



To find out the effectiveness of normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators admitted in a tertiary care hospital, Thiruvananthapuram

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Need and Significance of the Study

To date, a standard for pin site care that has been proven to be effective in preventing infection has yet to be identified. There is very little evidence to say that which pin site care regimen is best to reduce the infection rates. So an attempt is made to see that which existing practices are better for prophylaxis of pin site infection cases. Preventing infection of skeletal pin sites of patients with skeletal traction pins or external fixator pins is a nursing priority. Being nursing personnel, it is a need to find out the most effective protocol to reduce the number of pin site infection cases. This motivated me to do study on this topic.

This study is undertaken to high-lighten the effective protocol in preventing of pin site infection. The study will be useful for the nurses to enlighten their knowledge regarding pin site care and observation. By that it helps prevention of pin site infection among patients who are in external skeletal fixators. If the pin care has been properly done, the skin will rapidly heal around the pins and the discharge stops. It is therefore important to identify pin site infection

earlier. Special care of the fixator and pin tracts are necessary to prevent infection and unsuccessful healing of the fracture. If the pin care has been properly done, the skin will rapidly heal around the pins and the discharge stops. It is therefore important to identify pin site infection earlier.

Statement of the Problem

A study to assess the effectiveness of pin site care with normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators admitted in a tertiary care hospital, Thiruvananthapuram.

Objective of the Study

To find out the effectiveness of normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators admitted in a tertiary care hospital, Thiruvananthapuram.

Hypotheses

H₀: There is no difference on proportion of pin site infection among experimental group and control group.

There is a difference on proportion of pin site infection among experimental group and control group.

Operational Definitions

Effectiveness: Effectiveness is the difference in proportion of Pin Site Infection by applying pin site care with Normal saline versus povidone iodine among patients with external skeletal fixators as measured by Checkett's and Otterburn's grading system and, culture & sensitivity reports of pin site swab.

Pin Site Infection: Pin Site Infection is the adverse tissue reaction to the presence of a skeletal pin that requires lancing of skin. In this study it refers to varying degrees of skin changes around the external fixators, as measured by Checkett's and Otterburn's grading system, culture and sensitivity reports of pin site swab and radiological examination (X ray).

External Skeletal Fixator: It consists of rigid external frame attached to percutaneous metal pins inserted through the soft tissue and bone and skeletal traction pin, used to manage complex fractures.

Patients with External Skeletal Fixator: Patients who had external skeletal fixator in extremities admitted in orthopaedic wards, Government Medical College Hospital, Thiruvananthapuram.

Pin site care with Normal saline: Pin site care with normal saline is refers to cleansing of pin site with 0.9 % normal saline thrice daily for a period of 2 weeks followed by application of normal saline soaked gauze under aseptic precautions.

Pin site care with povidone iodine: Pin site care with povidone iodine refers to cleansing of pin site care with 5% povidone iodine solution thrice daily for a period of 2 weeks followed by application of povidone iodine soaked gauze under aseptic precautions.

Conceptual Framework

The investigator adopted Modified Imogene King's Goal Attainment Theory (1981) based on the personal & interpersonal systems including interaction, perception, judgment, action, reaction and transaction. The investigator adopted goal attainment as a basic theory for conceptual framework, which is aimed at effectiveness of pin site care with normal saline versus povidone iodine on pin site infection. This involves interaction between the researcher and the patients with external skeletal fixator.

Six major concepts describe these phenomena:

Perception; It refers to people's representation of reality. Here the patients perceived the need of pin site care.

Judgment; Judgment is decision which is made. Here the researcher decides to provide pin site care and patient decided to accept the pin site care.

Action; This refers to the changes that have to be achieved. The researcher action is to assess the level of pin site infection by checkett's and otter burns grading system and then patients decided to receive the pin site care.

Reaction; Reaction helps in setting a mutual goal. In this study the researcher and patients set a mutual goal. Here the mutual goal is plan to reduce the pin site infection.

