



Assess the Effectiveness of Elastic Compression on Pain and Edema of Lower Extremities among Nursing Staff in Selected Hospitals, Kerala

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KEYWORDS

Elastic compression, pain, edema, staff nurses, effectiveness, lower extremities.

ABSTRACT:

Introduction: Nursing is a globally recognized profession that works with human beings and is emotionally connected to the patients. Therefore, nurses are often experience to strain-induced stress, resulting in injury to muscles, blood vessels, and nerve tissues. Nurses frequently spend prolonged periods standing, with shifts that can extend up to 12 hours. They do overtime after their normal working shift of 9 to 12 hour and it has opportunity to get pain and edema on lower extremities. **Methodology:** The research were performed in the selected hospitals of Kerala, India, among 40 nursing staffs regarding the effectiveness of elastic compression on pain and edema of lower extremities. The research approach and research design were used are quantitative research approach and true experimental pre-test post-test control group design. The tools were used for data collection are Demographic characteristics of samples, Numerical Rating Scale (NRS), Glass fiber tape measure and Likert satisfaction Survey scale. A knee length toe exposed with 23-32 mm Hg firm pressure elastic compression stocking were used as intervention tool for the study. **Results:** The most of participants from experimental group fully satisfied to the elastic stocking compression 18 (90%) and 2(10%) of participant had partially satisfied. The average and standard deviation of satisfaction is 1.11 ± 0.3 . **Conclusion:** The nurses are integral part of health care system; they provide comprehensive care which physical, mental and social support to needy people. The sound health is a essential and most important aspects. Although physical strain always reported by nursing staffs, especially those are working prolonged time. Hence elastic compression stocking needed to improve the blood circulation of lower extremities.

1. Introduction

In the contemporary healthcare environment, nurses often experience significant stress due to the demanding nature of their duties, resulting in considerable strain. Reports indicate that the strain is particularly evident in their musculoskeletal system, impacting areas such as the neck, shoulders, arms, hands, back, waist, legs, knees, and feet. This strain can stem from factors such as supporting patients' weight, experiencing discomfort from prolonged patient handling, and adopting sustained postures while working on computers for extended periods. Nurses frequently spend prolonged periods standing, with shifts that can extend up to 12 hours. They do overtime after their normal working shift of 9 to 12 hour and it has opportunity to get pain and edema on lower extremities. Upon waking up in the morning, an individual's feet are at their smallest size for the day. However, once they begin standing, a natural swelling

occurs due to the considerable distance blood needs to travel through the body and back to the heart. This phenomenon becomes more prominent with age. In some cases, shoes might feel tighter, legs can feel burdened or fatigued, and feet may experience discomfort. These symptoms might be particularly pronounced if the person has varicose veins. Unfortunately, these issues tend to exacerbate over time, especially with prolonged periods of standing, and they can have a significant impact on the well-being of one's feet and legs.

A safe work environment always reflects the work performance of employees. The workers or employee required an adequate rest and recreation between works. The rest between the work which help to enhanced the job satisfaction among nursing staffs. Physical strain is another major problem often reported by employees who work for a prolonged time. Nursing is a globally recognized profession that works with human beings and



is emotionally connected to the patients. Therefore, nurses are often experience to strain-induced stress, resulting in injury to muscles, blood vessels, and nerve tissues, therefore they need assistance or rest or less work burden mostly improves their mental health.(Moayed et al., 2015)

Nurses must stand for long periods of time, typically during 12-hour shifts. They labour overtime after their regular working schedule of 9 to 12 hours, and it has resulted in Lower extremity pain and oedema are possible. When one wakes up in the morning, his or her feet are the tiniest they will be for the rest of the day. Swelling develops naturally as soon as they get to their feet since it is a long distance for blood to circulate through the body and back up to the heart. This becomes more common as one gets older. Shoes may seem tighter in certain cases, legs may feel heavy or fatigued, and feet may feel achy. Symptoms may be more noticeable if varicose veins are present. They are prone to deteriorate.(Griffiths et al., 2014)(Saville et al., 2020)

Need for the study

Extended periods of standing during work have been connected to various potential health issues, including lower back and leg pain, coronary heart disease, fatigue, general pain, and health outcomes associated with pregnancy. Recent research has delved into investigating the correlation between the duration of time spent standing at work and the emergence of these health problems. Existing literature further reinforces the idea that specific interventions can effectively mitigate the risks linked to extended periods of standing. Proposed interventions encompass the implementation of floor mats, adoption of sit-stand workstations or chairs, utilization of supportive footwear, incorporation of shoe inserts, and the use of hosiery or stockings.(Waters & Dick, 2015)

Epidemiology in India

The research aimed to evaluate the efficiency of elastic compression on pain and edema of lower limbs among nursing personnel. This study finding will help to recommend the guidelines development or requires further studies on large scales. Nurses are always victims of unsafe working conditions or work overload. Therefore, healthcare administrator or policymakers to

understand the existing working condition and modifies policies towards employees.

