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

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Introduction

Because of the nature of nurses' work, they are put under stress caused by extreme work pressure. It has been reported that their muscles, blood vessels, and nerve tissues in the neck, shoulders, arms, hands, back, waist, legs, knees, and feet are affected or damaged because of the strain placed on their feet, body ache from holding the patients' arms, and postural changes due to working on the computer for a long time. Nurses are on their feet for extended periods, often for 12-hour shifts. They do overtime after their normal working shift of 9 to 12 hours, and it increases the probability of getting pain and edema in the lower extremities. When one awakens in the morning, it is difficult to walk or stand as it is a long way for the blood to flow through the body and back up to the heart. As one gets older, this situation becomes more prevalent. In some cases, shoes feel tighter, legs feel heavy or tired, and feet are achy with pain. These symptoms become more apparent if varicosities are present. Prolonged standing can only worsen these symptoms, also when one gets older. This is the impact on the nursing professionals who devote their lives to the service and care of the patients.

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

Prolonged standing at work has been shown to be associated with a number of potentially serious health outcomes, such as lower back and leg pain, cardiovascular problems, fatigue, discomfort, and pregnancy related health outcomes. Recent studies have been conducted examining the relationship between these health outcomes and the amount of time spent standing while on the job. literature also supports the conclusion that certain interventions are effective in reducing the hazards associated with prolonged standing. Suggested interventions include the use of floor mats, sit-stand workstations/chairs, shoes, shoe inserts and hosiery or stockings .(Waters & Dick, 2015)

Epidemiology in India

This research study aimed to evaluate the efficacy of elastic compression stockings on pain and oedema of lower extremities among nursing personnel. This study's findings will help recommend guidelines for developing the nursing sector in the healthcare industry to varying degrees. Nurses who devote their

lives to humanitarian services and care are subjected to unsafe working environments and work overload. Therefore, healthcare administrators and government policymakers should understand the problems and challenges of the nursing staff and bring strategies and plans to protect their rights thereby creating a nurse-friendly working atmosphere and timings.

A cross-sectional study conducted in tertiary hospitals in India reported that about half 50.7% of the participants reported symptoms at least in one part of their bodies, over the past 12 months. Among all the symptoms, low back pain was the highest at 45.7%, followed by neck pain at 28.5% and shoulder pain at 23.5%, whereas hip/thigh pain at 7.1% and elbow pain at 5% was the least reported, irrespective of parts of the body. Body pain was complained by 56% of nurses 55% of physiotherapists, 54% of dentists, 39% of lab technicians and 38% of physicians.(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*:* Knee-length toe exposed with 23-32 mm Hg firm pressure elastic compression stocking are made of elastic fibers or rubbers. It helps to improve blood circulation, thereby preventing swelling and reducing pain. Theses stockings will be provided to selected participants of the experimental group after evaluating their measurements.

Statement of the problem

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 a control group of nursing staff.

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

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 Edema of Lower Extremities among Nursing Staff in Selected Hospitals, Kerala.

Elastic compression: These are compression stocking garments which are knee-length and can help in the blood flow by gently applying pressure on the legs and ankles. Patients with distended veins are advised to wear the stockings to reduce the diameter of those distended veins thereby increasing the venous blood flow velocity and boosting valve effectiveness. In this research study, the knee length toe-exposed with 23-32 mm Hg firm pressure elastic compression stockings are provided for the nursing staff as part of the intervention.

8. **Pain:** An unpleasant physical experience which is a signal given by the body about the possibility of tissue damage. In light of this, the research study here is about the pain in the lower extremities experienced by nursing staff.

   Edema: Edema is a medical terminology meaning swelling. It is excessive fluid build-up. Also swelling can affect any part of the human body. In this thesis an experimental study on edema in the lower extremities in the nursing staff.

   Lower extremities: Our body from him to toes is lower extremity. It includes hip, thigh, knee, leg, ankle, foot and toes.

9. **Nursing staff:** A group of healthcare professionals who have dedicated their life journey to providing patient care with knowledge, skill and expertise. Within this research, we have nursing staff and participants as an experimental group already suffering pain and oedema on the lower extremities within the age group of 35-45 years with a working hour of 9-12 hours of clinical duty in private and government hospitals of Kerala.

   Hospital: A hospital is a residential establishment which provides short-term and long-term medical care consisting of observational, diagnostic, therapeutic, and rehabilitative services for sick or injured people. As part of the research, the study was conducted in private and government hospitals across the Kerala state with 40 nursing staff.