Interaction; If refers to the verbal and non verbal communication between one individual or between two or more individual who involve goal directed perception. Here the researcher encourages the patients with external skeletal fixator to receive pin site care with normal saline and povidone iodine on pin site infection.

Transaction; This is the achievement of a goal. Here the researchers goal is achievement of the reduction in level of pin site infection and evaluate the effectiveness of pin site care with normal saline versus povidone iodine by using checkett's and otter burn's grading system.

Methodology

Research methodology involves the steps, procedure and strategies for gathering and analysing the data in a research investigation. Research methodology is a process for collecting, analysing and interpreting information to answer the question²⁵.

This chapter deals with the methodology adopted for the study. It includes research approach adopted, research design, setting of the study, population, sample and sample size, sampling

technique, development of the tool, method of data collection and plan for analysis.

Research approach

Quantitative approach.

Research design

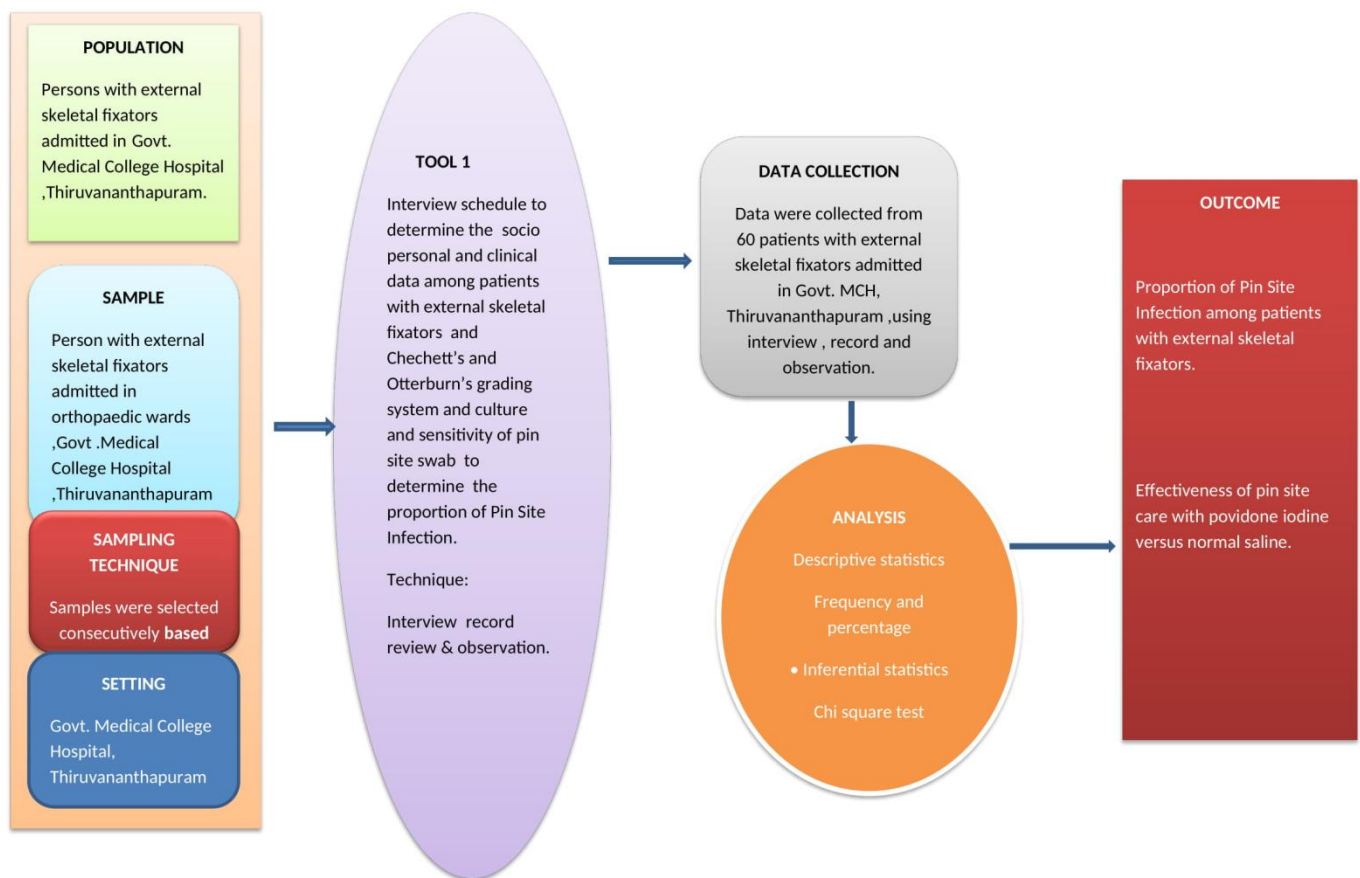
The research design selected for this study is post-test only control group design.