A cross sectional study performed tertiary hospital in India revealed that approximately half (50.7%) of the cases experiencing symptoms in at least one area of their bodies over the preceding 12 months. Among these reported symptoms, most prevalent was low back pain, affecting 45.7% of participants, followed by neck pain at 28.5% and shoulder pain at 23.5%. Conversely, hip/thigh pain was reported by 7.1% of participants, and elbow pain by 5%, representing the least frequently reported symptoms. Interestingly, irrespective of professional domains, a considerable 56 % of nurse, 55% of physiotherapist, 54% of dentists, 39 of laboratory technicians, and 38% of health care practitioners complained of body pain during the past 12 months. (Yasobant & Rajkumar, 2014)

Variables

A variable is defined as a characteristics, number or quantity that may assume different values. This study was included;

Independent variable	:	Elastic compression
Depended variable	:	Edema and Pain

Intervention

Elastic compression stocking: A knee length toe exposed with 23-32 mm Hg firm pressure elastic compression stocking which constructed using elastic fibers or rubber. This intervention will be applied to each selected participants in experimental group after measurement taken.

Statement of the problem

Assess the Effectiveness of Elastic Compression on Pain and Edema of Lower extremities among Nursing Staff in Selected Hospitals, Kerala.

Objectives

The objectives of the study are:

1. Assess the pain of lower extremities in pre and post clinical duty among control group of nursing staff.
2. Find the edema of lower extremities in pre and post clinical duty among control group of nursing staff.



3. Evaluate the pain of lower extremities in pre and post clinical duty among experimental group of nursing staff.
4. Determine the edema of lower extremities in pre and post clinical duty among experimental group of nursing staff.
5. Compare the pain and edema post - test score among experimental group of Nursing Staff.
6. Evaluate the satisfaction of nursing staff regarding the effect of Elastic compression.
7. Determine the relationship between pre test score with selected socio demographic and clinical factors.

Hypothesis

In the study, the hypothesis will be raised and tested at 0.05 level of significance.

H1: There will be significant association between effectiveness of elastic compression and pain score of lower extremities among nursing staff.

H2: There will be significant association between effectiveness of elastic compression and edema level of lower extremities among nursing staff.

H3: There will be significant association in between pain and edema score among nursing staff.

H4: There will be significant association between the pre-test scores and the selected socio-demographic and clinical variables.

Operational Definitions

A study to assess the effectiveness of elastic compression on pain and lower extremities among Nursing Staff in Selected Hospitals, Kerala.

- **Elastic compression:** These garments are stockings worn on the legs that apply pressure, constricting the limb. This action decreases the size of swollen veins, enhances the speed of blood flow in veins, and improves the functionality of valves within the veins. In this research study, the knee length toe - exposed with 23-32 mm Hg firm pressure elastic compression stockings are used as intervention for nursing staff.
- **Pain:** Pain is an unpleasant sensory and emotional experience which is similar to those associated with, real or potential harm to tissue. In this research study pain on lower extremities experienced by nursing staff.
- **Edema:** Edema refers to the enlargement resulting from an accumulation of excess fluid confined within the body's tissues. In this research study edema on lower extremities experienced by nursing staff.
- **Lower extremities:** Lower extremities refer to the portion of the body that extends from the hip to the toes. The lower extremities consist of the hip, knee, and ankle joints as well as the thigh, leg, and foot bones.
- **Nursing staff:** They are typically registered nurses who monitor, observe and assess patients and provide direct patient care. In this research study, bedside nursing staffs are study participants who are already suffering from pain and edema on lower extremities; with age limit of 35 to 45 years and working 9-12 hours of clinical duty either in private or government hospitals of Kerala state of India.
- **Hospital:** A hospital is a facility designed for both temporary and extended medical care, encompassing observation, diagnosis, treatment, and rehabilitation services for individuals afflicted by illnesses or injuries. In this present study the research will be conducted in either private or government hospitals of Kerala state of India.

Assumptions

- Nursing staffs will have pain and edema during long working hours.
- Nursing staffs will have limited knowledge regarding elastic compressive stocking.
- Nursing staffs will be cooperated with the investigator during the implementation of the elastic compression stocking.

Limitations

- The subjects selected from a scattered population hence the study findings are limited to the setting of the research.



- Since the current study was time bound, only limited events were observed period of time.
- Post-test was assessed only one month of intervention.

2. Research Methodology

Research Approach

The present study adopted quantitative research approach:

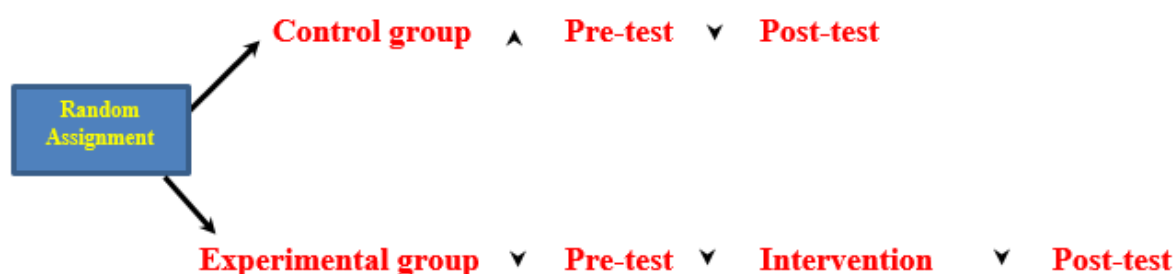


Figure:2 Schematic diagram of pre-test post-test control group design

Research Setting

The current research was performed in the selected **hospitals of Kerala, India.**

Population

Present study populations were nursing staffs.

Sample

Sampling Technique:

The sampling technique was used in two parts, first was study setting and another for study participants.

Study settings were identified by Probability sampling technique, whereas participants were selected by Cluster sampling technique. Allocations of participants were done using systematic random sampling technique for an experimental and control group.

Sample Size: 40 nursing staffs.

