ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 06 | June - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECT OF AUDIO VISUAL DISTRACTION ON ARTERIOVENEOUS FISTULA CANNULATION PAIN AND BIOPHYSIOLOGICAL PARAMETERS IN HEMODIALSIS PATIENT

Nursing

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ABSTRACT

Aim of the study:- The aim of the study is to assess the effect of audio-visual distraction on fistula cannulation pain and biophysiological parameters among patients undergoing hemodialysis at AIIMS New Delhi. **Methodology –** Study was conducted on 50 hemodialysis patients more than 18 year of age undergoing hemodialysis at hemodialysis unit of AIIMS, New Delhi. Patients were randomized into two groups experimental (25) and control group (25). Intervention (audio visual distraction) was given to the experimental group before and during cannulation via laptop and wireless earphone whereas in control group routine care was given during AV fistula cannulation for 3 consecutive hemodialysis sessions. Pain was assessed using Numerical pain rating scale and biophysiological parameters were assessed by cardiac monitor before and after cannulation in both groups. **Result –** Total 50 patients enrolled in the study were randomized to experimental($n_1 = 25$) and control group($n_2 = 25$). The two groups were comparable in terms of socio demographic data. There was statistically significant difference in pain intensity between Experimental (3.186±2.00) and control group (4.53±2.59) with the p value<0.05 and Diastolic Blood Pressure with p value<0.05. There was no significant difference in pulse, respiration and systolic Blood pressure among subjects of experimental and control group. There was no association of sociodemographic variables with fistula cannulation pain, but systolic and diastolic Blood pressure was found to be associated with marital status at baseline with statistically significant p value <0.05. **Conclusion** – Audio visual distraction is effective in reducing fistula cannulation pain and diastolic Blood Pressure. The effect of audio visual distraction is not statistically significant in reducing Pulse rate, Respiration and systolic Blood Pressure of subjects.

KEYWORDS

Hemodialysis , Audio visual distraction, Numerical pain rating scale

INTRODUCTION

Chronic kidney disease is a progressive condition characterized by gradual loss of kidney function over a period of month and years. Greater than 10% of the general population are affected by CKD worldwide, almost >800 million individuals. Chronic kidney disease has emerged as one of the leading causes of mortality worldwide[1]

End-Stage Renal Disease (ESRD) is a medical condition in which a person's kidneys cease functioning on a permanent basis which leads to the need of long-term dialysis or a kidney transplant to maintain life. Women are at higher risk for CKD, while men have a higher risk of ESRD worldwide[2]

The Hemodialysis medical doctors and staff are devotedly willing to give excellent hemodialysis services to take care of patient undergoing hemodialysis who is suffering from CKD and ESRD. whole purpose of the team is to improve quality life, better health and longer life but sometimes pain concerns during AV fistula cannulation is ignored

Pain relief leads to the acceptance of the procedure and ultimately enhances the patients' quality of life. Pain Perception can be controlled because an individual is able to process only a small amount of information at once. Use of audio visual distraction during painful procedures may serve as a distraction.

MATERIAL AND METHODS

Study Design And Setting

This is a single blinded randomized controlled trial conducted in All india institute of medical sciences in New Delhi.

Participants And Recruitment

Patient undergoing hemodialysis via an AV fistula in the hemodialysis unit of a tertiary care hospital, and who were older than 18 year of age experiencing some kind of pain and capable of reporting pain were enrolled for this randomized control trial.Considering the confidence interval of 95%, 5% level of significance and 80% power, calculated sample size was 20.3 in each group. Regarding the attrition rate of 10% , final sample size was considered to be 50 (n = 25 per group). Inclusion criteria were composed of the following (a) More than 18 years of age (b) Giving consent to participate in the study (c) Undergoing hemodialysis 3 session per week with a functioning AVF . Exclusion criteria consist of (a) Patient with altered Consciousness (b) Diagnosed with deafness and blindness (c) Having pain or drug dependence to pain medications (c) having history of mental health disease.