Outcome variables

Proportion of Pin Site Infection.

Schematic representation of the study

It is presented in figure 2.



Setting of the study

The setting refers to the area where the study was conducted⁶⁰. The study was conducted in Govt. Medical College Hospital, Thiruvananthapuram.

Population

In present study, the population comprised of persons with external skeletal fixators admitted, Govt. Medical College Hospital, Thiruvananthapuram.

Sample

Person with external skeletal fixators admitted in orthopaedic wards, Govt. Medical College Hospital, Thiruvananthapuram.

Sampling Procedure

Samples were selected consecutively based on inclusion criteria

Sample Size

Sample size is calculated based on formula,

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 \{ P_1(1-P_1) + P_2(1-P_2) \}}{(P_1 - P_2)^2}$$

P1: Proportion of pin site infection in the first group

P2: Proportion of pin site infection in the second group

α : Significance level β : Type 2 error

1- β : Power

According to the similar study "Empirical evidence of pin site care practices" conducted by Sharma SK, Gupta JV, Walia I and Sen RK10.

Pin site infection rate	Povidone iodine group	Normal saline group
	56.97 %	30 %

Here P1 : 56.97%

P2 : 30%

α : 5%

β :20%

1- β : Power =80%

$$n = \frac{(1.96+0.84)\{56.97(1-56.97)+30(1-30)\}}{(56.97-30)^2}$$

n =52 which can be rounded off to 60.

Sampling Criteria

Inclusion Criteria

- Patients who were receiving same types of antibiotics and on first Post- operative day.
- Participants willing for study.

Exclusion Criteria

- Participants with diabetes mellitus and peripheral occlusive vascular disease (POVD).
- Participants with change in antibiotics during the post- operative period.
- Participants with poly trauma

Tools and Technique

In research process the methods and procedures employed for the collection of the data are called technique and the instruments used are called tools. The following tools were selected to collect the data.

Tool 1: Interview schedule to determine the socio personal data and clinical data.

Tool 2: Chechett’s and Otterburn’s grading system.

Tool 3: Culture and sensitivity results of pin site swab to determine the proportion of Pin Site Infection.

Tool 4: Radiological examination (X -ray) to determine bone infection.

Development or Selection of the tools

An intense search of related literature and extensive consultation with experts in the field of orthopaedic nursing was done in selecting an appropriate tool. The items of the tool were collected, scrutinized, selected and checked for any overlapping, cross checking was done and modification made in consultation with experts from medical surgical nursing and Orthopaedics. An interview schedule was used to collect socio-personal and clinical data, observation technique was used to determine the proportion of Pin Site Infection by using Chechett’s and Otterburn’s grading system .The tool was initially written in English and then the validated tool was given to language experts for translating to Malayalam to facilitate data collection. The language validity was determined by retranslating the tool by language experts.

Description of Tool

Tool 1: Interview schedule to determine the socio personal data and clinical data.

Interview schedule consisted of two sections.

Section A: Socio-personal data

Section A consisted of 6 items including Age, Sex, Occupation, Dietary habits and Adverse health habits collected by using structured interview schedule.

Section B: Clinical data

Section B consisted of 6 items including. location of fracture ,fracture type, location of the external skeletal fixator, pin type of the external skeletal fixator, number of pins in external skeletal fixator, comorbidities, date of admission and

date of surgery assessed by reviewing the record and interview schedule .