Assumptions

- Nursing staff will have pain and edema while working long hours of duty.
- Nursing staff will have inadequate knowledge of elastic compression stockings and their uses.
- Nursing staff will teamed up with the investigator to find out the efficacy of the stockings.

Limitations

1. The participants were selected from diverse hospitals so the research results are limited to the research framework.
2. The study was time-specific, and the results were limited and restrained.
3. Post-test was able to assess only for a single month intervention.

RESEARCH METHODOLOGY

Research Approach

The present study adopted a quantitative research approach. Researchers gathered quantitative data in the form of pain scores and edema measurements, which helped evaluate the effectiveness of elastic compression on pain and edema in the lower extremities among nursing staff.

Research Design

This study employed a true experimental pre-test post-test control group design. The investigator randomly assigned nursing staff to either the experimental or control group. The intervention group received elastic compression, while the control group did not receive any interventions

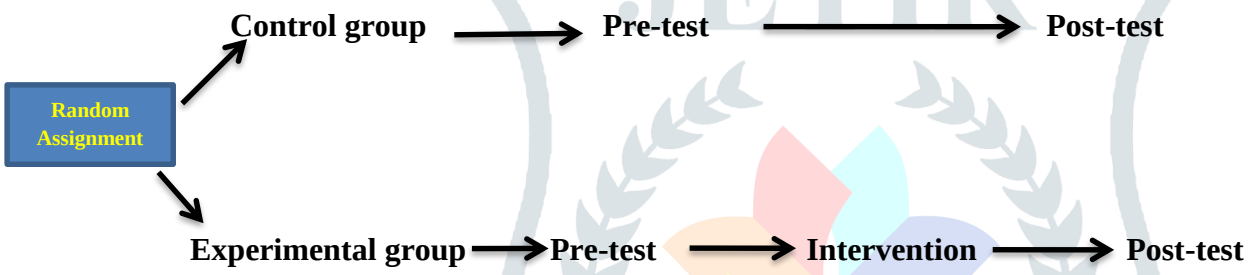

Figure:2 Schematic diagram of pre-test post-test control group design

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 applied in two parts: one for the study setting and another for the study participants.

The study settings were identified using a probability sampling technique, while participants were selected through cluster sampling. The allocation of participants was performed using a systematic random sampling technique for both the experimental and control groups.

Sample Size: 40 nursing staffs.

Criteria for sample selection

Inclusion criteria:

Participants were selected based on following criteria:

Participants in this study were selected based on the following criteria:

1. Willingness to participate in the study.
2. Nursing staff working the morning shift with 9 to 12 hours of clinical duty.
3. Participants' ages ranged from 35 to 45 years.
4. Both male and female nursing staff are experiencing pain and edema in their lower extremities.

Exclusion criteria:

Nursing staff were excluded from the study for the following reasons:

1. Presence of skin diseases, including wounds on the feet or lower extremities.
2. Any medical records regarding history of heart, liver, kidney, and vascular diseases.
3. Individuals with prior experience of wearing elastic compression stockings.
4. Skin allergies to elastic fibers or rubber.

Variables

Researchers collected quantitative data regarding pain scores and edema measurement to evaluate the effectiveness of elastic compression on pain and edema in the lower extremities of nursing staff.

A variable is defined as a characteristics, number or quantity that can take on 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 employed to assess the effectiveness of elastic compression on pain and edema of nursing staff. The following instrument was used for data collection:

Section-1: Demographic characteristics of samples

Age (years), Gender, Height (cm), Weight (kg), Body Mass Index (BMI) (Kg/m^2), Hours worked, and Area of work

Section- II: Numerical Rating Scale (NRS):

Pain will be assessed using the Numerical Rating Scale. Participants will rate their pain on a scale from 0 to 10 where 0 indicates “No pain” and 10 indicates “Severe pain”.

Section- III: Glass fiber tape measure:

A glass fiber tape measure (150 cm / 60 inches) assessed edema. Edema measurements were taken 10 minutes before applying elastic compression stockings and again 10 minutes after removing them or after the clinical duties of the experimental group. A marking was made with an indelible pen 10 cm below the tibial tuberosity before and after intervention.