Criteria for sample selection

Inclusion criteria:

Participants were selected based on following criteria:

Researchers gathered the quantitative information in terms of pain scores and edema measurement that helped to determine the efficacy of elastic compression on pain and edema of lower extremities among nursing staffs.

Research Design

True experimental pre-test post-test control group design was used in this research. Investigator randomly assigned the nursing staffs in experimental and control group. The intervention group received elastic compression, while control group hasn't received any type of interventions.

Nursing staff who are meeting the following criteria were included in this study:

1. Who are willing to participate in this study.
2. Who were performing morning shift 9-12 hours of clinical duty.
3. Age of nursing staff ranged from 35 year to 45 year
4. Both male and female Nursing staff, who have pain and edema on lower extremities
5. Nursing staff working in inpatient or outpatient department with normal BMI

Exclusion criteria:

The nursing staffs excluded following reasons

1. Skin conditions, such as injuries to the feet or lower extremities.
2. Any medical records pertaining to the past history of vascular, liver, renal, and cardiac illness.
3. People who previously wore elastic compression stockings.
4. Skin allergy to elastic fibers or rubber



Variables

Researchers gathered the quantitative information in terms of pain scores and edema measurement that helped to assess the effectiveness of elastic compression on pain and edema of lower extremities among nursing staffs

A variable is defined as a characteristics, number or quantity that may assume different values.;

Extraneous variables : Demographic variables

Independent variable : Elastic compression

Depended variable : Edema and Pain scores

Description of the data collection instrument

Various tools and techniques were used to determine the efficacy of elastic compression on pain and edema of nursing staff. The following tool employed for data collection.

Section-1: Demographic characteristics of samples

Age (years), Gender, Height (cm), Weight (kg), BMI (Kg/m²), Hours of working and Area of working

Section- II: Numerical Rating Scale (NRS):

The pain will be assessed by using Numerical pain rating scale. The participants are asked to make the pain rating on numeric pain rating scale which is 0 (No pain) to 10 (Severe pain)

Section- III: Glass fiber tape measure:

A glass fiber tape (150 cm/60inches) for assessing edema. The edema was assessed 10 minutes before wearing elastic compression stocking and 10 minutes after doffing or clinical duties of experimental group. Before and after intervention, at a point 10 cm below the tibial tuberosity was marked with an indelible pen.

Section- IV: Likert satisfaction Survey scale:

This Likert scale assessed the nursing staffs satisfaction on compression stocking in experimental group. The scale consists of 10 items which include pain, edema, and effects of elastic compression stocking. The satisfaction survey consists of 5 point Likert type scale. The participants scored from 1 to 5 which correspond to 1- Strongly disagree, 2- Disagree, 3- Not sure, 4- Agree and 5- Strongly agree. The researcher measured the

satisfaction effect of nursing staff with elastic compression stocking based on the scores provided.

Section- V: Description of Elastic compression stocking:

A knee length toe exposed with 23-32 mm Hg firm pressure elastic compression stocking which constructed using elastic fibers or rubber. This intervention will be applied to each selected participants in experimental group after measurement taken.

Score interpretation of the data collection instrument

Pain: No Pain when score zero, similarly mild pain (1-3 scores), moderate pain(4-8scores) and severe pain(7-10 scores)

Pain score 0	-----	No Pain
Pain score 1 to 3	-----	Mild Pain
Pain score 4 to 6	-----	Moderate Pain
Pain score 7 to 10	-----	Severe Pain

Edema: The edema scale has classified no edema, mild edema and severe edema.

No edema= less than 35cm

Mild edema = 36-40 cm

Severe edema= more than 40 cm

Pretest pain was measured 10 minutes before wearing an elastic compression stocking (before donning). The individual nursing staff pain scores were measured daily before and after their duties for the 30 days. The average 30 days Pretest and post-test pain scores were considered for experimental groups. Similarly, the control group was also assessed in the same manner as the experimental group without intervention.

Satisfaction of Nursing staff on intervention

The Likert scale was used for assessing nursing staffs' satisfaction on intervention.

The score categorized as follows:

Not satisfied: less than 50% scores

Partially satisfied: 51-75%

Full satisfied: More than 75%

Description of Intervention



The elastic compression stockings were made by Tynor Orthotics Pvt LTD, India ISO13485. Nursing staff wore this ECS for 9 to 12 hours per day before they began work and were removed once clinical duty was completed. These latex-free medical compression stockings are worn below the knee and provide precise and graduated compression. A knee length toe exposed with 23-32 mm Hg firm pressure elastic compression stocking which constructed using elastic fibers or rubber. This intervention was applied to each selected participants in experimental group after measurement taken.

Content validity

Standardized modified pain scale prepared along with the objective of the study, criterion rating scale and the blue print were submitted to six experts for content validity. Three experts were from the field of medical surgical nursing, one from the surgical department, one from the field of emergency medicine and one from the field of statistics. The professionals were requested to give their assessments regarding the sufficiency, pertinence, and suitability of the content.

Ethical consideration

The research was approved by Ethical Research & Review Committee of Desh Bhagat University, Mandi Gobindgarh, Punjab. After obtaining the ethical clearance, the approval for study permission received from hospital management and ethical committee, then Participants were chosen from those who fulfilled the study criteria and expressed their willingness to participate after being informed about the research procedures, duration, and safety measures. Subsequent to obtaining their consent, individuals in the experimental group were equipped with elastic compression stockings.