Tool 2: Observation technique to determine the proportion of Pin Site Infection among patients with external skeletal fixators by using Chechett's and Otterburn's grading system.

Tool 3

Culture and sensitivity results of pin site swab to determine the proportion of Pin Site Infection..

Tool 4

Radiological examination (X -ray) to determine bone infection.

Content Validity

To ensure content validity of the tool it was submitted to 5 experts from the field of Nursing and Department of orthopaedics. Based on their suggestions necessary modifications were made and the tool was finalized with the help of guide.

Pilot Study

After getting the approval from Institutional Research committee, Institutional

Ethics Committee, Kerala University of Health Sciences, Head of Department of Orthopaedics, Medical Superintendent in Govt. MCH, Thiruvananthapuram, the pilot study was conducted in orthopaedic wards 14,15,20 and 7 of Govt. MCH

Thiruvananthapuram for the period of 1 week starting from 25/11/2019 to 30/11/2019. It was conducted among 6 patients with external skeletal fixators. The data were amenable to statistical analysis and the study was found feasible.

The following modifications were made after the pilot study:

Hypotheses changed into

H_0 : There is no difference on proportion of pin site infection among experimental group and control group.

H_1 : There is a difference on proportion of pin site infection among experimental group and control group .

Data Collection Process

After getting the approval from Institutional Research committee, Institutional

Ethics Committee, Kerala University of Health Sciences, Head of Department of Orthopaedics, Medical Superintendent in Govt. MCH, Thiruvananthapuram, the data collection was conducted in orthopaedic wards 14,15,20 and 7 of Govt. MCH, Thiruvananthapuram from 06/ 01 / 2020 to 15/ 02 /2020. A total of 60 participants were selected consecutively based on the inclusion criteria. After the brief introduction, the investigator explained the purpose of study and ensured the comfort of study participants at bedside during the process of data collection. Informed signed consent was obtained from the participants, who were willing to participate in this study and assured the confidentiality of data being collected. The socio-personal and clinical data were collected by interview schedule and record review and it took around 10 minutes to collect all data from each sample. Provided pin site care with povidone iodine versus normal saline and assess the Pin Site Infection by using Chechett's and Otterburn's grading system. Culture and sensitivity of pin site swab to determine the Pin Site Infection.

Data Analysis

The collected data were analysed using appropriate descriptive and inferential statistics with the help of Statistical Package for the Social Sciences (SPSS) version 16.

1. Socio- personal and clinical variables would be analysed using frequencies and percentages.
2. Proportion of Pin Site Infection would be obtained by chi square test.

This chapter dealt with the research methodology and the process of data collection.

The next chapter deals with analysis and interpretation of the collected data.

Analysis and Interpretation

Analysis is the process of organizing data in such a way that the research question can be answered. The data were collected from 60 participants with external skeletal fixators, organized, tabulated and subjected to descriptive and inferential statistical analysis. The obtained data had been analysed and

organized based on the objective of the study under the following sections. Socio-personal and clinical variable of participants with external skeletal fixators were analysed by frequencies and percentages. Proportion of Pin Site Infection was analysed by chi square test.

Section 1: Distribution of participants according to their socio demographic variables.

Section 2: Distribution of participants according to their clinical data.

Section 3: Description of participants with external skeletal fixators according to the level of

pin site infection for experimental group and control group.

Section 4: Effectiveness of pin site care with normal saline versus povidone iodine.

Section 5: Comparison between the effectiveness of pin site care with normal saline versus povidone iodine.

Section 1 This section deals with socio-demographic variables such as age, sex, occupation, dietary pattern and adverse health habits

Table 1 Frequency distribution and percentage of participants with external skeletal fixators according to age (n=60)

Age in years	Group				Total	
	Experimental		Control		f	%
	f	%	f	%		
18-25	5	16.7	5	16.7	10	16.7
26-30	5	16.7	4	13.3	9	15.0
31-40	2	13.3	2	6.7	4	6.7
41-50	4	46.7	7	23.3	11	18.3
>50	14	100.0	12	40.0	26	43.3
Total	30		30	100.0	60	100.0

Chi square=1.08 df =4 p=0.897

Table 1 depicts that 43.3% of participants belonged to the age group of >50 Years. Only 6.7 % participants belonged to the age group of 31-40 years.