Section- IV: Likert satisfaction Survey scale:

This Likert scale evaluated the nursing staff's satisfaction with the compression stockings within the experimental group. The scale consists of 10 items that address factors such as pain, edema, and the overall effects of elastic compression stockings. Participants used a 5-point Likert-type scale, where scores ranged from 1 to 5, corresponding to: 1 -Strongly Disagree, 2 -Disagree, 3 -Not Sure, 4 -Agree, and 5 -Strongly Agree. The researcher analyzed the satisfaction levels of the nursing staff with the elastic compression stockings based on their scores.

Section- V: Description of Elastic compression stocking:

The elastic compression stockings are knee-length with an open toe design, providing firm pressure ranging from 23 to 32 mm Hg. They are constructed using elastic fibers or rubber. This intervention will be applied to each selected participant in the experimental group after measurements have been taken.

Score Interpretation of the Data Collection Instrument

Pain: The pain score categorizes pain in to four levels: no pain, mild pain, moderate pain and severe pain.

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 categorizes edema in to three levels: no edema, mild edema and severe edema.

No edema : Less than 35cm

Mild edema : 36-40 cm

Severe edema : More than 40 cm

Pain Measurement:

Pretest pain levels were measured 10 minutes before the nursing staff wore elastic compression stockings (before donning). Daily pain assessments were conducted for 30 days, both before and after the nursing staff completed their duties. The average pretest and post-test pain levels were calculated for the experimental group. Similarly, the control group was assessed in the same manner as the experimental group but without any intervention.

Nursing staff satisfaction with Intervention:

The satisfaction of nursing staff regarding the intervention was assessed using a Likert scale. The score categories were as follows:

Not Satisfied : Less than 50%

Partially Satisfied : 51-75%

Fully Satisfied : More than 75%

Description of Intervention

The elastic compression stockings used in this study were manufactured by Tynor Orthotics Pvt. Ltd India ISO13485. Nursing staff were required to wear these elastic compression stockings for 9 to 12 hours each day before starting their shifts, and they were removed after completing their clinical duties. These latex-free medical compression stockings extend below the knee and provide precise, graduated compression. A knee-length, toe-exposed elastic compression stocking, designed to exert firm pressure of 23-32 mm Hg, was constructed using elastic fibers or rubber. This intervention was applied to participants in the experimental group after initial measurements were taken.

Content validity

A standardized modified pain scale was prepared alongside the study's objectives, and a criterion rating scale and blueprint were submitted to six experts for content validity. The panel included three professionals from medical-surgical nursing, one from the surgical department, one from emergency medicine, and one from the field of statistics. The experts were asked to provide their opinions on the adequacy, relevance, and appropriateness of the content.

Ethical consideration

The study was approved by the Ethical Research & Review Committee of Desh Bhagat University in Mandi Gohingarh, Punjab. After obtaining ethical clearance, permission for the study was granted by the hospital management and the ethical committee. Participants were selected based on the study criteria and provided their informed consent after receiving detailed explanations about the research process, study duration, and necessary precautions. Elastic compression stockings were provided to the participants in the experimental group only after they had given their consent.

Pilot Study

A pilot study was conducted to assess the reliability and feasibility of the elastic compression stockings and to gauge participant satisfaction with the intervention. This pilot study involved 10% of the total sample size and was carried out with prior clearance and permission from the relevant department after ethical approval.

Reliability

Reliability of the Pain Scale

The reliability of the pain scale was established by administering the tool to 20 nursing staff working in a government hospital in Kerala, India. The tool was administered after obtaining administrative permission and individual consent. The reliability coefficient of the tool was calculated using the split-half method with Pearson's product moment correlation equation. The obtained "r" value was substituted into the Spearman-Brown prophecy formula, resulting in a reliability coefficient of 0.751, indicating that the tool is reliable.

Reliability of the Glass fiber tape measure

Similarly, the reliability of the Glass Fiber Tape Measure for assessing edema was evaluated by administering the tool to 20 nursing staff in the same government hospital in Kerala, India. After obtaining administrative permission and individual consent, the reliability coefficient was calculated using the split-half method and Pearson's product moment correlation equation. The obtained "r" value was substituted into the Spearman-Brown prophecy formula, yielding a reliability coefficient of 0.784, which confirms the tool's reliability.

Reliability of the Likert's scale

The reliability of the Likert scale was also assessed with the same group of 20 nursing staff in the government hospital in Kerala, India. Following the same procedures of obtaining administrative permission and individual consent, the reliability coefficient was computed using the split-half method and Pearson's product moment correlation equation. The resulting "r" value was substituted into the Spearman-Brown prophecy formula, leading to a reliability coefficient of 0.766, demonstrating that the tool is reliable.

