysis patients.

The following research hypotheses were formulated to achieve the aim of the study:

- There will be a decrease in objective pain score after applying cutaneous stimulation at arteriovenous fistula puncture site among Hemodialysis patients.
- There will be a decrease in subjective pain score after applying cutaneous stimulation at arteriovenous fistula puncture site among Hemodialysis patients.

Operational definitions:

Cutaneous stimulation: It is the application of ice cubes wrapped in gloves and placed on the web between thumb and index finger of the hand not having AVF(contralateral) 10 minutes before the vein puncture and continued through the procedure(approximately 2 minutes).

Pain at arteriovenous fistula puncture site: It is the pain in the arteriovenous fistula site during vein puncture of the fistula among patients undergoing hemodialysis.

Material and Methods

1-Material

Design:

A quasi experimental research design was utilized to achieve the aim of this study.

Setting:

The study was conducted at hemodialysis units of Menoufia University hospital and Shebin El- Kom teaching hospital.

Subjects:

Random samples of hemodialysis patients who had an AVF in the previously mentioned setting and who fulfilled the inclusion criteria during the study period were selected (52 patients, 40 of them from Teaching hospital and 12 from University hospital).

Inclusion criteria: Adult patients of both sexes who undergoing hemodialysis via AVF and able for giving adequate response to pain.

Exclusion criteria: Patients on analgesic medications or having radiation injuries, peripheral vascular diseases, Raynauld's syndrome, connective tissue disorders, diabetic neuropathy, alternated level of consciousness, allergies to cold applications and suffering from pain of other origin than AVF were excluded from the study.

Sampling technique:

The researcher asked the head nurses in both previously mentioned settings to list all patients in the morning and afternoon shifts. The head nurses nominated that there were 210 patients in Teaching hospital and 66 patients in the University hospital in the three shifts. From these subjects, 140 from Teaching hospital and 44 in the University hospital were in the morning and afternoon shift forming 184 patients, out of these patients, only 140 patients meet the criteria of selection and 16 of them refused to participate in the study to give a final number 124 patients.

Based on the review of related literature, the prevalence of pain related to needle puncture was found to be 90% and by using EPI program, sample size was calculated and it was determined that a total of 52 patients were sufficient to represent the population where confidence coefficient was 90% and the power was 80%

Tools:

In order to achieve the aim of the study, three tools were utilized for data collection. These tools are as follow:

Tool I : An interviewing questionnaire:

It was constructed by the researchers to assess patients' sociodemographic and medical data. It included three parts:

Part one : Sociodemographic Data. It included information about : patients' age, sex, marital status, educational level and occupation.

Part two : Medical data. It included data about presence of other chronic diseases, duration of HD, duration of AVF, vital signs and laboratory investigations.

Part three: Assessment of AVF site as presence of hotness, redness, swelling, localized pain, bleeding and bruises.

Tool II : Abbey pain scale:

It was developed by Abbey et al.,⁽¹⁷⁾ and modified by the researchers to be five parts instead of six parts. It was utilized to assess objective pain behavior. It consisted of five signs to be checked by the researchers if they were observed on the patients during AVF puncturing such as vocalization, facial expression, change of body language, behavioral changes and physiological changes.

Scoring system:

Each statement options were given four point likert boxes that rated objective pain behavior into four subheadings. It ranges from zero to three, in which zero indicated absent, 1 indicated mild, while 2 indicated moderate and three indicated severe sign of pain. The total scores were summed with a higher score indicated sever pain score. A total score of:

- 0- 2 indicated no pain.
- 3-7 indicated mild pain.
- 8-13 indicated moderate pain.
- 14 or more indicated severe pain.

Tool III : 0-10 numeric pain rating scale: It was developed by the McCaffery and Beebe⁽¹⁸⁾ for subjective pain assessment. The scale consisted of 10 cm line that was numerated from zero to ten in which: 0 = no pain,

1-3 = mild pain , 4-6 = moderate pain and 7- 10 = sever pain .

II-Methods

1- An official permission to carry out the study was obtained by the researchers from responsible authorities after explanation of the aim of the study before initiating the study.