Data Collection

Data were collected using Demographic Characteristic Form and Numeric Pain Rating Scale and Biophysiological parameters record sheet

Demographic Characteristic Form consists of questions about the patients' age, gender, marital status, employment status, family type, education of the head of the family, occupation of the head of the family. Content validity was done by 2 Nursing Expert and 3 medical Expert.

The numerical pain rating scale is standardized tool. It was use to assess the severity of pain having 0 to 10 rating with 0 being “no pain” and 0 to 3 mild, 4 to 6 moderate and 7 to 9 Severe and 10 very severe pain. Mirtajadini H, Kalroozi F (2016) confirms the reliability of the tool using Cronbach's alpha coefficient (0.95)

Biophysiological parameters includes Pulse rate, Respiration rate, Blood Pressure were measured by cardiac monitor which is attached to the patient and recorded in sheet.

Intervention

Ethical approval was obtained from the Institute ethical committee AIIMS. After Ethical Approval, Researcher provide clear information of study clear information of study process to the incharge of hemodialysis ward Total enumerative sampling was utilize to recruit the patient. Then eligible patients were asked to participate in the study. Researcher gave clear explaination regarding study to the participants and answered their concerns and questions. Anonymity and Confidentiality of the information given by the subject was maintained. Informed Consent was taken from the participants after explaining the purpose and important details of the patients. Subsequently patients were allocated to two groups of control (n=25) and intervention (n = 25) using sealed envelop randomization.

Group Assignment-

Researcher was blinded from the random allocation of patient. Random assignment was done using computer-generated random

number list drawn by Biostatistics department which they handed over to the independent person who doesn't have contact with the Research Population.Sequentially Numbered opaque sealed Envelopes were prepared by the independent person and were kept in the custody of Hemodialysis unit's incharge. Envelopes were opened by the researcher only after informed consent was obtained from the subjects to participate in the study and accordingly subjects were allocated into the Experimental (n=25) and control group(n = 25).

Researcher continued recruitment and randomization until reaching the target sample size(n=50). Sampling was conducted from 27 September 2022 to 4 December 2022. Among 50 eligible patient no one excluded.50 patients were randomized and allocated to two groups. Patients in the Intervention group received audio visual distraction consisting of the Images of nature, baby animals, cute activities of babes with sound were broadcasted through a video display device on laptop monitor (Lenovo) with wireless Bluetooth version ear phone Model i7S TWS having a wireless frequency of 2.40 GHZ, Microphone sensitivity of 42 Db. It covers a reception distance of 12 M. Its working temperature is 10-55° C and playing time is 3 to 4 hours. Cardiac monitor model(Philips IntelliVue MX430) was used to measure biophysiological parameters ie Respiration ,Pulse, BP. The distraction technique continued for three consecutive hemodialysis session.

Pre cannulation pain assessment was done by researcher using NPRS in 1 min and include by cardiac monitor in 2 min after that 7 min video of river, waterfall, mountain, forest, snow peak was provided to see and listen 5 min before AV fistula cannulation 2 min during AV fistula cannulation and after that immediate Post cannulation Pain was assessed by researcher using NPRS in 1 minute and biophysiological Parameters by cardiac monitor in 2 minute. In control group standardized routine care was given to the patient before and during cannulation.

Different kind of Intervention given in three consecutive hemodialysis session.

1st session - 7 minutes video of waterfall, mountain, forest, Flower, snow peak was provided to see and listen for 5 min before starting AV fistula cannulation and 2 min throughout AV fistula cannulation for 3 hemodialysis session.

2nd dialysis session – 7 minutes video of baby animals was provided to the patient to see and listen for 5 minutes before starting AV fistula cannulation and 2 minutes throughout AV fistula cannulation for 3 hemodialysis session.

3rd dialysis session -7 minutes video of happy faces of children, funny activity of children was provided to the patient to see and listen for 5 minutes before starting AV fistula cannulation and 2 minutes throughout AV fistula cannulation for 3 hemodialysis session.