Pilot Study

This pilot study was performed to determine the reliability and feasibility of the elastic compression stockings and the satisfaction of intervention. The pilot study was performed with 10% of the total sample size. The study was carried out after approval of ethical clearance and permission from the concerned department.

Reliability

Reliability of the Pain scale

The reliability of the tool established by administering the tool to 20 nursing staffs working in government hospital Kerala, India. The tools were administered after taking the administrative permission and individual consent. The reliability coefficient of the tool was computed by the split-half method using the Pearson's product movement correlation equation, and the 'r' substituted in the Spearman-Brown Prophecy formula, and the tool was found to be reliable ($r=0.751$)

Glass fiber tape measure

Similarly, reliability of (Glass fiber tape measure) edema scale was checked by administering the tool to 20 nursing staffs working in government hospital Kerala, India. The tools were administered after taking the administrative permission and individual consent. The reliability coefficient of the tool was computed by the split-half method using the Pearson's product movement correlation equation, and the 'r' substituted in the Spearman-Brown Prophecy formula, and the tool was found to be reliable ($r=0.784$)

Reliability of the Likert's scale

The reliability of the tool established by administering the tool to 20 nursing staffs working in government hospital Kerala, India. The tools were administered after taking the administrative permission and individual consent. The reliability coefficient of the tool was computed by the split-half method using the Pearson's product movement correlation equation, and the 'r' substituted in the Spearman-Brown Prophecy formula, and the tool was found to be reliable ($r=0.766$)

Feasibility

The pain and edema measuring scale was found to be clear and all the items in the tool were clearly understood by the subjects without ambiguity. The outcomes of the pilot study demonstrated the viability of the settings, samples, and tool for the primary research study. The tool was therefore determined to be feasible and practical for the study.

Data collection Procedure

The data collection of pilot study was started after approval of ethical committee, and concerned hospital authority, as well as individual informed consent of the



participant. Before data collection researchers explained the study purpose, objectives and data confidentiality and anonymity. The target population identified and obtained the written consent from each participant. The participants can withdraw from the study at any point of

time, researcher also ensured that obtained information will not be disclosed to the third party.

Table:1 Schematic table of pre and post-test pain and edema in experimental and control groups

Pre and post-test was assessed for continuous one month		Experimental group			Control group		
		Pre-test Pain & Edema measured 10 minutes before donning of ECS	Elastic Compression Stocking (ECS)	Post-test Pain & Edema measured 10 minutes after donning ECS	Pre-test Pain & Edema measured 10 minutes before donning ECS	No intervention	Post-test Pain & Edema measured 10 minutes after donning ECS
Pain	Right leg	O1	X	O2	O1		O2
	Left leg	O1	X	O2	O1		O2
Edema	Right leg	O1	X	O2	O1		O2
	Left leg	O1	X	O2	O1		O2

O1=Pretest assessment

X= Elastic Compression Stocking (ECS) intervention

O2=Posttest assessment

Screening test for selection of participants were conducted for nursing staff according to inclusion and exclusion criteria. Thus, only those who voluntarily signed the consent of the study participation and met the criteria were assigned into the experimental and control group. The pilot study was conducted from **September 1, 2022 to February 28, 2023**.

First tool was administrated for basic information of participants. Second tool used for pain assessment: Numeric Rating Scale (NRS) and measured on lower extremities 10 minutes before donning elastic compression stocking and 10 minutes after doffing of elastic compression stocking for experimental group and without elastic compression stocking for the control group before and after their clinical duty.

Edema was also measured using a glass fibre tape measure and an indelible marker at a point 10 cm below

the tibial tuberosity, and the value was given in centimetres (150 cm/60 inches).Edema were measured on lower extremities 10 minutes before donning elastic compression stocking and 10 minutes after doffing of elastic compression stocking for experimental group and without elastic compression stocking for the control group before and after their clinical duty.

After 10 minutes of pretest assessment elastic compression was applied to nursing staff in the experimental group. While control group not given any intervention and observed routine activities. Post test was conducted after 10 minutes doffing of elastic compression stocking. Intervention group measured the pain and edema before and after elastic compression, while control measured the pretest and posttest pain and edema without intervention.



Table: 2

Research Approach and Design	Population, setting, Sampling Technique	Variables	Instruments	Plan for Data Analysis
Research Approach Quantitative research Research design True experimental pretest post-test control group design	Population: Nursing staff selected hospitals of Kerala,India Study setting by selected hospitals of Kerala,India Participants selected by Cluster sampling technique. Allocation of participants by Systemic random sampling technique	Dependent Variable: Pain and oedma of lower extremities on calf muscles Independent variable: Elastic compression. Demographic variable: Sociodemographic characteristics of nursing staffs	Tool –I: Demographic variable tool Tool-II: Pain scale Numerical Rating Scale (NRS) Tool-III Glass fiber tape measure for edema measurement Tool-IV: Likert satisfaction Survey scale	Analysis of the data was performed using SPSS version 16, involving descriptive statistical techniques such as frequency and percentage calculations. Inferential statistics. i.e parametric and non-parametric test were used to test the effectiveness of the intervention.

Pre and post-test measurement of pain and edema were noted by nursing staffs for 30 days in both groups. Satisfaction of elastic compression stocking was assessed 5 days,15 days and 30 days of intervals. using 5-point Likert satisfaction Likert scale.

