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A Study to Assess the Effectiveness of Cold Application on Arteriovenous Fistula Puncture Pain among Hemodialysis Patients at Selected Hospitals Bagalkot

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Abstract **Original Research Article**

Background of the Study: Chronic kidney disease (CKD) is one of the most devastating medical, social and economic problems for patients and their families in our country. Patients undergoing haemodialysis are repeatedly exposed to pain from approximately 300 punctures per year. Therefore, pain assessment and management are considered as the nursing priority and one of the important aspects of clinical nursing and one of the therapies to reduce pain is Cold Application. ***Aim:*** The aim of study was to assess the effectiveness of cold application on arteriovenous fistula puncture pain among haemodialysis patients. ***Methodology*:** The research design selected for this study was True experimental pre-test post–test control group design. The sample size comprises of 60 haemodialysis patients attending the Dialysis unit of HSK Hospital and Research centre, Bagalkot. The samples Selected through simple random sampling technique and divided into two groups, 30 haemodialysis patients to experimental group and 30 haemodialysis patients control group. In the present study the data will be collected by Abbey pain Scale to assess the AV Fistula puncture pain. Cold application Technique was administered for 10 minutes before the haemodialysis to the experimental group. Data analysis done by using descriptive and inferential statistics in terms of frequency, percentage, mean, standard deviation, paired "t test, Un paired t test. ***Results*:** Findings related to significance of difference between post-test AV fistula puncture and perceived pain scores of experimental group and control group subjects revealed that, a statistically significant difference was found. The t-value is 40.11544. The p-value is < .00001. The result is significant at $p < .05$. ***Conclusion*:** The study proved that administration of Cold application Technique is helps to reduction of AV Fistula pain and Perceived pain from cannulation, Among Haemodialysis patients. Cold application technique was effective scientifically/logically proven among the Haemodialysis patients.

Keywords: Assess, effectiveness, AV Fistula puncture, Puncture pain, Cold application Technique, and Haemodialysis Patient.

INTRODUCTION

Kidney disease, or renal disease, technically referred to as nephropathy, is damage to or disease of a kidney. Nephritis is an inflammatory kidney disease and has several types according to the location of the inflammation. Inflammation can be diagnosed by blood tests. Nephrosis is non-inflammatory kidney disease. Nephritis and nephrosis can give rise to nephritic syndrome and nephrotic syndrome respectively. Chronic Kidney disease is defined as prolonged kidney abnormalities (functional and/or structural in nature) that last for more than three months [1].

Haemodialysis is the process of removing excess water, solutes, and toxins from the blood in people whose kidneys can no longer perform these functions naturally. This is referred to as renal replacement therapy. The first successful dialysis was performed in 1943. Dialysis may need to be initiated when there is a sudden rapid loss of kidney function, known as acute kidney injury (previously called Acute

Renal Failure), or when a gradual decline in kidney function, Chronic Kidney Failure, reaches stage 5. Stage 5 Chronic Renal Failure is reached when the Glomerular Filtration Rate is 10–15% of the normal, creatinine clearance is less than 10 mL per minute, and uraemia is present [2].

Kidney transplant is the best replacement therapy for people whose kidneys have failed completely. Millions of people across the world have kidney disease. Of those millions, several thousand will need dialysis or a kidney transplant at its end-stage. In the United States, as of 2008, 16,500 people needed a kidney transplant. Of those, 5,000 died while waiting for a transplant. Currently, there is a shortage of donors, and in 2007 there were only 64,606 kidney transplants in the world. This shortage of donors is causing countries to place monetary value on kidneys. Countries such as Iran and Singapore are eliminating their lists by paying their citizens to donate. Also, the black-market accounts for 5–10 percent of transplants that occur worldwide [3].

An Arterio Venous (AV) Fistula is an irregular connection between an artery and a vein. Usually, blood flows from the arteries to tiny blood vessels (capillaries), and then on to the veins. Nutrients and oxygen in the blood travel from the capillaries to tissues in the body. With an Arterio Venous Fistula, blood flows directly from an artery into a vein, avoiding some capillaries. When this happens, tissues below the avoided capillaries receive less blood. Treatment for Arterio Venous Fistula includes monitoring, compression, catheter-based procedures and, sometimes, surgery [4].

Cold compression is a combination of cryotherapy and static compression, commonly used for the treatment of pain and inflammation after acute injury or surgical procedures. Cryotherapy, the use of ice or cold in a therapeutic setting, has become one of the most common treatments in orthopedic medicine. The primary reason for using cryotherapy in acute injury management is to lower the temperature of the injured tissue, which reduces the tissue's metabolic rate and helps the tissue to survive the period following the injury. It is well documented that metabolic rate decreases by application of cryotherapy [5].

