"Effectiveness of splint on Peripheral Intravenous therapy among Hospitalized children in tertiary care Hospital".

Chaudhari Amrita Singh[1], Subin S[2], Anugrah Charan[3], Sanjeev Kumar Verma[4]

1.Ms. Chaudhari Amrita Singh, M.Sc. Nursing KGMU College of Nursing, King George's Medical University, Lucknow, Uttar Pradesh, India.

Email: amritachaudhari1@gmail.com

2.Mr. Subin S (Corresponding author), Medical Surgical Nursing, Assistant Professor, KGMU College of Nursing, King George's Medical University, Lucknow, Uttar Pradesh, India.

Email: subinsudarsanan1990@gmail.com

3. Mrs. Anugrah Charan, Child Health Nursing, Clinical Instructor, KGMU, College of Nursing, King George's Medical University, Lucknow, Uttar Pradesh, India.

Email: anugracharan@kgmcindia.edu

4. Dr. Sanjeev Kumar Verma, Additional Professor, Department of Paediatrics, King George's Medical University, Lucknow, Uttar Pradesh, India.

Email: Drsanjeev78@gmail.com

Corresponding Author-

Mr. Subin S, Medical Surgical Nursing, Assistant Professor, KGMU, College of Nursing, King George's Medical University, Lucknow, Uttar Pradesh, India.

Email: subinsudarsanan1990@gmail.com

Contributorship statement –

Chaudhari Amrita Singh is the primary investigator who conceptualized the research idea, collected the data and conceptualized the data. Also she has reviewed the literature, Subin S, helped in manuscript writing and editing. Anugrah Charan and Dr. Sanjeev edited manuscript. The manuscript was reviewed by all co-authors for language use, data analysis and interpretation.

Funding- Nil

Conflict of interest- There is no conflict of interest.

Acknowledgement: The authors thanks to all volunteers and participants who took part in the study.

Total word count:

Abstract: 199

Text: 2091

Abstract:

Intravenous therapy is a simple procedure which is having a great role in administration of medicine, fluid and parental nutrition. Hence application of splint may reduce the number of cannulation attempts and prevent the complications. The aim of the study is to assess the

effectiveness of splint on intravenous therapy among hospitalized children in tertiary care hospital and assess the association among study and control group. In this study Quasi experimental non-randomized controlled trial was used and 44 sample size that was 22 in each group selected through purposive sampling technique from paediatric unit of KGMU, Lucknow, UP, India. The efficacy was assessed through standardized tool infiltration scale and followed by demographic variables, clinical variables. The mean pre- test grade of study group was 2.86±1.46 while in control group it was 3.09±1.15. No significant difference was found in mean pre- test grade between the groups. The computed't' value't' (21) 4.58, $p<0.05$ shows that there was a significant difference between pre-interventional score and post -interventional score. This specify that splint was effective for the reduction in the complication rate of intravenous therapy. The finding reveals that splint was effective in reducing the complication rate related to intravenous therapy in children.

Key-words: Effectiveness, Splint, Intravenous therapy, hospitalized children**.**

Key Messages: In my there was used of splint reduce the complication rate related to intravenous therapy.

DOI Number: 10.48047/nq.2022.20.19.NQ99168 **NeuroQuantology2022;20(19): 1931-1942**

INTRODUCTION

Hospitalization rates for children are greater due to persistent infectious illnesses, which often require intravenous therapy for parenteral administration. Intravenous treatment is an invasive first-line procedure that can have a variety of side effects or complications. Splints are used to secure peripheral intravascular catheterization, reducing the likelihood of intravenous treatment complications.

According to Asian general research, infusion therapy is used in more than 90% of hospital stays, there are 1.8 million peripheral catheterization are conducted in paediatric patients in 2019. Jeong et al.[1]

It is estimated that >90% of hospital stays involves the use of infusion therapy and 1.8 million peripheral catheterization are performed in pediatric patients. (Asian Journal of nursing research, 2019).