Table 2 Frequency distribution and percentage of participants with external skeletal fixators according to sex (n=60)

Sex	Group				Total	
	Experimental		Control		f	%
	f	%	f	%		
Male	27	90.0	25	83.3	52	86.7
Female	3	10.0	5	16.7	8	13.3
Total	30	100.0	30	100.0	60	100.0

Chi square=0.577 df=1 p=0.448

Table 2, shows that 86.7 % of the participants were males

Table 3 Frequency distribution and percentage of participants with external skeletal fixators according to occupation (n=60)

Occupation	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Unemployed	7	23.3	7	23.3	14	23.3
Professional	0	0.0	1	3.3	1	1.7
Agriculture	6	20.0	6	20.0	12	20.0
Manual labour	5	3.3	10	3.3	15	3.3
Technical	1	10.0	1	10.0	2	10.0
Business	3	26.7	3	6.7	6	16.7
Others	8	100.0	2		10	100.0
Total	30		30		60	

Chi square=6.3 df=6 p=0.394

Table 3 illustrates that 25 % of participants were manual labours. Only 1.7 % participants were professionals.

Table 4 Frequency distribution and percentage of participants with external skeletal fixators according to dietary pattern (n=60)

Diet	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Vegetarian	2	6.7	2	6.7	4	6.7
Non vegetarian	28	93.3	28	93.3	56	93.3
Total	30	100.0	30	100.0	60	100.0

Chi square=0.000 df=1 p=1.000

It is inferred from table 4 that 93.3% participants were non vegetarians.

Table 5 Frequency distribution and percentage of participants with external skeletal fixators according to smoking (n=60)

Smoking	Gr		oup		Total	
	Experimental		Control			
	f	%	f	%	f	%
No	19	63.3	20	66.7	39	65.0
Yes	11	100.0	10	100.0	21	35.0
Total	30		30		60	100.0

Chi square=0.073 df=1 p=0.787

From table 5 it is obvious that 65 % participants have no habit of smoking.

Table 6 Frequency distribution and percentage of participants with external skeletal fixators according to alcoholism (n=60)

Alcoholism	Gr		oup		Total	
	Experimental		Control			
	f	%	f	%	f	%
No	18	60.0	20	66.7	38	63.3
Yes	12	40.0	10	33.3	22	36.7
Total	30	100.0	30	100.0	60	100.0

Chi square=0.287 df=1 p=0.592

Table 6 shows that 63.3 % participants have no habit of alcoholism.

Table 7 Frequency distribution and percentage of participants with external skeletal fixators according to betel chewing (n=60)

Chewing	Gr		oup		Total	
	Experimental		Control			
	f	%	f	%	f	%
No	28	93.3	27	90.0	55	91.7
Yes	2	6.7	3	10.0	5	8.3
Total	30	100.0	30	100.0	60	100.0

Chi square=0.218 df=1 p=0.640

It is highlighted in table 7 that 91.7 % of participants have no habit of betel chewing.

Section 2 This section deals with clinical variables such as location of fracture ,type of fracture, location of external skeletal fixator, pin type of external skeletal fixator, ,number of pins in external skeletal fixator, comorbidities.

Table 8 Frequency distribution and percentage of participants with external skeletal fixators according to location of fracture. (n=60)

Fracture location	Gr		oup		Total	
	Experimental		Control			
	f	%	f	%	No	%
Upper extremity	3	10.0	0	3.3	3	5.0
Lower extremity	27	90.0	29	96.7	57	95.0
Total	30	100.0	30	100.0	60	100.0

Chi square =0.351 df=1 p=0.554

Table 8 illustrates that 95 % of fracture located in lower extremity.