Control Group – Standardized routine care was provided during 3 hemodialysis session . Rotine care include assessing biophysiological parameters before and after AV fistula cannulation

In both experimental and control group 1st session completed by all subjects. In 2nd session, intervention received by 22 subjects in among experimental group. 3 patients were lost to follow up due to kidney transplantation whereas in control group all subjects completed the 2nd session.

3rd session was recieved by 20 patients in experimental group. 3 patients were lost to follow up in which 2 patients were reluctant to continue and in 1 patient researcher was unable to assess Endline due to dysfunctional Av fistula whereas in control group 3rd session was completed by 23 patients. 2 Patients were lost to follow up in which 1 patient was reluctant to continue and 1 patient had kidney transplantation. *Flow diagram of entering subject in the study group has shown in Fig 1*

Outcome Measures

Primary outcome - Pain severity

Numerical pain rating scale was used to assess the pain severity

Secondary outcome-Biophysiological parameters ie Pulse Rate, Respiratory rate, blood Pressure.

CONSORT DIAGRAM

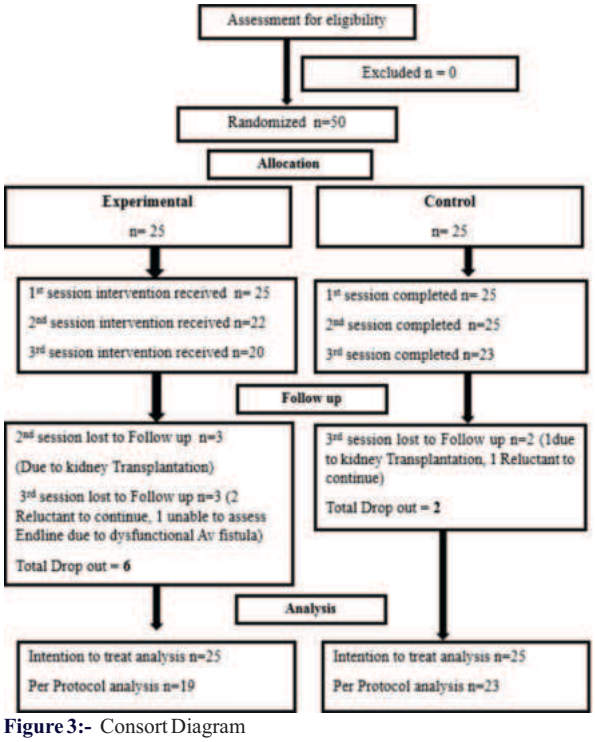

Figure 3:- Consort Diagram

Cardiac monitor which was attached to the patient were used to measure the biophysiological parameters before and after cannulation and recorded in the sheet

Data Analysis

Data was analyzed using Stata version 16.1All patient who were randomized into the controlled trial and completed the baseline were included in the analysis for primary outcome.Sample size was calculated 20 in each group but 19 patients were remain in experimental group due to attrition. To justify sample size, intention to treat analysis was done for assessing effect of intervention on pain. For secondary outcome measure per protocol analysis were performed.

The collected data were first coded and then summarized in the master data sheet. Both descriptive and Inferential statistics were used. Frequency, Percentage, mean Median, standard deviation and interquartile range were computed. Normal Distribution of data were assessed by Shapiro wilk w test. Fisher Exact test were used to analyse the categorical variables. Independent t test as parametric test was used for comparing means of two groups. Mann Whitney U test was used for determining association of fistula cannulation pain and biophysiological parameters with selected demographic variables.