2- **Tools development:** The first tool was constructed by the researchers after reviewing the relevant literature, while tool two was constructed by Abbey et al.,⁽¹⁷⁾ and the third one developed by McCaffery and Beebe⁽¹⁸⁾ and all tools were tested for content validity by 5 experts in Nursing and Medical fields. Then these tools were tested for reliability by using a test- retest method and Pearson correlation coefficient formula was used. It was found to be 0.89 for tool one, 0.87 for the second tool and 0.94 for the third tool. Modifications were done accordingly to ascertain relevance and completeness.

3- **Ethical consideration:** Hemodialysis patients who met the inclusion criteria were included in the study, and then a clear and simple explanation about the nature and aims of the study was given to each participant. After that, an informal consent was obtained from each participant to get his/ her acceptance as well as cooperation. All participants were informed about confidentiality of the data and they have the right to withdraw from the study at any time without any effect on their routine care they received.

4- Prior to the actual study, a pilot study was conducted on 10% of the study sample (5 patients) to test study tools for its clarity, feasibility and applicability and determine the required time to fulfill these tools and then necessary modifications were carried out accordingly. Those who shared in the pilot study were excluded from the study sample.

5- Data collections :

- a. Data were collected over a period of four months from the beginning of May to the end of August 2013.
- b. The researchers initiated data collection by assessing sociodemographic data, medical data and arteriovenous fistula site through interviewing each participant individually using tool I.
- c. A staff nurse of the unit performed the puncture for AVF according the unit schedule and the researchers assess objective pain behaviour during the AVF puncture to determine the objective pain scoring using tool II.
- d. Patients were asked after the AVF puncture to tick on the numeric pain rating scale to indicate how strong their pain during AVF puncture using tool III.
- e. Cold application sensitivity test was done by the researchers in the hand of the contralateral site to AVF for each participant to detect sensitivity to cold therapy by placing ice cubes wrapped in gloves on the web between the thumb and index finger of the hand not having AVF (contralateral arm) for 5 minutes.
- f. After one week from the patients' assessment, cutaneous stimulation through cryotherapy intervention was applied in the dialysis unit twice in two consecutive visits. This cold application was done with ice cubes wrapped in gloves on the web between the thumb and index finger of the hand not having AVF (controlateral arm). This procedure was started 10 minutes before the puncture and continued throughout the puncture procedure (approximately two minutes). The researchers themselves performed the ice massage while the staff nurse performed the AVF puncture.
- g. During AVF puncture, the researchers assessed objective pain behaviour for each participant by using tool II and after AVF puncture, the researchers assessed subjective pain for each participant by using tool III. These assessments were done during the second and third visit to the patients, and then a comparison between both objective and subjective pain scores AVF puncture site before and after cryotherapy was done by the researchers.

Statistical analysis

Results were collected, tabulated, statistically analyzed by IBM personal computer and statistical package SPSS version 16. Two types of statistics were done

- 1- **Descriptive:** e.g. percentage (%), range, mean and standard deviation SD
- 2- **Analytical:-**

- A) Mann-Whitney test: it is a nonparametric test of Student's t-test. It is used to collectively indicate the presence of any significant difference between two groups for a not normally distributed quantitative variable
- B) Kruskal -Wallis test: It is the non-parametric version of ANOVA. It is used to collectively indicate the presence of any significant difference between several groups for a not normally distributed quantitative variable.
- C) Chi-Squared (χ^2): It is used to compare between two groups or more regarding one qualitative variable in 2x2 contingency table or r c complex table.

D) Paired t test: It is a single test used to collectively indicate the presence of any significant difference between different time sequences for a normally distributed quantitative variable.

P value:

- Non-significant difference if $P > 0.05$.
- Significant difference if $P < 0.05$
- Highly significant difference if $P < 0.001$.

3. Results

Table (1): Showed that, the mean age of studied sample was 44.13 ± 13.29 years. More than half of them (51.9%) were male. More than two thirds of them (71.2%) were married. In relation to educational level, less than half of studied sample were either illiterate or had preparatory and secondary education (42.3% and 40.4% respectively). Regarding occupation, more than one third of them were either house wife or not working at all (36.5% and 38.5% respectively).

Table (2): Revealed that, the more than half of studied sample (51.9%) didn't have any other chronic diseases. The mean duration of hemodialysis was 4.11 ± 3.38 years, while the mean duration of AVF was 3.03 ± 2.35 years. Regarding blood pressure, more than one third of them (36.5%) had increased level of blood pressure during time of assessment. All studied sample (100%) had abnormal renal function test (increased urea and creatinine). More than half of studied sample (57.7%) had bruises in puncture site. More than three fourth of them (78.8%) know how to care for their fistula.