It is a first line invasive and painful procedure which can lead to many complication due to improper handling that can delay the prognosis and have an adverse impact on the clinical outcome of the patients so splint was used to reduced the complication of intravenous therapy and increase the lifespan of intra venous cannula.

Studies has revealed that use of splint has improve the efficacy of intravenous therapy.

A cardboard splint was used to provide intravenous cannula support, particularly in children to reduce complication rate.

Material and method:

Study Design:

In this study quantitative approach, Quasi-experimental non-randomized control group design was used. The present study consist of an analysis of data from hospitalized children. 44 sample was selected through purposive sampling (non-probability sampling techniques). The sample in this proposed study were hospitalized children (1-6yeras) in paediatric medical and surgical unit,

KGMU, Lucknow, who met the inclusion criteria and parents of children are willing to participate in the study.

In this study demographic variables, clinical variables, and standardized tool Infiltration scale was used.

The study was conducted after getting clearance from the Institutional Ethical Committee via reference no.56/Ethics/2022, this study was done on preterm infants. An informed consent was taken from the parents of Hospitalized Children. The institutional and/or national research committee's ethical requirements were followed in all techniques used in studies involving human subjects. The purpose of the study was explained to the parents of Hospitalized Children. After getting the consent the researcher assessed the pre-interventional data in both study and control group by using an Infiltration scale.

Paired T test was done to analyse if there is any difference in the mean score of pre and post interventional within the experimental and control group. Unpaired T test was used to analyse if there is mean difference in the mean score of post-interventional between interventional and control group. Tests of associations were performed by Chi square test. A *p* value <0.05 was considered significant.

STUDY

INTERVENTION

Investigator will perform the following step:

1. Pre-interventional assessment
2. Application of splint in study group
3. Post interventional assessment

Pre-interventional assessment

The researcher will assess the situation after inserting the intravenous cannula and look for any clinical signs of complication at the catheterization site in the first step of the intervention.

Application of splint in study group

Following a first evaluation, the researcher places the splint in the study group. Splints are utilised to keep peripheral intravascular catheterization at or around the area of flexion secure. This effectively immobilises the joint and reduces the danger of venous injury caused by bending.

Peripheral intravenous cannula at the site of joint site will be immobilised with a card board splint.

Patients with IV catheters were observed during their hospitalisation after receiving written agreement from parents of children. Researchers used "The consent Form of IV Insertion Site in Paediatric Patients" to determine their demographic and catheter features. The patients in the study group were monitored based on the occurrence of catheter infiltration, the cause for catheter removal, and reinsertion. If infiltration occurred, researchers used "The consent Form of IV Insertion Site in Paediatric Patients with Infiltration" to document the location. From the notes of bedside nurses, the amount of IV fluid infiltrated, medication therapy and its flow rate, and the time of discovering the infiltration and the interventions used were determined.

Post- Interventional assessment

The post assessment is done after 2days of giving intervention and complication score will be check through infiltration scale that is the scale was developed by the Infusion Nurses Society (2006). The infiltration scale evaluates the infiltration site by rating it on a scale of 0–4 (Grade 0=no symptoms; Grade 1=skin blanched, edema 6 in (15 cm) in any direction, touching to cool, mild-or moderate pain, and there is possible numbness; Grade 4=skin blanched, translucent, skin tight, leaking, skin is becoming colourless, bruised, swollen, gross edema >6 in (15 cm) in any type of direction, deep pitting tissue edema, circulatory impairment, moderate-to severe pain, infiltration of any amount of blood and blood product, irritant).

In the study group, the life duration of peripheral intravenous cannulas is also tested after putting the splint at the site of intravenous cannulization, and according to the Central of Disease Control (2011) criteria, every intravenous cannula has changed after insertion of 72hours. According to the rules, the study and control groups will be compared in terms of intravenous cannula life span.