Feasibility

The pain and edema measuring scale was found to be clear, with all items in the tool easily understood by the participants without any ambiguity. The pilot study results indicated that the settings, samples, and tools were feasible enough for conducting a research study. Therefore, the tool was deemed feasible and practical for the study.

Data collection Procedure

Data collection for the pilot study commenced after approval from the ethical committee and the concerned hospital authority, as well as informed consent from the participants. Before data collection, the researchers explained the study's purpose, objectives, and ensured data confidentiality and anonymity. The target population was identified, and written consent was obtained from each participant. Participants had the right to withdraw from the study at any time, and the researchers ensured that the information collected would not be disclosed to any 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 tests for participant selection were conducted for the nursing staff according to specific inclusion and exclusion criteria. Only those who voluntarily signed the consent form and met the criteria were included in the study group. The pilot study was conducted from September 1, 2022, to February 28, 2023, and assigned participants in to experimental and control groups.

The first tool used collected basic information about the participants. The second tool employed for pain assessment was the Numeric Rating Scale (NRS), which measured pain in the lower extremities 10 minutes before donning elastic compression stockings and 10 minutes after doffing them for the experimental group. The control group was assessed without elastic compression stockings before and after their clinical duty.

Similarly, edema was marked with an indelible pen at a point 10 cm below the tibial tuberosity and measured in centimeters using a glass fiber tape measure (150 cm/60 inches). Edema was measured on the lower extremities 10 minutes before donning elastic compression stockings and 10 minutes after doffing them for the experimental group while the control group was assessed without the stockings before and after their clinical duty.

After 10 minutes of pretest assessment, elastic compression was applied to the nursing staff in the experimental group. The control group did not receive any intervention and continued with their routine activities. A post-test was conducted 10 minutes after the removal of elastic compression stockings. In the intervention group, pain and edema were measured before and after the application of elastic compression, while the control group measured pain and edema before and after the assessment without any intervention.

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:** Pian 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 measurements of pain and edema were recorded by nursing staffs over 30 days in both groups. Satisfaction with the elastic compression stockings was assessed at intervals 5 days, 15 days and 30 days using 5-point Likert satisfaction Likert scale.

Table: 2

Plan for Data analysis

The collected data was summarized and coded in a Microsoft Excel sheet. The data sheet was transferred to SPSS software version 16. Descriptive statistics were used to calculate frequencies, percentages, mean and standard deviations. For inferential statistics, chi-square test and independent t-test were utilized to assess the associations and effectiveness of elastic compression.

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
Age in years	35-37	16	40
	38-40	9	22.5
	41-43	6	15
	44-46	9	22.5

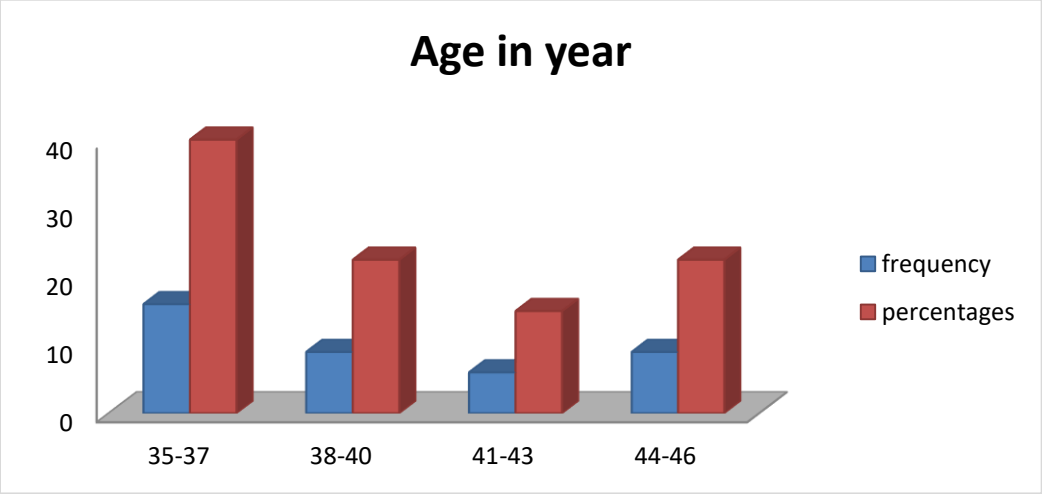

Figure: 3 Describe the participants age in frequency and percentages n=40

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 years6(15%), and 44-46 years 9(22.5%), respectively.