RESULTS

Demographic Characteristics

Result shows that median age of the subjects in the experimental group was 32 with interquartile range of 27 to 54. The median age of subjects in the Control group was 49 with interquartile range of 44 to 69. Majority of subjects in both groups were male (76% in Experimental group and 56 % in Control group. Majority of subjects in both groups were married (69% in Experimental group and 84 % in control group. Majority of subjects in both groups were unemployed (72% in Experimental and 72% in control group). Majority of the subjects in experimental group were live in nuclear family (13%). Majority of the subject in control group were live in Joint family (13%). Majority of the subject's head of the family were graduated in both group (36 % in Experimental group and 32% in Control group). in experimental group majority of the subject's head of the family have Clerical shop and Farm occupation (20%) and in control group, majority of the subject's head of the family are Unskilled worker (24%). Majority of the subject's head of the family have monthly income greater than 2091 in both group (44% in Experimental and 36% in Control group)

There is no statistically significant difference between the Experimental and control group in terms of age, Gender, Marital

status, Employment status, Family type, Education of the head of the family, Occupation of the head of the family, Monthly income of head of the family (p>0.05). Data among groups were comparable

Table 1. Comparison Of Demographic Data Among Groups

Variables	Experimental n_1=25	Control n_2= 25	P value
Age (median (IQR))	32(27,54)	49(44,69)	0.117
Gender			0.136
a) Male	19(76%)	14 (56%)	
b) Female	6(24%)	11(24%)	
Marital Status			0.059
a) Married	15(69%)	21(84%)	
b) Unmarried	10(40%)	4(16%)	
Employment Status			1.000
a) Government job	4(16%)	5(20%)	
b) Private Job	1(4%)	0(0%)	
c) self employed	2(8%)	2(8%)	
d) unemployed	18(72%)	18(72%)	
Family Type			0.500
a) Joint	12(48%)	13(52%)	
b) Nuclear	13(52%)	12(48%)	
Education of head of the family			0.093
a) Professional degree	3(12%)	4(16%)	
b) Graduate	9(36%)	8(32%)	
c) intermediate / diploma	7(28%)	1(4%)	
d) High school	5 (20%)	4(16%)	
e) Middle School	1(4%)	3(12%)	
f) primary school	0(0%)	2 (8%)	
g) Illiterate	0(0%)	3(12%)	
Occupation of the head of the Family			0.988
a) Professionals	4(16%)	5(20%)	
b) Semi Professional	2(8%)	2(8%)	
c) Clerical /shop/farm	5(20%)	3(12%)	
d) Skilled honour	3(12%)	3(12%)	
e) Semi skilled worker	312%)	3(12%)	
f) Unskilled worker	4(16%)	6(24%)	
g) Unemployed	4(16%)	3 (12%)	
Monthly Income			0.602
a) ≥41,430	3 (12%)	3(12%)	
b) 20715-41429	2(8%)	0	
c) 15536– 20714	0	3 (12%)	
d) 10357-15535	3(12%)	4 (16%)	
e) 6214-10356	2(8%)	2(8%)	
f) 2092-6213	4(16%)	4(16%)	
g) < 2091	11(44%)	9(36%)	

Fisher exact test
*** Significant p value<0.05**

Pain severity
No Baseline pain were reported by the patient

After 1st session, 11 Patient had no pain, 9 Patient had mild pain, 5 Patient had moderate pain among experimental group where as among control group , 12 Patient had mild pain,8 Patient had moderate pain, 3 Patient had Severe pain and 2 Patients had very severe pain after 1st session . Depicted in Figure 2

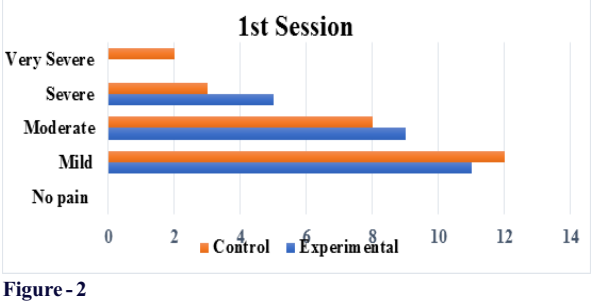

Figure - 2

After 2nd session, 11 patients had mild pain,5 patients had moderate pain, 6 patients had severe pain among experimental group where as In control group 13 patients had mild pain, 6 patients had moderate pain and 4 patients had Severe pain. 3 patients were lost to follow up in 2nd session among experimental group and 2 patients were lost to follow up in 2nd session among control group. Depicted in figure 3.