Result:

Demographic variables and clinical variable:

The children were in the age between 1-2yrs. 8(36.4%), 3yrs.7 (31.8%), 4-6yrs. 7(31.8%) in study and control group. Most of the children were male 15(68.2%), in study group and 14(63.6%) in control group. Most of the children height were in between 75-85 cm. that was 12(54.5%), 5(22.7%), 2(9.1%), 3(13.6%) in study group and 7(31.8%), 6(27.3%), 5(22.7%), 4(18.2) in control group. Most of the children were weight in between 7-12kg.that was 16(72.7%) in study group and 10(45.5%) in control group. Most of the children's family was coming under <10000 per month income that was 9(40.9%) in study group and 8(36.4%) in control group. Most of the children were belonging to rural area that was 13(59.1%) in study group and 16(72.7%) in control group. Most of children were coming under Thin physical status that was 11(50.0%), in study group and majority of children were coming under normal body build that was 10(45.5%) in control group. Only 1(4.5%) children was coming under obese in study group and 5(22.7%) in control group. **(Shown in table 1).**

The most involved site of cannulation was dorsum of hand which was included in 68.2% cases of experimental group, 50% cases of control group and 59.1% cases overall. No significant difference in proportion of various sites of cannulation was found between study and control group (p=0.128). The most common gauge of IV cannula was 24 G which was applied in 77.3% cases of study group, 50% cases of control group and 63.6% cases overall. No significant difference in proportion of various gauge of IV cannula was found between study and control group (p=0.117). In most of the cases the cannulation was done in first attempt with 59.1% cases of study group, 63.6% cases of control group and 61.4% cases overall. No significant difference in proportion of cannulation attempts was found between study and control group (p=0.723). The most common type of drug administered was antibiotics which was applied in

45.5% cases of study group, 45.5% cases of control group and 45.5% cases overall. No significant difference in proportion of various types of drug administered between study and control group (p=0.536). The distribution of subjects according to rate of medication infusion is shows that in study group, the proportion of slow, medium and high was 77.3% : 18..2% : 4.5% while in control group the proportion of slow, medium and high was 68.2% : 31.8% : 0.0%. Overall the proportion of slow, medium and high was 72.7%: 25.0%: 2.3%.No significant difference in proportion of various rates of medication infusion between experimental and control group (p=0.378). Distribution of subject according to IV cannula securement device splint was used in 22(100%) in study group. **(Shown in table 2).**

Study shows that in study group, at pre-test maximum 50% subjects showed grade 4 (worst grade). After post-test none of the subjects showed the worst grade 4. Hence proportion of better grades was increased at post- test. The significant change was observed in infiltration grade at post- test (p<0.001).

In control group, at pre-test maximum 45.5% subjects showed grade 4 (worst grade). After post- test again maximum 81.8% subjects showed the worst grade 4. Hence proportion of worst grades was increased at post -test in control group. However no significant change was observed in infiltration grade at post- test (p=0.109). So the experimental technique was found to be effective. **(Shown in table 3.1)**

The mean pre- test grade of study group was 2.86±1.46 while in control group it was 3.09±1.15. No significant difference was found in mean pre- test grade between the groups. The computed't' value't' (21) 4.58, p<0.05 shows that there was a significant difference between pre-interventional score and post -interventional score. This specify that splint was effective for the reduction in the complication rate of intravenous therapy.

The mean post-test grade of study group was 1.00±0.93 while in control group it was 3.77±0.53. The significant difference was found in mean post -test grade between the groups (p<0.001). The mean post- test grade of study group was less than the control group. The computed't' value't' (21) 2.29, p<0.05 shows that there was a significant between pre-interventional score and post-interventional score. **(Shown in table 3.2)**

The post –interventional test score of study group mean value was 1± SD was 0.93 and control mean value was 3.77 ± SD 0.53. The tabulated't' value 12.14 and p value is 2.02 which was significant at the level of significance 0.05.

Hence, the hypothesis H_1 stating that there is a significant difference between pre-interventional and post –interventional level of reduction in complication status of children in study and control group **(Shown in table 3.3)**

Study depicts that computed chi square value for each variable i.e. age in years, gender, height in cm. weight in kg., family income per month, place of residence, physical status.