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

	Variable	frequency	percentages
Gender	Male	10	25
	Female	30	75

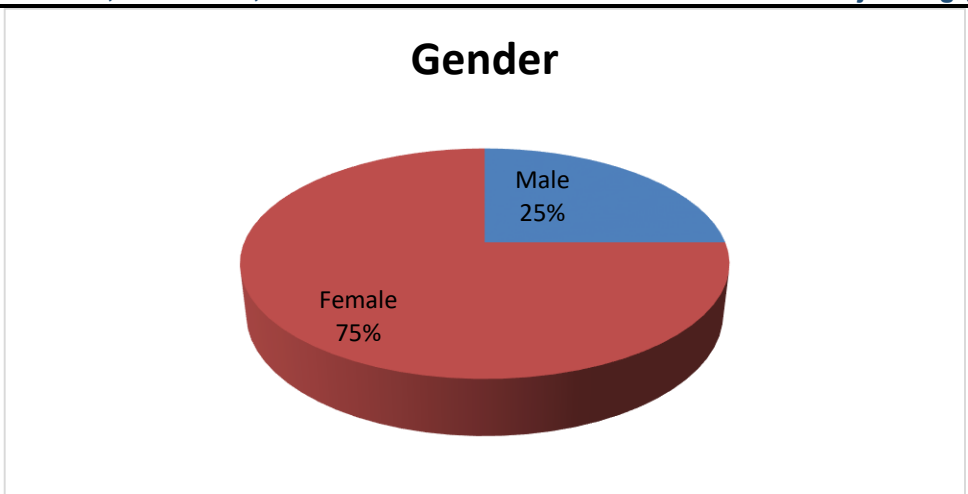

Figure-4: Describe the gender in frequency and percentages n=40

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

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

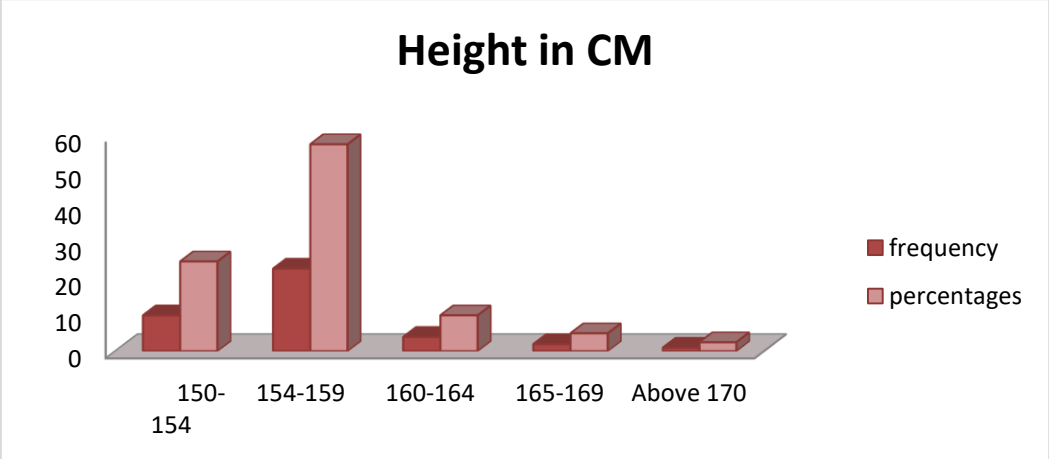

Figure-5 describe Height in centimeter in frequency and percentage n=40

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%).165-160 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