Table (3): Reported that there were highly significant improvement in vocalization, facial expression, physiological changes and total objective pain scores at AVF puncture site among studied sample after the cutaneous stimulation during the second and third visit than before. Also there were improvements in body language and behavioral changes' scores but with non significant results.

Figure (1): Revealed that there was significant decreasing of mean objective AVF puncture pain after cutaneous stimulation during second and third visit than before.

Table (4): presented that less than half of studied sample (46.2%) had sever AVF puncture pain and more than half of them (51.9%) had moderate pain before applying cutaneous stimulation. While after applying cutaneous stimulation 46.2% of them had mild pain during the second visit of study and during the third visit, more than half of them (51.9%) had no AVF puncture pain at all.

Table (5): Showed that objective AVF puncture related pain score didn't affected by sex, education and marital status.

Table (1): Distributions of sociodemographic characteristics of studied sample

Sociodemographic characteristics	No n=52	%
Age (year)		
Mean \pm SD	44.13 ± 13.29	
Range	19-60	
Sex		
Female	25	48.1
Male	27	51.9
Marital status		
Single	9	17.3
Married	37	71.2
Widow/ Divorced	6	11.5
Education		
Illiterate	22	42.3
Preparatory and secondary	21	40.4
University/ Post graduate	9	17.3
Occupation		
Manual work	6	11.5
Administrative work	7	13.5
House wife	19	36.5
Not working	20	38.5

Table (2): Distributions of medical characteristics of studied sample

Medical characteristics	No. n=52	%
Chronic diseases*		
Hypertension	25	48.1
Hepatitis C	21	40.4
No	27	51.9
Duration of hemodialysis(year)		
Mean \pm SD	4.11 \pm 3.38	
Duration of AVF(year)		
Mean \pm SD	3.03 \pm 2.35	
Blood pressure		
Normal	33	63.5
Increased	19	36.5
Renal function test		
Normal	0	0.0
Abnormal	52	100.0
Fistula assessment*		
Bruises	30	57.7
Swelling	6	11.5
No	22	42.3
Ability to care of fistula		
Know	41	78.8
Don't know	11	21.2

*Some subjects choose more than one answer

Table (3): Distributions of total and subtotal AVF puncture objective pain scores among studied sample before and after cutaneous stimulation

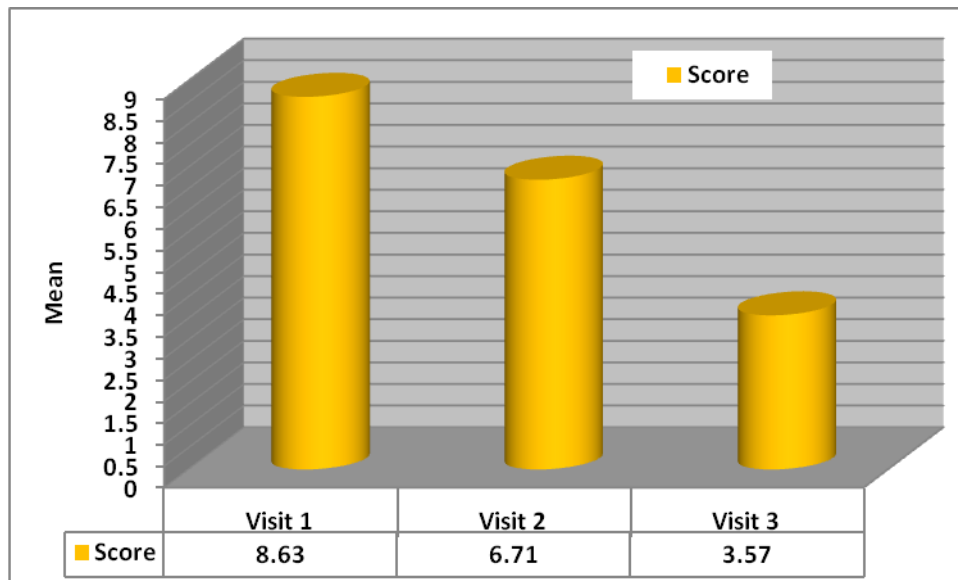
Items	During first visit (n=52)		During second visit (n=52)		During third visit (n=52)		χ^2	P value
	No	%	N0	%	N0c	%		
Vocalization								
Absent	1	1.9	20	38.5	37	71.2	56.22	P1<0.001
Mild	9	17.3	27	51.9	15	28.8	77.61	P2<0.001
Moderate	28	53.8	5	9.6	0	0.0		*
Severe	14	26.9	0	0.0	0	0.0		
Facial expression								
Absent	0	0.0	10	19.2	30	57.7	68.35	P1<0.001
Mild	5	9.6	37	71.2	21	40.4	83.96	P2<0.001
Moderate	34	65.4	4	7.7	1	1.9		*
Severe	13	25.0	1	1.9	0	0.0		
Body language								
Absent	8	15.4	14	26.9	34	65.4	29.70	P1=0.115
Mild	10	19.2	27	51.9	15	28.8	49.23	P2=0.115
Moderate	18	34.6	11	21.2	3	5.8		
Severe	16	30.8	0	0.0	0	0.0		
Behavioral changes								
Absent	0	0.0	14	26.9	34	65.4	36.28	P1=0.115
Mild	26	50.0	36	69.2	18	34.6	61.45	P2=0.115
Moderate	22	42.3	2	3.8	0	0.0		
Severe	4	7.7	0	0.0	0	0.0		
Physiological changes								
Absent	10	19.2	35	67.3	50	96.2	29.48	P1<0.001
Mild	30	57.7	17	32.7	2	3.8	63.17	P2<0.001
Moderate	10	19.2	0	0.0	0	0.0		*
Severe	2	3.8	0	0.0	0	0.0		
Total pain score								
Absent	0	0.0	13	25.0	34	65.4	40.68	P1<0.001
Mild	19	36.5	35	67.3	18	34.6	67.03	P2<0.001
Moderate	29	55.8	4	7.7	0	0.0		*
Severe	4	7.7	0	0.0	0	0.0		