At the appropriate degree of freedom, the socio demographic variable such as age, ($\chi2$=7.52), gender ($\chi2$= 5.39), height ($\chi2$=20.49), Weight ($\chi2$=12.21), family income ($\chi2$=12.57), place of residence ($\chi2$=7.46), physical status (=11.08). Then the researcher compared the chi. square calculated value of each variable with respect tabulated values. The values are less than the tabulated value for each variable. So the researcher accepted the alternate hypothesis. That is there was no significant association between the demographic variable and complication rate of intravenous therapy in study group. **(Shown in table 4.1)**

The study depicts computed chi square value for each variable i.e. age in years, gender, height in cm. weight in kg., family income per month, place of residence, physical status.

At the appropriate degree of freedom, the socio demographic variable such as age, ($\chi2$=11.81), gender ($\chi2$=8.26), height ($\chi2$=14.31), Weight ($\chi2$=3.3), family income ($\chi2$=10.31), place of residence ($\chi2$=1.94), physical status ($\chi2$=12.75). Then the researcher compared the chi. square calculated value of each variable with respect tabulated values. The values are less than the tabulated value for each variable. So the researcher accepted the research hypothesis. That is there was no significant association between the demographic variable and complication rate of intravenous therapy in study group. **(Shown in table 4.2)**

Discussion:

The finding of the study showed that there was significant effect of splint on reduction of complication related to intravenous therapy in hospitalized children. The finding of the study was also found to have the same result.

Similar finding were illustrated in a study conducted by **Gehan EL Nabawy Ahmed in 2018,** that more than two thirds (66.7%) of children aged from 6 to 12 years had infiltration of grade 1 while 60.7% of children aged from 1 to 5 years had infiltration of grade 2. More than two thirds of either boys or girls had infiltration of grade 1. More than two thirds of children diagnosed with surgical or gastrointestinal problems had infiltration of grade 2 and 60.0% of obese children had infiltration of grade 2. 65.4% of children who had infiltration of grade 2 previous experiences of submitted peripheral intravenous therapy.[2]

Conclusion

From the finding of the study, it has been observed that score of effectiveness of splint on intravenous therapy in the pre-test was lower than the post test.

The study finding proved that the splint was effective to maintain the patency of peripheral intravenous cannula and also in reducing the complication rate related to intravenous catheterization. So, there is a need of proper knowledge of using splint during intra venous cannulation in children. So, the health care provider should have a proper knowledge of using splint.

Ethical approval: This study involves human participants and was approved by the Institutional Ethics committee with Ref. Code: VIII- PGTSC-IIC/P12

Table 1: Frequency and percentage distribution of children based on socio-demographic variables.

n=44

Demographic Variables	Categories	Study Group (n_1=22)		Control Group (n_2=22)		Total (%)	
		(f)	%	(f)	%	(f)	%
1.Age	a) 1-2 year	8	36.4	8	36.4	16	36.4
	b) 3-4 year	7	31.8	7	31.8	14	31.8
	c) 4-6 year	7	31.8	7	31.8	14	31.8
2.Gender	a) Male	15	68.2	14	63.6	29	65.9
	b) Female	7	31.8	8	36.4	15	34.1
3. Height (in cm.)	a) 75-85	12	54.5	7	31.8	19	43.2
	b) 86-95	5	22.7	6	27.3	11	25.0
	C) 96-105	2	9.1	5	22.7	7	15.9
	d) 105 and above	3	13.6	4	18.2	7	15.9
4. Weight (in Kg.)	a) 7-12	16	72.7	10	45.5	26	59.1
	b) 13-17	5	22.7	10	45.5	15	34.1
	c) 18-22	1	4.5	2	9.1	3	6.8
	d)22 and above	0	0	0	0	0	0
5.Income (per month)	a) <10000	9	40.9	8	36.4	17	38.6
	b)10001-15000	6	27.3	6	27.3	12	27.3
	c)15001-20000	2	9.1	4	18.2	6	13.6
	d)20001 and above	5	22.7	4	18.2	9	20.5
6.Place of residence	a) Rural	13	59.1	16	72.7	29	65.9
	b) Urban	9	40.9	6	27.3	15	34.1
7.Physical Status	a) Thin	11	50.0	7	31.8	18	40.9
	b)Normal body build	10	45.5	5	22.7	6	13.6
	c)Obese	1	4.5	5	22.7	6	13.6