Plan for Data analysis

Obtained data were summarized and coded in the Microsoft of the Excel sheet. The data sheet was transferred to the SPSS software version 16. Descriptive statistics encompass measures like frequency, percentages, mean, and standard deviation. On the other hand, inferential statistics are employed to assess the connection and efficacy of elastic compression, such as the chi-square test and independent t-test.

3. Result

The analyzed data were presented under the following headings: -

I. Demographic Characteristics of nursing staffs

Table: 3 Describe the participants age in frequency and percentages n=40

	Variable	frequency	percentages
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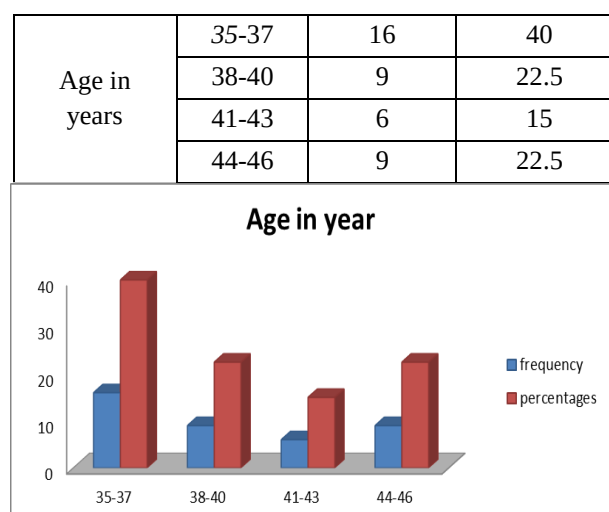


Figure: 3 Describe the participants age in frequency and percentages n=40



The table & figure 3- depicts the age of nursing staffs. On assessment, majority of participants aged between 35-37 years 16(40%), 38-40 years 9(22.5%), 41-43 years 6(15%), and 44-46 years 9(22.5%), respectively.

Table-4. describe the participants gender in frequency and percentages n=40

Gender	Variable	frequency	percentages
	Male	10	25
	Female	30	75

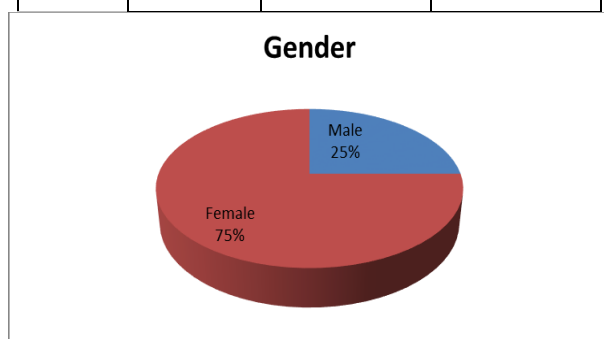


Figure-4: Describe the gender in frequency and percentages n=40

The figure- & table-4 summarized the number of male and female participants. On assessment, majority of the nursing staffs were female 30(75%), and male 10(25%), respectively

Table-5 describe Height in centimeter in frequency and percentage n=40

Height	Variable	frequency	percentages
	150-154	10	25
	155-159	23	57.5
	160-164	4	10
	165-169	2	5
	Above 170	1	2.5

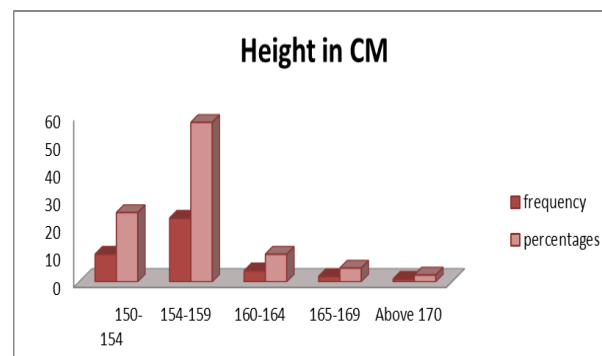


Figure-5 describe Height in centimeter in frequency and percentage n=40

In Table & figure 5 described the height of nursing staff in frequency and percentages. The majority of nursing staff's height in between 154-159cm 23(57.5%), 150-154cm 10(25%), 160-164cm 4(10%), 165-169 2(5%) and above 170cm 1(2.5%), respectively. (figure-5 & table-5)

Table-6 describe weigh in kilo-grams in frequency and percentage n=40

Weight	Variable	frequency	percentages
	50-54	6	15
	55-59	6	15
	60-64	18	45
	65-69	10	25

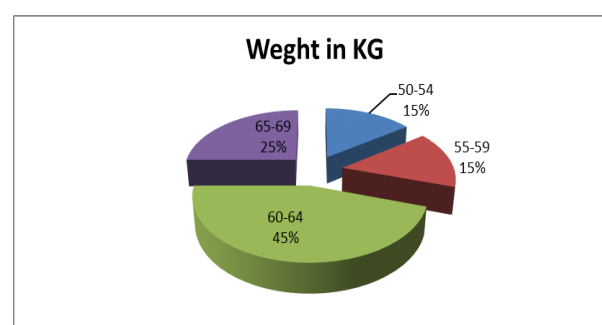


Figure-6 describe weight in kilo gram in frequency and percentage

In Table & figure 6 described the weight of nursing staffs in frequency and percentages. The majority of nursing staff's height in between 50 -54kg 6(15%), 55 -59kg 6(15%), 60 -64kg 18(45%) and 65-69 -10kg (25%), respectively. (Figure-6 & table-6)