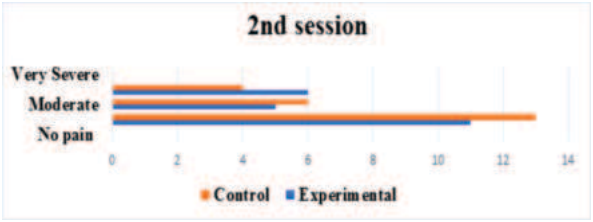

Figure – 3
After 3rd session, 11 Patients had mild pain,5 Patients had moderate pain, 6 Patients had severe pain among experimental group where as in control group 13 Patients had mild pain ,6 Patients had moderate pain and 4 Patients had Severe pain.

3 Patients were lost to follow up in 3rd session among experimental group and 2 Patients were lost to follow up in 3rd session among control group. Depicted in figure 4

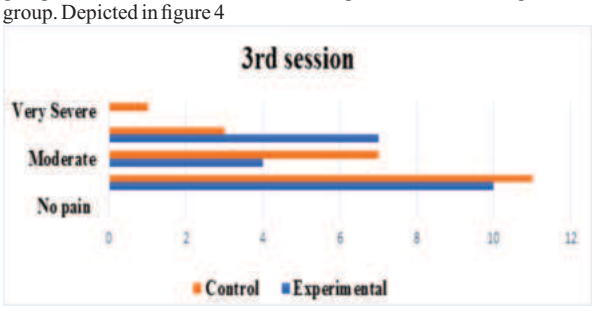

Figure – 4

Effect On Fistula Cannulation Pain And Biophysiological Parameters
Intention to treat analysis reveals that there was statistically significant difference in Fistula cannulation pain between Experimental (2.84±2.06) and control group (4.53±2.59) with p <0.05. Shown in table 2.

Table 2- Effect Of Audio-visual Distraction On Fistula Cannulation Pain And Biophysiological Parameters Among Subjects Of Experimental And Control Group

Pain and Physiological Parameters	Assessment	Experimental 3 sessions Mean±SD	Control 3 sessions Mean±SD	Mean Difference	P value
Intention to treat analysis n=50					
Pain	Baseline	0	0	0	0
	Endline	3.186±2.00	4.53±2.59	1.74	0.01*
Per protocol Analysis n=42					
Pulse	Baseline	80.5±76.0	82.2±9.20	1.72	0.7039
	Endline	79.75±9.41	85.17±11.46	5.419	0.9466
Respiration	Baseline	20.54±2.78	20.33±3.21	0.21	0.411
	Endline	19.71±2.80	19.47±2.72	0.24	0.389
Systolic BP	Baseline	146.85±17.16	145.84±19.10	1.019	0.429
	Endline	145.36±17.23	148.63±19.66	3.26	0.712
Diastolic BP	Baseline	87.91±12.12	73.78±10.23	14.12	0.001*
	Endline	87.64±14.17	76.98±12.88	10.66	0.007*

Independent T Test

*** Significant p value 0.05**

Per protocol analysis shows that Pulse rate respiration rate, BP was decreased after giving intervention in experimental group and increased from baseline in control group but it was not significant. Diastolic BP was remained almost same after intervention in Experimental group(87.64±14.17) from the baseline (87.9±14.0) whereas in control group ,Diastolic BP was increased at endline assessment (76.98±12.88) from baseline (73.78±10.23) with statistically significant p value (p <0.05)

Association of Fistula cannulation pain and biophysiological parameters with Selected socio demographic variables shown in Table 3(a) and Table(b) respectively.