Table: 2 Frequency and percentage distribution of children of based on clinical variable.

n=44

Clinical Variables	Categories	Study Group (n_1)		Control Group (n_1)		Total	
		(f)	(%)	(f)	(%)	(f)	(%)
1.Site of cannulation	a)Dorsum of the hand	15	68.2	11	50	26	59.1
	b)Inner aspect of the forearm	0	0.0	3	13.6	3	6.8
	c)Outer aspect of the Forearm	0	0.0	2	9.1	2	4.5
	d) Any other	7	31.8	6	27.3	13	29.5
2. Gauze of IV Cannula	a) 20 G	2	9.1	2	9.1	4	9.1
	b) 22 G	3	13.6	9	40.9	12	27.3
	c) 24G	17	77.3	11	50.0	13	29.5
3. Number of attempted cannula	a) First	13	59.1	14	63.6	27	61.4
	b) Second	5	22.7	3	13.6	8	18.2
	c) More than 2 times	4	18.2	5	22.7	9	20.5
4. Type of drug Administration	a) Antibiotics	10	45.5	10	45.5	20	45.5
	b) Any IV fluids	0	0.0	2	9.1	2	4.5
	c) Antipyretic	6	27.3	5	22.7	11	25
	d) Any other	6	27.3	5	22.7	11	25
5. Rate of medication infusion	a) Slow	17	77.3	15	68.2	32	72.7
	b) Medium	4	18.2	7	31.8	11	25
	c) High	1	4.5	0	0	1	2.3

Table: 3.1 Frequency and percentage distribution of pre-interventional data and post – interventional data in both study and control group.

n=44

Score	Study group (n_1)				Control group (n_1)			
	Pre-intervention		Post-intervention		Pre-intervention		Post-intervention	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Grade 0	3	13.6	8	36.4	1	4.5	0	0
Grade 1	1	4.5	7	31.8	2	9.1	0	0
Grade 2	3	13.6	6	27.3	1	4.5	1	4.5
Grade 3	4	18.2	1	4.5	8	36.4	3	13.6
Grade 4	11	50.0	0	0	10	45.5	18	81.8

Table: 3.2- Comparison in the reduction rate of complication of intravenous therapy by infiltration scale in pre and post intervention with in the study and control group.

n=44

	Study group (n_1)		Control group ($n_{1)}$		Paired t- test	
	Mean	SD	Mean	SD	Study Group	Control Group
Pre-intervention	2.86	1.46	3.09	1.15		
Post-intervention	1	0.93	3.77	0.53	**4.58**	**2.29**

Table: 3.3 – Comparison of the difference in the reduction rate of complication in intravenous therapy by infiltration scale in study and control group.

n=44

	Mean	SD	Unpaired t-test
Study group (n_1)	1	0.93	
Control group (n_1)	3.77	0.53	**12.14**

Designation:*'t' (42) 2.02, p<0.05

Table: 4.1 Association between pre-interventional value of complication related to intravenous therapy of study group with their selected demographic variables.