MATERIAL AND METHODS

Study Design and Participants

Present study was "Quasi-experimental design". Conducted between 05-06-2024 to 28-06-2024, A sampling technique adopted for this study will be Convenient Non-probability Purposive Sampling Technique using lottery method for randomization was used to select the 60 subjects for the present study. Haemodialysis patients with level sno pain, mild pain, moderate pain, sever pain, and who were able to understand read and write Kannada or English and available at the time of data collection.

Instruments

Abbey Pain Scale and Observational Physiological Parameters

The Abbey Pain Scale (22) has been developed to measure pain in patients with late-stage dementia, who is not verbalizing. There are six categories, each levelled on a four-point scale (Absent: 0; Mild: 1; Moderate: 2; Severe: 3), with a total score ranging from 0 to 18.

Items 4 and 10 are reverse-scored, meaning their responses are inverted when calculating the total score. The total score can range from 10, indicating the lowest level of knowledge, to 60, representing the highest level of pain. The questions was translated into Kannada and then back-translated into English to ensure accuracy and consistency. To evaluate the reliability of the test, the Karl Pearson's coefficient of correlation was applied. The reliability coefficient for the knowledge assessment scale was found to be r= 0.86, indicating a high level of reliability.

Data Collection Procedure:

The data collection was carried out from 05-06-2024 to 28-06-2024, among who are having Arterio Venous Fistula and taking treatment under dialysis unit at selected dialysis unit of Bagalkot. Permission was obtained from the Head of the different Hospital. Written consent was obtained from 60 samples. Haemodialysis patients were selected on the basis of Convenient non probability Purposive Sampling Technique. Then the investigator conducted pre-test on assessment of level of Arterio Venous Fistula puncture pain before 10 minutes of cannulation on haemodialysis patient. Then the administered the cold application for haemodialysis patient, and post-test on the same day after 10 minute of pre-test cannulation on haemodialysis patient. Then the post-test of AV Fistula puncture pain was assessed.

RESULTS

Part I: Description of socio-demographic characteristics of subjects

The study results showed that, Majority (43.33%) of Arterio Venous Fistula puncture pain among Haemodialysis patients were in the age group of 40-60 years old and above, and remaining .(33.33%) age between 60-80yrs, (23.33%) age between 20-40yrs. with regards to the Majority (43.33%) of Arterio Venous Fistula puncture pain among Haemodialysis patients were in the age group of 60-80 years old and above, (33.33%) of Arteriovenous fistula puncture pain among Haemodialysis patients were between the age group of 40-60 years, and remaining 23.3% of Arterio Venous Fistula puncture pain among Haemodialysis patients were between the age group of 20-40 years. The Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients were males (53.33%) and remaining (46.66%) were females. With regards to Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients were males (60%) and remaining

(40%) were females. The Majority of Arterio Venous Fistula puncture pain among haemodialysis patients were Hindu (46.66%) Muslim (36.66%) and remaining Christian were (16.66%). With regards to, majority of Arterio Venous Fistula puncture pain among haemodialysis patients were Hindu (50%) Muslim (40%) and remaining Christian were (10%). The Majority ofArterio Venous Fistula puncture pain among haemodialysis patients were (30%) had secondary education, (13.33%) were of Higher Secondary Education holders, (10%) were of Diploma, (16.66%) Illiterate, (13.33%) were of Primary education, (6.66%) Under Graduate, (10%) of Post Graduate. With regards to majority of Arterio Venous Fistula puncture pain among haemodialysis patients were (43.33%) had secondary education, (23.33%) were of Higher Secondary Education holders, (13.33%) were of Diploma, (10%) Illiterate, (6.66%) were of Primary education, (3.33%) Under Graduate, (0%) of Post Graduate. With regards to Majority of Arterio Venous Fistula puncture pain among haemodialysis patients (23.33%) were Private Employee, Business, and Unemployed, (16.66%) Daily wages, (13.33%) were Govt employees. With regards to Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients (36.66%) were Private Employee (20%) Daily wages and Unemployed, (13.33%) were Business, (10%) were Govt employees. The Majority Duration of sleep at night of the Arterio Venous Fistula puncture pain among haemodialysis patients, (66.66%) were between 7-9hrs, (33.33%) were between 4-6hrs, (0%) were 0-3hrs, (3.33%) were between above 10hrs. with regards to Majority Duration of sleep at night of the Arterio Venous Fistula puncture pain among haemodialysis patients, were (56.66%) were between 4-6hrs, (43.33%) were between 7-9hrs, (0%) were 0-3hrs, (0%) were between above 10hrs. The Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients, (66.66%) were mixed, (30%) were Vegetarian, (3.33%) were non-vegetarian. With regards to Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients, (50%) were mixed, (30%) were Vegetarian, (20%) were non-vegetarian. The Majority of Arterio Venous Fistula puncture pain among Haemodialysis patients, (60%) No habit, (26.66%) Smoking, (13.33%) Chewing Tobacco (3.33%) remaining (0%) of Supari pan/ Betelnut, Using harmful drugs, Multiple Habit and Alcohol. With regards to Majority of Arterio Venous Fistula puncture pain among haemodialysis patients, (60%) No habit, (23.33%) Smoking, (13.33%) Chewing Tobacco (3.33%) Alcohol and remaining (0%) of Supari pan / Betelnut, Using harmful drugs and Multiple Habit. The Majority of Arterio Venous Fistula puncture pain among haemodialysis patients, (43.33%) None of the Above, (26.66%) Watching Television, (13.33%) Playing mobile Games, (10%) Reading Books (3.33%) listening Music and Reading News Paper. With regards to Majority of Arterio Venous Fistula puncture pain among haemodialysis patients, (73.33%) None of the above, (10%) listening Music, (6.66%) Watching Television and playing mobile Games, (3.33%) Reading Books (0%) of Reading Newspaper.