Table 443 Frequency distribution and percentage of participants with external skeletal fixators according to type of fracture. (n=60)

Type of fracture	Gr		oup		Total	
	Experimental		Control			
	f	%	f	%	f	%
Open	8	26.7	18	60.0	26	43.3
Closed	22	73.3	12	40.0	34	56.7
Total	30	100.0	30	100.0	60	100.0

Chi square=6.8 df=1 p=0.009

Table 9 illustrates that 56.7 % of fractures are open fractures.

Table 443 Frequency distribution and percentage of participants with external skeletal fixators according to location of external skeletal fixator (n=60)

External skeletal fixator location	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Humerus	3	10.0	0	0.0	3	5.0
Tibia	16	53.3	15	50.0	31	51.7
Femur	0	0.0	2	6.7	2	3.3
Fibula	3	10.0	1	3.3	4	6.7
Ankle	6	20.0	4	13.3	10	16.7
Feet	2	6.7	8	26.7	10	16.7
Total	30	100.0	30	100.0	60	100.0

Chi square=10.0 df=5 p=0.074

Table 10 illustrates that 51.7 % of external skeletal fixator located in tibia.

Table 444 Frequency distribution and percentage of participants with external skeletal fixators according to pin type of external skeletal fixator (n=60)

Pin type of ESF	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Schanz	18	60.0	20	66.7	38	63.3
Kirschner	12	40.0	10	33.3	22	36.7
Total	30	100.0	30	100.0	60	100.0

Chi square =0.287 df=1 p=0.592

Table 11, shows that 63.3 % of pins were schanz pin.

Table 12 Frequency distribution and percentage of participants with external skeletal fixators according to number of pins in external skeletal fixator. (n=60)

No of pins in ESF	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
1-3	13	43.3	17	56.7	30	50.0
4-7	16	100.0	11	100.0	27	45.0
8-11	1		2		3	
Total	30		30		60	

Chi square=1.8 df=2 p=0.408

Table 12, shows that 45 % of participants have 4-7 pins in external skeletal fixator.

Table 13 Frequency distribution and percentage of participants with external skeletal fixators according to comorbidity. (n=60)

Comorbidity	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Nil	23	76.7	18	60.0	41	68.3
Hypertension	7	23.3	9	10.0	16	26.7
Others	0	0.0	3	100.0	3	5.0
Total	30		30		60	

Chi square=3.9 df=2 p=0.145

Table 13, shows that 68.3 % of participants have no comorbidities

Section 3 Proportion of Pin Site Infection.

This section includes frequency and percentage distribution of Pin Site Infection.

Table 14 Frequency distribution and percentage of minor infection. (n=60)

Minor infection	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
No infection	27	90.0	25	83.3	52	86.7
Minor infection	3	10.0	5	16.7	8	13.3
Total	30	100.0	30	100.0	60	100.0

Chi square=0.577 df=1 p=0.448

Table 14, shows that 86.7 % of participants have no minor infections developed.

Table 15 Frequency distribution and percentage of major infection

(n=60)

Major infection	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
No infection Total	30	100.0	30	100.0	60	100.0
	30	100.0	30	100.0	60	100.0

Table 14, shows that 100 % of participants have no major infections developed.

Table 16 Frequency distribution and percentage of Pin site Infection according culture and sensitivity of pin site swab.

(n=60)

Culture and sensitivity of pin site swab	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
Infection Absent	30	100.0	29	96.7	59	98.3
Infection Present	0	0.0	1	3.3	1	1.7
Total	30	100.0	30	100.0	60	100.0

Chi square=1.01 df=1 p=0.313

Table 16, shows that 98.3% of participants have no infections developed.

Table 17 Frequency distribution and percentage of bone infection.

(n=60)

Radiological examination for bone Infection	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
No infection Total	30	100.0	30	100.0	60	100.0
	30	100.0	30	100.0	60	100.0

Table 17, shows that 100 % of participants have no infections developed.

Section 4 Effectiveness of pin site care with normal saline versus povidone iodine

Table 18 Frequency distribution and percentage of pin site infection.