Table:7- describe body mass index (BMI) in frequency and percentage n=40

	Variable	frequency	percentages
BMI	18.5-20	14	35
	20.5-22	16	40
	22.5-25	10	25

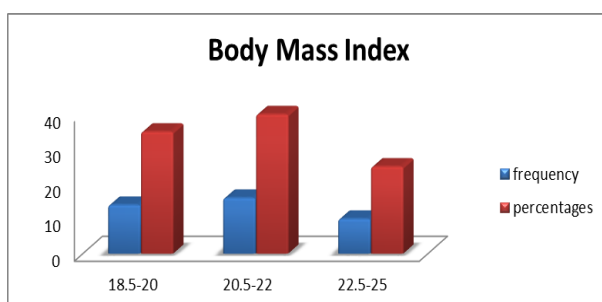


Figure:7- describe body mass index (BMI) in frequency and percentage n=40

In Table & figure 7 described the BMI of nursing staffs. The most of the nursing staffs BMI ranged between 20.5-22 (40%), 18.5-20 (35%) and 22.5-25 (25%), respectively.

Table:8- describe working hours per day in frequency and percentage n=40

	Variable	frequency	percentages
Working hours	9 hrs	8	20
	12 hrs	22	55
	>12 hrs	10	25

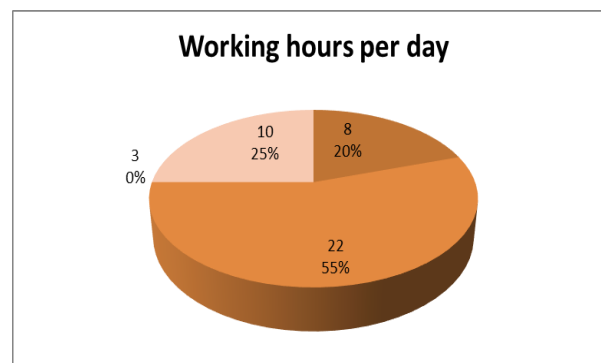


Figure-8 describe working hours per day in frequency and percentage n=40

In Table & figure 8 summarized the working hours of nursing staffs. The majority of the participants working 12 hours per day 22(55%), 9 hours per day 8(20%) and more than 12 hours 10(25%) per day.

Table:9- describe working area of nursing staff in frequency and percentage n=40

	Variable	frequency	percentages
Working area	In patient	30	75
	Out patient	10	25

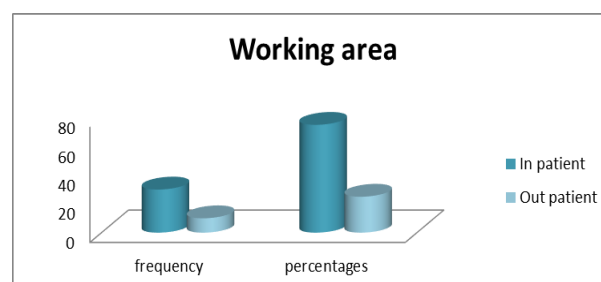


Figure:9- describe working area of nursing staffs in frequency and percentage n=40

In Table & figure 9 summarized the working area of nursing staffs. The majority of the participants working in in patient department 30(75%) and out-patient department 10 (25%).

Table:10- describe working area of nursing staffs in frequency and percentage n=40

Name of area	Department name	frequency	Percentage
In patients	ICU	14	35
	General ward	6	15
	OT	8	20
	Labor room	2	5



Out patients	Emergency department	6	15
	Outpatient department	4	10

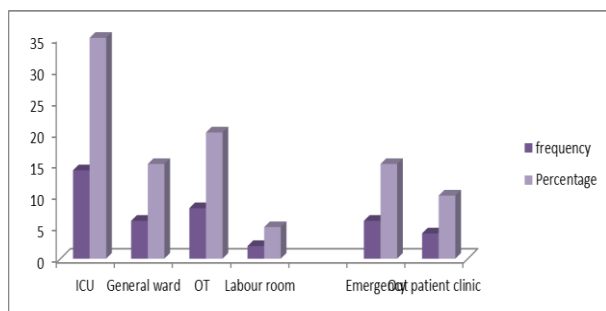


Figure:10 describe working area of nursing staff nurses in frequency and percentage

II. Evaluate the pain of lower extremities in pre and post clinical duty among experimental and control group of Nursing staff.

Table: 11 Evaluate the pain of lower extremities in pre and post clinical duty among experimental group of Nursing staffs n=20

Variables	Pretest pain			Post test pain		
	Mild	Moderate	Severe	Mild	Moderate	Severe
Right leg Pain	2	10	8	14	6	0
Left leg Pain	2	11	7	13	7	0

The pretest calf muscle pain was measured before starts duty and 10 minutes before applying stocking compression. Similarly posttest pain was measured after completing their duty. Right leg pain pretest scores ,mild (2),moderate(10) and severe(8).Similarly post pain assessment was done after duty while most of the

nursing staffs had less pain that mild (14),and moderate pain (6). On the other hand, pretest pain of left leg that mild (2), moderate (11) and severe (7), respectively. Posttest pain was reducing that mild (13) and moderate pain (7) among nursing staffs.