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

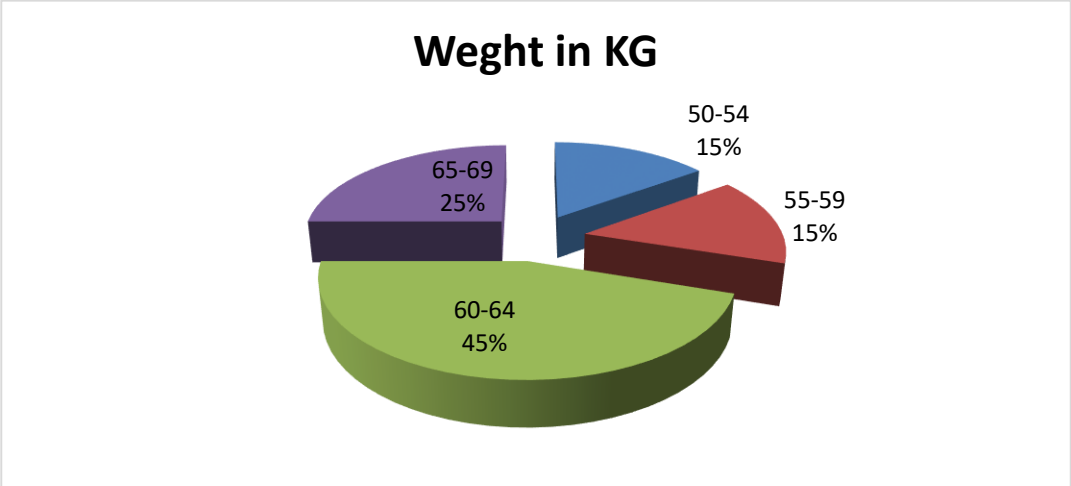

Figure-6 describe weight in kilo gram in frequency and percentage

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

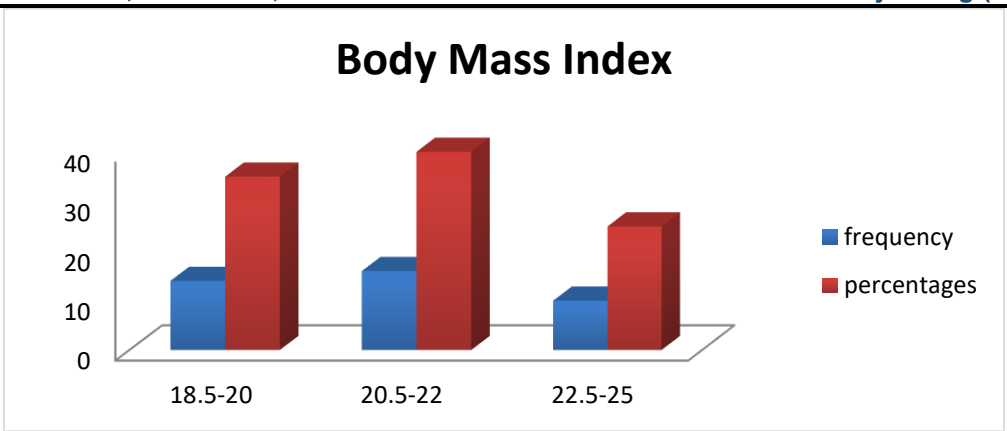

Figure:7- describe body mass index (BMI) in frequency and percentage n=40

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

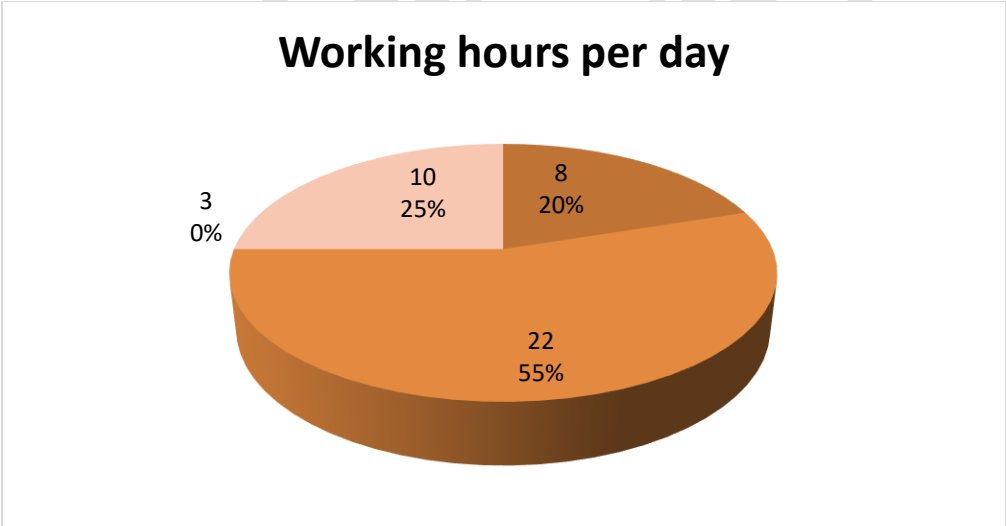

Figure-8 describe working hours per day in frequency and percentage n=40

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

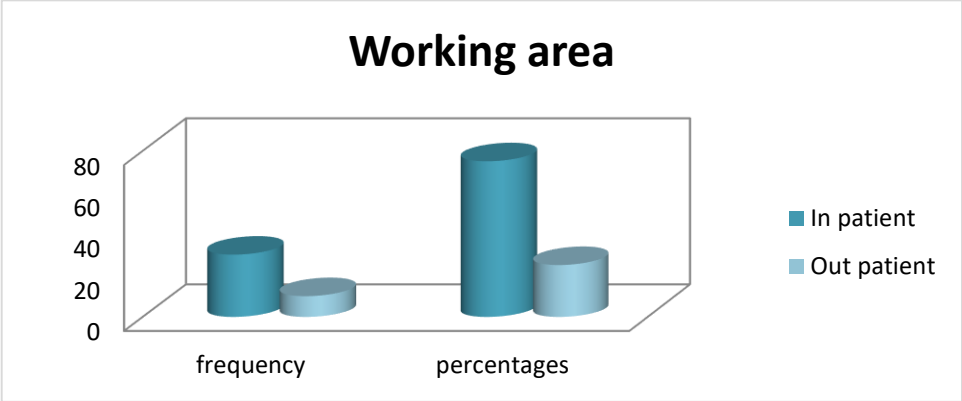

Figure:9- describe working area of nursing staffs in frequency and percentage n=40

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

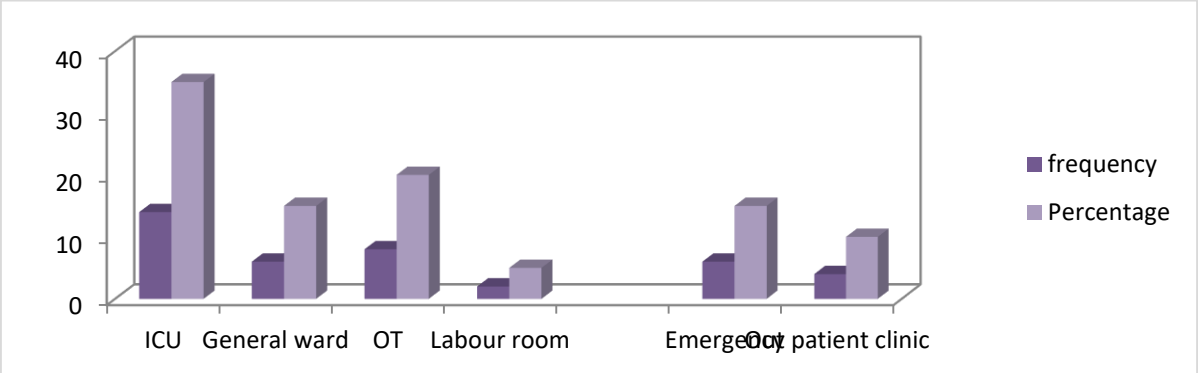

Figure:10 describe working area of nursing staff nurses in frequency and percentage

In Table& figure 10 summarized the working area of nursing staffs. The majority of the participants inpatient department 30(75%) which included ICU 14(35%) Operation theater (OT) 8(20%) and general ward6(15%). Similarly, outpatient 10(25%), of these most of the nursing staffs in emergency 6(15%) and outpatient department 4(10%).

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.

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)

Conclusion

The nurses are essential components of the healthcare system. They provide integrated healthcare which comprises physical, mental and social support to patients and their family members. An important aspect of health care professionals is having sound physical and mental health. Only then the nurses can reach their full potential. Almost all nursing staff complain about the physical strain due to long working hours. So it is advised to recommend the use of compression stockings for the nurses to improve the blood flow to the lower extremities. However, this study and analysis are beneficial for the nursing community and the decision-makers in making proposals and suggestions for the welfare of the nurses as such.

Recommendation

1. A similar study should be conducted on a large sampling.

2. A qualitative study can be conducted to evaluate the nursing staff's observations, experience and viewpoints regarding prolonged working hours.

3. A comparative study should be carried out to evaluate the effectiveness of diverse interventions on calf muscle pain and oedema.

4. A randomized control study must be conducted to evaluate the efficiency of elastic compression stockings in male and female nursing staff.

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