n=22

S.No.	Demographic Variables	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	DF	χ^2 Value	p value (<0.05)
1.	**Age (In years)**								

a)	1-2	1	0	1	0	6	8	7.5	15.51
b)	3-4	1	0	1	3	2			
c)	4-6	1	1	1	1	3			
2.	**Gender of Children**								
a)	Male	1	0	3	3	8	4	5.3	9.49
b)	Female	2	1	0	1	3			
3.	**Height (In Cm.)**								
a)	75-85	1	0	2	1	8			
b)	86-95	1	0	1	2	1	12	20.4	21.03
c)	96-105	0	1	0	1	0			
d)	106 and above	1	0	0	0	2			
4.	**Weight (In Kg.)**								
a)	7-12	2	0	2	4	8	8	12.2	15.51
b)	13-18	0	1	1	0	3			
c)	18-22	1	0	0	0	0			
d)	22 and above	0	0	0	0	0			
5.	**Family Income(In month)**								
a)	<10000	0	0	2	2	5			
b)	10000-15000	1	0	0	1	4	12	12.5	21.03
c)	15001-20000	0	0	0	1	1			
d)	20001and above	2	1	1	0	1			
6.	**Place and Residence**								
a)	Rural	0	1	2	4	6	8	7.4	9.49
b)	Urban	3	0	1	0	5			
7.	**Physical status**								
a)	Thin	1	1	2	3	4			
b)	Normal body build	2	0	0	1	7	12	11.08	15.51
c)	Obese	0	0	1	0	0			

Level of significant (p=<0.05)

Table: 4.2 Association between pre- interventional value of complication related to intravenous therapy of control group with their selected demographic variables.

n=22

S.No.	Demographic Variables	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	DF	χ^2 Value	p value (<0.05)
1.	**Age (In years)**								
a)	1-2	0	1	0	3	4			
b)	3-4	0	1	1	0	5	8	11.8	15.51
c)	4-6	1	0	0	5	1			
2.	**Gender of Children**								
a)	Male	0	0	0	6	8	4	8.2	9.49
b)	Female	1	2	1	2	2			
3.	**Height (In Cm.)**								
a)	-85	0	0	0	3	4			
b)	86-95	0	1	1	1	3			
c)	96-105	0	1	0	1	3	12	14.3	21.03
d)	106 and above	1	0	0	3	0			
4.	**Weight (In kg)**								
a)	7-12	0	1	1	4	4			
b)	13-18	1	1	0	3	5			
c)	18-22	0	0	0	1	1	8	3.3	15.51
d)	22 and above	0	0	0	0	0			
5.	**Family Income (In month)**								
a)	<10000	0	1	1	3	3			
b)	10000-15000	0	0	0	3	3	12	10.3	21.03
c)	15001-20000	0	0	0	2	2			
d)	20001andabove	1	1	0	0	2			
6.	**Place and Residence**								
a)	Rural	1	1	1	6	7	4	1.94	9.49
b)	Urban	0	1	0	2	3			
7.	**Physical Status**								

a)	Thin	0	0	0	2	5			
b)	Normal body build	0	1	1	6	2	8	12.7	15.51
c)	Obese	1	1	0	0	3			

References:

1. Buyukylmaz F, Sahiner C N, Cagler S, Eren H. Effectiveness of an intravenous protection device in pediatric patients on catheter dwell time and phlebitis score. Asian Nursing Research. 2019 October; 13 (4):236-241 available on http://doi.org/10./016/j.anr. 2019.09.001.
2. Nabaway Ahmad Gehan EL. Conducted study on factors affecting intravenous infiltration among Hospitalized children. International journal of nursing didatics.2017April4; 17(4):27-37. DOI: http://dx.doi.org/10.15520/ijnd.2017.vol7.iss4.204.27-37
3. Prajapati D, Jibanlata Devi M, P D Rita. An experimental study to evaluate the effectiveness of peripheral intravenous cannula with splint in terms of functional duration among the children between 1-3 years of age admitted in selected hospital of New Delhi. World Journal of advance Health Care Research. 2021 September 21; 5(6):161-164.
4. Dalal S S, Chawla D, Singh J, Agrawal RK, Deorari AK, Paul VK, Effectiveness of limb splinting for intravenous cannula in neonates a randomized controlled trial study. National library of medicine. Arch Dis child fetal neonatal. 2009 November; 94 (6): F394-6doi:10.1136/adc.2008.147595.Epub2009may12.PMID: 19439433.