* Highly significant result

P1 difference between pain before and after cutaneous stimulation during second visit

P2 difference between pain before and after cutaneous stimulation during third visit

Figure (1): Means and standard deviation of total AVF puncture objective pain score among studied sample before and after cutaneous stimulation



Paired t test between first and second visit was 7.88 and its p value =<0.001

Paired t test between first and third visit was 15.93 and its p value =<0.001

Table (4): Distributions of AVF puncture subjective pain score among studied sample before and after cutaneous stimulation.

Items	During first visit (n=52)		During second visit (n=52)		During third visit (n=52)		χ^2	P value
	N	%	N	%	N	%		
Pain								
Absent	0	0.0	5	9.6	27	51.9	45.53	P1<0.001
Mild	1	1.9	24	46.2	11	21.2	63.46	P2<0.001
Moderate	27	51.9	21	40.4	14	26.9		
Severe	24	46.2	2	3.8	0	0.0		

P1 difference between pain before and after cutaneous stimulation during the second visit

P2 difference between pain before and after cutaneous stimulation during third visit.

Table (5): Distribution of selected sociodemographic characteristics among studied subjects regarding total score of pre AVF puncture objective pain score

Score of total	Mean \pm SD	Kruskal-Wallis test	P value
Sex			
Female (n=25)	8.48 \pm 2.46	0.62*	0.629
Male (n=27)	8.77 \pm 3.05		
Education			
Illiterate (n=22)	8.54 \pm 2.19	2.78	0.249
Preparatory/secondary(n=21)	8.09 \pm 1.92		
University/post graduate(n=9)	10.11 \pm 4.85		
Marital status			
Single(n=9)	8.77 \pm 2.77	0.003	0.995
Married (n=37)	8.62 \pm 2.76		
Widow/divorced(n=6)	8.50 \pm 3.27		

* **Mann-Whitney**

4. Discussion:

Vascular access remains as the life line for patient with renal failure who needs hemodialysis. A first access should be an arteriovenous fistula⁽¹⁹⁾. Hemodialysis through AVF use 14-16 gauge needle in which patient has to suffer much pain with AVF puncture pain than intravenous injection⁽²⁰⁾.

The result of the present revealed that the mean age of studied sample was 44.13 \pm 3.29 years. This near the result of El- Gahsh who reported that the studied samples' mean age was 41.5 \pm 0.7years for experimental group and 46.6 \pm 0.6years for control group⁽²¹⁾. This may be related to the statement stated by Abou Elsood that renal function decrease gradually with increasing age⁽²²⁾.