Table No 3(a) Association Of Fistula Cannulation Pain With Selected Socio Demographic Variables N = 42

Physiological Parameters	Socio Demographic Variables	Post intervention Assessment	
		Experimental Group Median(IQR)	Control Group Median(IQR)
Fistula cannulation Pain	## Age r(p-value)	-0.338(0.156)	0.173(0.429)
	Gender		
	Male	2(1,4)	4(2.5,7)
	Female	2(1,3)	4(3,9)
	p-value	0.5182	0.518
	Marital status		
	Married	2(1,3)	4(3,8)
	Unmarried	4(2,5)	4(2,8)
	p-value	0.039	0.867
	Family Type		
	Nuclear	3(2,5)	4(3.5,7)
	Joint	2(1,4)	4(2,8)
	p-value	0.1958	0.8539

Mann Whitney u test, ## Spearman's rank correlation coefficient
*** Significant p value < 0.05**

Table 3(b). Association Of Physiological Parameters With Sociodemographic Variables N=42

Physiological parameters	Socio demographic variables	Baseline		Endline	
		Experimental Group Median(IQR)	Control Group Median(IQR)	Experimental Group Median(IQR)	Control Group Median(IQR)
Pulse	## Age r(p value)	-0.059(0.809)	-0.180(0.410)	-0.143(0.557)	-0.119(0.586)
	Gender				
	Male	83(75,90)	85(79,89)	80(74,88)	88(84,93)
	Female	76(72,86)	76(68,89)	77(72,79)	79(70,98)
	p-value	0.7145	0.2538	0.7012	0.1507
	Marital status				
	Married	76(72,90)	84(73,89)	76(72,83)	84(76,93)
	Unmarried	84(79,86)	82(81,90)	84(77,88	83(82,91)
	p-value	0.6531	0.6245	0.6388	0.83
	Family Type				
	Nuclear	83(73,76)	79(76,90)	83(74,87)	84(79,93)
	Joint	79(75,90)	83(76,89)	77(74,79)	74(78,94)
	p-value	0.9855	0.999	0.7197	0.9279
Respiration					
	##Age r(p value)	-0.057(0.816)	0.348(0.104)	0.212(0.387)	0.005(0.998)
	Gender				
	Male	21(18,22)	21(19,23)	21(18,22)	20(18,21)
	Female	20(16,22)	19(18,21)	18(18,19)	18(16,22)
	p-value	0.6539	0.3524	0.5919	0.3377
	Marital Status				
	Married	20(19,22)	20(18,23)	19(18,21)	19(16,22)
	Unmarried	21(18,22)	19(19,21)	21(18,22)	19(18,20)
	p-value	0.8466	0.6302	0.883	0.7386
	Family Type				
	Nuclear	20(19,22)	21(19,23)	20(18,22)	21(19,22)
	Joint	21(18,22)	19(18,22)	19(18,22)	18(16,20)
	p-value	0.9527	0.3213	0.5334	0.0564
Systolic BP					
	## Age r(p value)	0.314(0.1905)	0.325(0.129)	-0.087(0.721)	0.206(0.345)
	Gender				
	Male	146(136,160)	151(138,159)	145(132,159)	153(141,161)
	Female	142(138,158)	138(116,163)	144(142,151)	139(122,166)
	p-value	0.9154	0.5766	0.4274	0.347
	Marital status				
	Married	140(132,146)	151(135,160)	142(132,151)	151(138,163)
	Unmarried	160(147,169)	139(123,147)	154(145,167)	142(127,150)
	p-value	0.0455*	0.1626	0.236	0.3094
	Family Type				
	Nuclear	144(137,164)	135(128,154)	143(132,159)	138(135,157)
	Joint	145(139,157)	151(147,162)	145(137,157)	158(148,165)
	p-value	0.7629	0.082	0.8259	0.0156 *
Diastolic BP	## Age r(p value)	-0.548(0.015)	-0.3164(0.141)	-0.438(0.061)	-0.4174(0.0475)
	Gender				
	Male	91(79,98)	74(67,84)	90(80,96)	77(71,81)
	Female	88(73,85)	77(67,82)	81(76,98)	76(63,86)
	p-value	0.1595	0.6833	0.7175	0.8466
	Marital Status				
	Married	82(73,90)	74(67,82)	83(76,92)	76(67,86)
	Unmarried	97(94,105)	79(76,89)	94(89,102)	81(76,92)
	p-value	0.0167*	0.3614	0.1241	0.6256
	Family Type				
	Nuclear	92(81,100)	72(66,78)	89(75,96)	71(66,86)
	Joint	86(79,94)	78(72,83)	88(80,96)	77(75,94)
	p-value	0.7369	0.1375	0.3447	0.1652

Mann Whitney u test,## Spearman's rank correlation coefficient
*** Significant p value <0.05**

There was no correlation between fistula cannulation pain and age of the patient. There was no significant association of Gender, Marital status, family type with Fistula cannulation pain.