Table:12 Assess the pain of lower extremities in pre and post clinical duty among control group of Nursing staff. n=20

Variables	Pretest pain			Post test pain		
	Mild	Moderate	Sever	Mild	Moderate	Sever
Right leg Pain	2	9	9	3	8	9
Left leg Pain	3	10	7	3	9	8

The pretest calf muscle pain was measured before starts duty and posttest pain was measured after completing their duty clinical duty. Right leg pretest pain was state as follow, mild (2), moderate (9) and severe (9). Similarly post pain was done after duty mild

(3),moderate (8),and severe (9) respectively. Similarly, left leg pretest pain was mild (3), moderate (10) and severe (7), and posttest was mild pain (3) and moderate pain (10),and severe pain(7), respectively

III.Determine the edema of lower extremities in pre and post clinical duty among experimental and control group of Nursing staff.



Table:13 Find the edema of lower extremities in pre and post clinical duty among experiment group of Nursing staff.
n=20

Variables	Pretest edema			Post test edema		
	No edema	Mild edema	Severe edema	No edema	Mild edema	Severe edema
Right leg edema	5	7	8	17	3	0
Left leg edema	6	8	6	16	4	0

The pretest calf muscle edema was measured before starts clinical duty and 10 minutes before intervention. Similarly posttest edema was measured after completing duty of nursing staff. Right leg edema was measured before intervention, no edema (5), mild edema (7) and severe edema (8). Similarly posttest edema was measured

after their clinical duty while most of the staff nurses no edema (17), and mild edema (3). The pretest scores of left edema categorized as follows no edema (6), mild edema (8) and severe edema (7), respectively and posttest edema was reduced into mild (16) and moderate (4).

Table:14 Find the edema of lower extremities in pre and post clinical duty among control group of Nursing staff.
n=20

Variables	Pretest edema			Post test edema		
	No edema	Mild edema	Severe edema	No edema	Mild edema	Severe edema
Right leg edema	6	7	7	5	8	7
Left leg edema	5	8	7	6	9	5

The pretest calf muscle edema was measured before starts duty. Similarly posttest edema was measured after completing duty of nursing staff. Right leg pretest edema was measured as follows, no edema (6), mild edema (7) and severe edema (9). Similarly post edema assessment was done after duty no edema (5), mild edema (8) and

severe edema (7). respectively. Similarly, left leg pretests no edema (5), mild edema (8) and severe edema (7). respectively. While posttest edema was reducing no edema (6), mild edema (9) and severe edema (5) respectively.

IV. Compare the pain and edema post - test score among experimental group of Nursing Staff.

Table: 15 Compare the effectiveness of stocking compression on posttest pain and edema in experimental group
n=20

Variables	Posttest pain			Posttest edema		
	Mild	Moderate	Severe	No edema	Mild edema	Severe edema
Right leg Pain	14	6	0	17	3	0
Left leg Pain	13	7	0	16	4	0

Table:16 Calf muscle Pain in experimental and control group
n=40

	Pretest			Post test			Paired t test	df	P value
	Mean	SD	N	Mean	SD	N			
Experimental group									
Right leg pain	2.3	0.65	20	1.3	0.47	20	9.7	19	0.0



Left leg pain	2.2	0.63	20	1.3	0.48	20	13.7	19	0.0
Control group									
Right leg pain	2.2	0.67	20	2.3	0.73	20	1	19	0.33
Left leg pain	2.2	0.69	20	2.5	0.71	20	-1	19	0.33

The table revealed that pain was the primary outcomes that was categorized mild, moderate and severe and reported mean and SD separately for the right and left legs before and after the intervention.

Pretest mean and standard deviation of pain at experimental group in right leg 2.3 ± 0.65 and left leg 2.2 ± 0.63 . Similarly, post-test was conducted after the intervention and checked the mean and the standard deviation of the right leg was 1.3 ± 0.47 and left leg 1.3 ± 0.48 , respectively. Control group pretest pain mean and standard deviation in the right leg pain was 2.2 ± 0.67 and left leg 2.2 ± 0.69 . Further post-test was conducted without intervention that reported mean and the standard

deviation of the right leg 2.3 ± 0.73 and left leg 2.5 ± 0.71 .

The independent -t test was employed to evaluate the efficacy of elastic stocking compression. Participants in the experimental group reported lessen the calf muscle pain as compared to control group. The independent paired t-test value revealed that elastic compression stockings more benefits for reducing right leg pain 9.7 ($P < 0.05$) and left leg pain 13.7 ($P < 0.05$). The independent paired t-test revealed that there was no significant to reduce calf muscle pain of right and left leg calf muscle pain in control group state right leg -1 ($P = 0.33$), left leg calf muscle pain -1 ($P = 0.33$) respectively [Table-16].

Table-17 Calf muscle edema at experimental and control group

n=40

Variables	Pretest			Post test			Paired t test	df	P value
	Mean	SD	N	Mean	SD	N			
Experimental group									
Right leg edema	2.15	0.81	20	1.15	0.36	20	6.1	19	0.0
Left leg edema	2.2	0.79	20	1.1	0.41	20	5.1	19	0.0
Control group									
Right leg edema	2.05	0.82	20	2	0.85	20	1	19	0.32
Left leg edema	2.2	0.69	20	2.25	0.71	20	-1	19	0.33

On the other hand, calf muscle edema of control and experimental group reported separately for the right and left legs. The result of the pretest edema mean and standard deviation in the right leg was 2.15 ± 0.81 and the left leg 2.2 ± 0.79 . Post test was performed after the intervention and checked the average and standard deviation of the right leg 1.15 ± 0.36 and left leg 1.1 ± 0.41 respectively.