Part II: Evaluation of the Effectiveness of Arterio Venous Fistulapuncture pain among Haemodialysis patients in both the groups.

Table 1: Interpretation of Pain in Experimental Group, N=30

Sl. No	Description		Pretest	Post-test
1	No Pain	0 to 2	0	9
2	Mild	3 to 7	13	21
3	Moderate	8 to 13	17	0
4	Severe	14 to 18	0	0

The level of A V Fistula puncture pain among the Haemodialysis patients in Experimental group in the pre-test where the patients with no pain were 0(0%), with a mild pain 13, with moderate pain 17, and with severe pain 0 (0%) where as in post-test with no pain were 9, with a mild pain 21, with moderate pain and severe pain 0.

Table 1.2: Interpretation of Pain in Control Group, N=30

Sl. No	Description		Pre-test	Post-test
1	No Pain	0 to 2	0	0
2	Mild	3 to 7	27	0
3	Moderate	8 to 13	3	30
4	Severe	14 to 18	0	0

The level of A V Fistula puncture pain among the Haemodialysis patients in control group in the pre-test were the patients with no pain were 0, with a mild pain 27, with moderate pain 3 and with an severe pain 0 (0%) where as in post-test with no pain and mild pain and severe pain were 0, with a moderate pain 30.

Table 2: There will be significant difference between Mean Pre and post-test puncture pain scores towards reduction of Arterio Venous Fistula among Haemodialysis patients in experimental group

Level of Pain in experimental group	Mean	SD	Mean Diff.	SD Diff.	% of effect	t-value	p-value
Pre-test	7.6	1.07	4.9	0535	47.6	-23.33	0.0001*
Post-test	2.7	0.535					

Findings related to the significance of the difference between pretest and post-test scores of the Arterio Venous Fistula puncture pain among haemodialysis patients shows that, difference between mean pretest [7.6] and mean post-test [2.7] scores, found to be statistically significant at 0.05 [t= -23.33 (p valve=0.0001). As Hypothesis H_1 states that the mean post-test level of Arterio Venous Fistula puncture

painwill be significantly lower than the mean pretest level of Arterio Venous Fistula puncture pain among haemodialysis patients.

Hence H_1 is accepted.

Part III: Compare the effectiveness of cold application on Arterio Venous Fistulapuncture pain experimental group and control group (cold application) Haemodialysis patient.

Table 3: Comparison between Post test experimental group and post-test control group levels of score on reduction of AV Fistula puncture pain among patient receiving intravenous cannulation, N=60

Group	Total score	Mean	SD	M.D	T. CAL	T Table
Experimental Group	321	10.7	0.95	8	40.12	0.897
Control Group	81	2.7	0.53			

*p<0.05

Represents to compare the mean and standard deviation of the post-test level of AV Fistula puncture pain among patients receiving AV Fistula puncture pain in experimental group and control group. In experimental group the mean score was 10.7 with standard deviation of 0.95 and in control group the mean score was 2.7 with standard deviation of 0.53. The mean difference was 8 and the calculated t value was 40.12 indicating that there was a significant difference in post-test level of AV Fistula puncture pain among haemodialysis patients receiving AV Fistula puncture pain in experimental group and control group at P<0.05 level.