Concerning sex, the present study showed that more than half of studied sample were male. This study was in line with Ahmed and Faheem et al., who found that more than half of their sample was male^(23, 24).

In this study, it was noticed that, less than half of studied sample were illiterate. This was in agreement with El- Hefnawy who stated that illiteracy rate among both study and control group were less than half⁽²⁵⁾.

Christensen and Kockrow reported that renal failure is a serious problem that may affect work due to loss of patients' ability and strength⁽²⁶⁾. This may explain the result of the current study which showed that more than one third of studied sample didn't work

Regarding the presence of other chronic diseases, it was found that more than one third of studied sample had hepatitis C. this result is greater than the result of Sabitha et al. who stated that minority of studied subjects had positive hepatitis C⁽²⁷⁾. This may be related to difference in setting which may affect the prevalence of any disease. Also less than half of the current sample had hypertension. This is in line with El- Taiar et al., who reported that hypertension is one of the most common complications of hemodialysis⁽²⁸⁾.

As regard duration of the last AVF, it was noted from the present study that the mean duration was 3.03 \pm 2.35years. In a similar study done by Hassan, the mean duration was 3.26 \pm 2.34 years⁽²⁹⁾. Also Celik et al., found that the mean age of AVF was 4.0 \pm 3.3 years⁽³⁰⁾. These researchers attributes the short age of AVF may be due to failure of vascular access

William and Anderson stated that increasing loss of nephron function cause elevation of nitrogenous metabolites such as urea and creatinine⁽³¹⁾. Also Fareed reported that the mean urea and creatinine of renal failure patients was increased⁽³²⁾. These findings are congruent with the result of the present study which revealed that the entire studied sample had elevated level of urea and creatinine (renal function tests).

Hemodialysis patients are repeatedly exposed to stress and pain because these patients undergo an average

ten AVF puncture a month and would continue to do so throughout their life. Repeated AVF puncture lead to a considerable degree of pain due to caliber and length of the bevel of fistula needle⁽³³⁾. This was in accordance with the result of the present study which showed that more than half of studied sample had moderate objective and subjective pain score before applying cutaneous stimulation and less than half of them had sever subjective pain score. These both scores either subjective or objective were significantly reduced after applying cutaneous stimulation. This was in line with Sabithia et al., who found that the objective and subjective pain scores were significantly reduced within the experimental group with the application of cutaneous stimulation⁽²⁷⁾. Also Hassan reported that there was a decrease in the mean pain score during either artery or vein needle puncture after applying cryotherapy⁽²⁹⁾. Moreover Abu Bakr et al., and Celik et al., stated that pain scoring decreased significantly in cryotherapy study group with using a superficial cooling^(34 and 30). In addition Walter and Raisler investigated the use of ice message to reduce labor pain during contraction and showed successful reduction in intensity of labor pain⁽¹³⁾.

It was noticed from the study that objective and subjective pain score continued to be decreased during the third visit than the second visit. This is in agreement with Hassan who revealed that there was decrease in mean of pain score during needle puncture in day four than day 3 and he illustrated that they may be related to patients' skin adaptation to cold therapy and patients became more interested with the procedure that produce more analgesic effect⁽²⁹⁾.

Sabitha et al., noted that female reported higher pain scores when compared to males⁽³⁰⁾. Also Jackson et al., studied gender difference in pain perception and found women typically greater pain than men⁽³⁵⁾. These results were in contrast to the result of the present study that showed that there was no statistical difference was found between male and female regarding pain. This may be due to cultural factors. But the result was in the same line with Ingalls et al and Celik et al., who found that there was no significant relationship regarding pain and gender^(36, 30).

5. Conclusion

Cutaneous stimulation is effective in reducing AVF puncture objective and subjective pain scores among hemodialysis patients. Also there were no significant relation of AVF puncture related pain with gender, education and marital status.

6. Recommendations:

- 1- Cutaneous stimulation should be carried out routinely for managing AVF puncture related pain among hemodialysis patients.
- 2- Replication of the study with respect to compare the effect of cutaneous stimulation with other nonpharmacological pain relieve measures such as exercise.
- 3- Replication of the study using a large probability sample from different geographical areas must be considered in the development of future research to allow greater generalization of the results.

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