(n=60)

Level of infection	Group				Total	
	Experimental		Control			
	f	%	f	%	f	%
No infection	27	90	25	83.3	52	86.7
Minor infection	3	10	5	16.7	8	13.3
Major infection	0	0	0	0	0	0
Total	30	100	100	100	60	100

Table 18 depicts that 10% of participants had developed minor infection in pin site care with normal saline and 13.3% of participants had developed minor infection in pin site care with povidone iodine.

Results

This chapter given a brief description on major findings of the study based on objectives of the study. The present study was intended to determine the effectiveness of pin site care with normal saline versus povidone iodine on pin site infection among patients with external skeletal fixators.

Objectives

To find out the effectiveness of normal saline versus povidone iodine on Pin

Site Infection among patients with external skeletal fixators.

Results

Major findings of the present study are the following

- Total 43.3% of participants belonged to the age group of >50, only 6.7 % participants belonged to the age group of 31-40 years, 16.7% participants belonged to the age group of 18-25 years, 15 % belonged to 26-30 years, 18.3 % belonged to age group of 41-50 years.
- 86.7 % of the participants were males and remaining 13.3 % were females
- 25 % of participants were manual labours. Only 1.7 % participants were professionals. 23.3% participants were unemployed, 20% were had agriculture, 3.3% were technical workers, 10 % were business man, 16.7% were had other jobs.
- 93.3% participants were non vegetarians and 6.7 % were non vegetarians.
- 65 % participants have no habit of smoking and 35 % participants have habit of smoking.
- 63.3 % participants have no habit of alcoholism and 36.7% participants have habit of alcoholism.
- 91. % of participants have habit of betel chewing and 8.3% of participants have habit of betel chewing.
- 95 % of fracture located in lower extremity and 5% located in lower extremity.
- 56.7 % of fractures are open fractures and 43.3% are open fractures.
- 51.7 % of external skeletal fixator located in tibia, 5% in humerus, 3.3% in femur, 6.7% in fibula, 16.7 % in ankle and 16.7 % in feet.

- 63.3 % of pins were schanz pin and 36.7 % of pins were K wires.
- 45 % of participants had 4-7 pins, 50 % of had 1-3 pins and 5 % had 8-11 pins in external skeletal fixator.
- 68.3 % of participants have no comorbidities, 26.7 % of had hypertension and 5% had other comorbidities.
- 86.7 % of participants have no minor infections developed, 13.3% of participants had developed minor infections.
- 100 % of participants had no major infections developed.
- 100 % of participants have no infections developed in radiological examination.

Discussion, Summary and Conclusion

This chapter gives a brief account of present study findings, including discussion of the research findings, summary, conclusion drawn from the findings, nursing implications, limitations of the study and recommendations for the future studies.

The focus of study was to assess the effectiveness of pin site care with normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators admitted in a tertiary care hospital, Thiruvananthapuram.

A post-test only control group design was adopted in this study. The data were collected from 60 persons with external skeletal fixators.

Discussion

The present study was aimed to assess the effectiveness of pin site care with normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators. The findings of the present study have been discussed in terms of objectives.

Summary

The present study was aimed to assess the effectiveness of pin site care with normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators

admitted in a tertiary care hospital, Thiruvananthapuram. The conceptual framework used in the study was based on Modified Imogen king's goal attainment theory. The tool used was an interview schedule to determine the sociodemographic data and clinical data, observation for determination of Pin Site Infection. A pilot study was conducted among 6 participants showed that the data were amenable to statistical analysis and study was found feasible.

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Data were collected from 60 participants selected consecutively from inpatient department of Orthopaedics (ward 14,15, 20,7) of tertiary care hospital, Thiruvananthapuram for period of 6 weeks. Data collected were organized and analysed using descriptive and inferential statistics. The result showed that 10% participants in normal experimental group had developed Pin Site Infection and 16.7% participants in control group. So pin site care with normal saline is effective on Pin Site Infection.

Conclusion

The purpose of the study was to assess the effectiveness of pin site care with normal saline versus povidone iodine on Pin Site Infection among patients with external skeletal fixators . The study findings revealed that proportion of Pin Site Infection is 10 % in experimental group and 16.7 % in control group.

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