Table 3(b) shows that there was no correlation of biophysiological parameters with age. There was no significant association of Pulse and Respiration with the selected demographic variables. Systolic BP was significantly associated with marital status at baseline among subjects of Experimental groups with statistically significant p value ($p<0.05$). At baseline, Systolic BP was high in unmarried subjects as compare to married subjects among experimental group.

Diastolic BP was significantly associated with marital status at Baseline among subjects of Experimental group with the p value ($P<0.05$). At baseline, Diastolic BP was high in unmarried subjects as compare to married subjects among experimental group.

DISCUSSION

This study assesses the effect of audio visual distraction on fistula cannulation and biophysiological parameters.Some similar studies were found to compare the effects of these distraction techniques on pain associated with AVF among patients undergoing hemodialysis.

In the present study, there was a statistically significant difference in the pain among subjects of Experimental and control groups. Fistula cannulation Pain intensity was lower in the Experimental group as compare to the control group with statistically significant p value <0.05.

Finding of this study is consistent with the study done by **Mina Ghadimi Aghbolagh (202**0) to assess the effect of visual versus audio distraction on fistula cannulation pain among elderly patients. Pain severity significantly reduced after the distraction interventions in either the auditory or visual distraction groups and also after all three distraction sessions ($p = 0.001$)[9].

Another study is also in agreement with the result of the present study done by **Alhani et al** evaluated the effect of Programme distraction on Fistula cannulation Pain. Pain was evaluated in 12 sessions, there was significant decrease in pain intensity. The intensity of the pain with distraction in the Experimental group was lower as compare to control group with the (p value <0.05,$p = 0.007$) [21]

Another study which was in agreement with result of our study done by **Lee et al. (2004)** showed that mean pain score was lower in the audio visual distraction group as compare to the only patient controlled sedation [34]

Finding of this study is consistent with the study done **by N C A C Oliveira (2017)** evaluated the effect of audio distraction for acute pain relief in 40 pediatric inpatients patients (6-11 years) who underwent painful puncture procedures. A significant difference was found between periods with and without distraction in both groups, in which scores on pain scales were lower during distraction compared with no intervention.[10]

The result of the study is in agreement with the finding of the study done by **Sogabe et al (2020)** evaluated the effect of audio and visual distraction on patients' vital signs and tolerance during Esophagogastroduodenoscopy. Blood pressure (BP) during and post-EGD was significantly higher than that at pre-EGD in control group ($p < 0.05$), but no significant elevation of BP was observed during the latter half of EGD and post-EGD in the 3 distraction groups. However Pulse rate at post-distraction and post Esophagogastroduodenoscopy in the distraction groups were significantly lower than those of control group ($p < 0.001$ and $p < 0.01$, respectively) [30]This finding is not in consistent with the Present study.

Limitations

Study has several limitations that must be considered along the findings. Cannulation of AV fistula was done by different staff of Hemodialysis unit. Intervention and data collection was done by same researcher thereby possibility of observation bias was there.

Recommendations

Similar studies can be replicated with large sample size in different settings.Study can be conducted on Self-selected audio visual distraction chosen by patients as intervention during AV fistula cannulation.Study can be conducted to observe long term effect of audio visual distraction Intervention on the participants.

CONCLUSION

The audio visual distraction video was effective in reducing the pain intensity at the time of cannulation ,also had an effect on Pulse rate, Respiration rate and BP.

This study contributes to evidence supporting the effect of audio visual distraction on fistula cannulation pain and biophysiological parameters.

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