Similarly, the result of the pretest edema mean and standard deviation of control group in the right leg was 2.05 ± 0.82 and the left leg 2.2 ± 0.69 . Post-test was conducted after some times and checked the mean and

standard deviation of the right leg 2 ± 0.85 and left leg 2.25 ± 0.71 . The independent -t test was employed to evaluate the without intervention of right leg 6.1 ($P < 0.05$), left leg 5.1 ($P < 0.05$), respectively. Similarly, the independent paired t-test revealed that control group significant to reduce calf muscle edema of right leg 1 ($P = 0.33$), and left leg 1 ($P = 0.3$). [Table-17].

V. Evaluate the satisfaction of nursing staff regarding the effect of Elastic compression.

The intervention satisfaction was analyzed among nursing staff. The most of participants from experimental



group fully satisfied to the elastic stocking compression 18 (90%) and 2(10%) of participant had partially

satisfied. The average and standard deviation of satisfaction as follows 1.11 ± 0.3 .

Table-18 Satisfaction of survey scores on Elastic compression among nursing staffs in experimental group.

n=20

S.No	Variable	frequency	Percentage	Mean & SD
At 5 days				
1	Fully Satisfied	12	60	77.3& 10.9
2	Partially satisfied	8	40	
3	Not satisfied	0	0	
At 15 days				
1	Fully Satisfied	17	85	86.7& 8.04
2	Partially satisfied	3	15	
3	Not satisfied	0	0	
At 30 days				
1	Fully Satisfied	20	100	96.9& 4.8
2	Partially satisfied	0	0	
3	Not satisfied	0	0	

VI.Determine the association in between pre-test score with selected socio-demographic and clinical variables

Table-19: Details of demographic characteristics and association with pre-intervention pain

n=40

S.N	Variables	Categories	Mild pain	Moderate pain	Severe pain	Total	Chi-square	df	Significance
1	Age in years	35-37	4	8	4	16	7.50	6	0.27
		38-40	0	5	4	9			
		41-43	0	2	4	6			
		44-46	0	4	5	9			
2	Gender	Male	2	6	2	10	6.93	2	0.01
		Female	2	14	14	30			
3	Height in CM	150-154	2	6	2	10	5.7	6	0.48
		155-159	2	10	11	23			
		160- 164	0	2	2	4			
		165-170	0	2	0	2			
		Above 170	0	1	0	1			
4	Weight in KG	50-54	0	6	0	6	15.4	6	0.01
		55-59	2	2	2	6			
		60-64	0	10	8	18			



		65-69	2	2	6	10			
5	BMI	18.5-20	2	4	8	14	5.53	2	0.02
		20.5-22	2	8	6	16			
		22.5-25	0	8	2	10			
6	Working hours per day	9 hrs	2	4	2	8	6.42	2	0.01
		12 hrs	2	8	12	22			
		<12 hrs	0	8	2	10			
7	Area of working	In patient	4	12	14	30	6.65	2	0.04
		Out patient	0	8	2	10			

On assessment of demographic variables of nursing staffs, the majority of participants were female age 16(40%), The age of participants between 35-37 years 8(40%), 38-40 years 8(20%), 41-43 years 8 (20%) and 44-46 years old (8 (20%). The participants' height ranged from 160–164 cm (60%) and 60–64 kg (45%) weight, with a BMI of 20.5–22 cm (55%). The most of the participants working 12 hours duty per day 22(55%) were working in patients department 32(80%) and 8(20%) outpatient departments, respectively.

The association between pre-test pain scores and demographic characteristics determined using the chi-square test. There was no association between pretest pain and age and height. However, demographic variables like gender, weight, BMI, and working area were associated with pretest pain score among nursing staffs.

4. Discussion

An elastic compression is one of most emerging noninvasive procedure that may help to reduce the pain and edema. Most of the nursing staffs suffered health issues at various levels. Although, physical health always influences mental well being. There are many countries are made compulsory nurses take rest in between working hours and break duty hours, especially those are working in intensive care units.

The long working hours that decreased the blood supply to the peripheral especially the lower limbs. Further pressure gradient ensures that blood flows upward towards the heart rather than refluxing laterally into the superficial veins or downwards to the foot. However, the application of graduated compression reduces the

diameter of major veins, which increases the velocity and the volume of blood flow.(Lim & Davies, 2014)

Our study reported that elastic compression beneficial and effective intervention to reduce pain and edema among nursing staffs. Similar randomized control trial was conducted by Lee among nursing students in Korea nursing schools. The investigation revealed that notable variations in pain, swelling, and contentment weren't apparent between the two sets. Notably, discomfort in the right legs of participants using thigh-length stockings considerably diminished following a clinical training shift compared to its state before the shift ($t = -2.377$, $p = 0.041$). Both cohorts demonstrated significance. Therefore, suggesting the utilization of knee length compression stockings for nursing students during their clinical practice training could be of importance. (Lee et al., 2020).

5. Conclusion

The nurses are integral part of health care system; they provide comprehensive care which physical, mental and social support to needy people. The sound health is a essential and most important aspects. Although physical strain always reported by nursing staffs, especially those are working prolonged time. Hence elastic compression stocking needed to improve the blood circulation of lower extremities. However this study findings benefits to the readers and decision makers can implement the elastic compression stocking to the nurses who working long or standing position.

6. Recommendation

1. A comparative study could be performed using a substantial sample size.



2. The qualitative study can be conducted to evaluate the nursing staffs' perception on long working hours.
3. The comparative study can be performed to evaluate the efficacy different interventions on calf muscle pain and edema.
4. The randomized control study can be conducted to evaluate the efficacy of elastic compression stocking in male and female nursing staffs.

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