To find out the Association between post-tests level of AV Fistula puncture pain with their selected socio demographic variables among the among patient receiving intravenous cannulation.

Table 4: Association between levels of post-test AV Fistula puncture pain with their selected socio-demographic Variables control group, N=60

CONTROL GROUP						
Sl. No	**SOCIODEMOGRAPHIC VARIABLE**	**DF**	**CHAI SQUERE**	**TABLE VALUE**	**P VALUE**	**ASSOCIATION**
1	Age	1	4.52	3.84	0.0335	Significant
2	Gender	1	1.41	3.84	0.2315	Not significant
3	Religion	1	0.17	3.84	0.6801	Not significant
4	Educational status	1	1.34	3.84	0.247	Significant
5	Occupational status	1	0.03	3.84	0.8625	Not significant
6	Duration of sleep at night	1	1.78	3.84	0.1821	Not significant
7	Dietary pattern	1	0.03	3.84	0.8625	Not significant
8	Personal habit	1	0.01	3.84	0.9203	Not significant
9	Recreational activities during procedure	1	0.02	3.84	0.8875	Not significant

Findings related to the association between pretest scores of AV Fistula puncture pain among haemodialysis patients with their selected socio demographic variables reveals that, there was no significant association found between the post-test level of AV Fistula puncture pain score of patients of Age ($\chi2$=4.52, P=0.0335), Gender ($\chi2$=1.41, P=0.2315), Religion ($\chi2$=0.17, P= 0.6801), Educational status ($\chi2$=1.34, P= 0.247), Occupation status ($\chi2$=0.03, P=0.8625), Duration of sleep at night ($\chi2$=1.78, P=0.1821), Dietary pattern ($\chi2$=0.03, P=0.8625), Personal habit ($\chi2$=0.01, P=0.9203), Recreational activities during procedure ($\chi2$=0.02, P=0.8875).

Hence H2: is accepted for Age, Educational status, and rejected remaining the all-socio demographic variables.

Table 5.14: Association between levels of post-test AV Fistula puncture pain with their selected socio-demographic Variables Experimental group

EXPERIMENTAL GROUP						
SL NO	**I)SOCIODEMOGRAPHIC VARIABLE**	**DF**	**CHAI SQUERE**	**TABLE VALUE**	**P VALUE**	**ASSOCIATION**
1	Age	1	0.02	3.84	0.8875	Not significant
2	Gender	1	0.01	3.84	0.9203	Not significant
3	Religion	1	0.13	3.84	0.7184	Not significant
4	Educational status	1	0.05	3.84	0.8231	Not significant
5	Occupational status	1	0.38	3.84	0.5376	Not significant

EXPERIMENTAL GROUP						
SL NO	**I)SOCIODEMOGRAPHIC VARIABLE**	**DF**	**CHAI SQUERE**	**TABLE VALUE**	**P VALUE**	**ASSOCIATION**
6	Duration of sleep at night	1	0.02	3.84	0.8875	Not significant
7	Dietary pattern	1	0.02	3.84	0.8875	Not significant
8	Personal habit	1	0.01	3.84	0.9203	Not significant
9	Recreational activities during procedure	1	2.17	3.84	0.1407	Not significant

Findings related to the association between pretest scores of AV Fistula puncture pain among haemodialysis patients with their selected socio demographic variables reveals that, there was no significant association found between the post-test level of AV Fistula puncture pain among haemodialysis patients of Age ($\chi 2$=0.02, P=0.08875), Gender ($\chi 2$=0.01, P=0.9203), Religion ($\chi 2$=0.13, P= 0.7184), Educational status ($\chi 2$=0.05, P= 0.8231), Occupation status ($\chi 2$=0.38, P=0.5376), Duration of sleep at night ($\chi 2$=0.02, P=0.8875), Dietary pattern ($\chi 2$=0.02, P=0.8875), Personal habit ($\chi 2$=0.01, P=0.9203), Recreational activities during procedure ($\chi 2$=2.17, P=0.1407).

CONCLUSION

Effectiveness of cold application on arteriovenous fistula puncture pain among hemodialysis patients mean score pre-test and post-test scores of the Arterio Venous Fistula puncture pain among haemodialysis patients shows that, difference between mean pretest [7.6]and mean post-test [2.7] Arterio Venous Fistula puncture pain among haemodialysis patients found to be statistically significant.

Ethical Consideration

The study was approved by the Institutional Ethical Clearance Committee, BVVS Sajjalashree Institute of Nursing Sciences, Bagalkot.

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Conflicts of Interest: There are no conflicts of interest.

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