Original Article

A Study to Assess the Effect of Intradialytic Modified Trendelenburg Position on Prevention of Hypotension among Patient Undergoing Hemodialysis in Selected Hospitals of PCMC, Pune

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Abstract

Aim: This study aims to assess the effect of intradialytic modified trendelenburg position on prevention of hypotension among patient undergoing hemodialysis in selected hospitals of PCMC, Pune.

Objectives: The objectives of this study were as follows: (1) To assess hypotension in control group and experimental group, (2) to assess the effect of intradialytic modified trendelenburg position on prevention of hypotension in experimental group, (3) to compare the effect of intradialytic modified trendelenburg position on prevention of hypotension in two groups, and (4) to correlate the effect of position with selected demographic variables.

Materials and Methods: The research design used was quasi-experimental two groups pre-test post-test design; non-probability convenience sampling method was used. There were 60 people in a sample both in control and experimental group. Each of them was assessed for seven parameters on signs and symptoms of hypotension. Their information about seven parameters was recorded. The framework of the present study is based on Orem's self-care model includes action of both nurses and patients.

Results: Analysis of the first section revealed that the in experimental group majority 14 (46.7%) of the samples were with age above 48 years. Majority 15 (50%) of them were higher secondary. Majority 23 (76.7%) of them were males. Majority 18 (60%) of them were of height 170–190 cm. Majority 11 (36.7%) of them were with weight 70–80 kg. Majority 28 (93.3%) of them had body mass index (BMI) in the range of 15–20. Moreover, in control group, majority 13 (43.3%) of the samples were with age above 48 years. Majority 12 (40%) of them were higher secondary. Majority 22 (73.3%) of them were males. Majority 18 (60%) of them were of height 170–190 cm. Majority 11 (36.7%) of them were with weight 70–80 kg. Majority 25 (83.3%) of them had BMI in the range of 15–20.

Conclusion: It can be concluded that the intradialytic modified trendelenburg position is proved to be effective in improving scores.

Keywords: Assess, effect, hemodialysis, trendelenburg position

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Introduction

Kidneys are cardinal organs of our body and are integral to maintain the body's homeostasis. Dysfunction of kidney is very common nowadays and may occur at any age with varying degrees. Kidney problems are acute and chronic kidney failure

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from Stage 1–5 and end-stage renal failure. Hemodialysis is the process, by which the crystalline substances will pass through a semipermeable membrane, usually employed to remove waste and toxic products from the blood in cases of renal insufficiency. Hemodialysis was first developed by Thomas Graham in 1884 and Dr. William Koff is considered as the father of dialysis.[1]

Hemodialysis is a procedure to remove waste products from the blood and to correct electrolyte imbalances. This is accomplished using a machine and a dialyzer. Hemodialysis can be an outpatient or inpatient therapy. Routine hemodialysis is conducted in a dialysis outpatient facility, either a purpose-built room in a hospital or a dedicated, standalone clinic. Less frequently hemodialysis is done at home. The principle of hemodialysis is the same as other methods of dialysis; it involves diffusion of solutes across a semipermeable membrane. It, where the dialysate, is moving in the opposite direction to blood flow in the extracorporeal circuit. Cou utilizes counter current flownter-current flow maintaines the concentration gradient across the membrane at a maximum and increases the efficiency of the dialysis. Fluid removal, that is, ultrafiltration is achieved by altering the hydrostatic pressure of the dialysate compartment, causing free water and some dissolved solutes to move across the membrane along a created pressure gradient. Hemodialysis often involves fluid removal that is through ultrafiltration, as most patients with renal failure pass little or no urine. Side effects are common because of removing so much fluid or removing fluid too rapidly includes low blood pressure (BP), fatigue, chest pains, leg cramps, nausea, and headaches.[2]

A decrease in BP is the most frequent complication reported during hemodialysis. When fluid is removed during hemodialysis, the osmotic pressure is increased and this prompts refilling from the interstitial space. The interstitial space is then refilled by fluid from the intracellular space. Excessive ultrafiltration with inadequate vascular refilling plays a major role in dialysis-induced hypotension. The immediate treatment to hypotension is to discontinue dialysis and place the patient in a trendelenburg position. This will increase cardiac filling and may increase the BP promptly.[3]

Need for the study

Kidney regulates the extracellular fluid volume, osmolarity, and pH of blood. Without dialysis, salts and other waste products will accumulate in the blood, poison the body, and damage other organs.[4]

A session of hemodialysis may typically remove 2–5 kg of fluid from patient. During dialysis, patients have low BP and lose consciousness. Often, this is temporary and passes after the head is placed down that is trendelenburg position for a short time.[5,7]

Heart rate, BP, cardiac output/cardiac index (CO/CI). The survival experience of 39 patients receiving long-term regular hemodialysis in 1960 was studied with reference to mortality and morbidity from arteriosclerosis. Overall, mortality was 56.4% at the end of 13 years follow-up period, and 14–23 deaths could be attributed to arteriosclerotic cardiovascular complication.[6]

Objectives

The objectives of this study are as follows:

1. To assess hypotension in control group and experimental group.
2. To assess the effect of intradialytic modified trendelenburg position on prevention of hypotension in experimental group.
3. To compare the effect of intradialytic modified trendelenburg position on prevention of hypotension in two groups.
4. To correlate the effect of position with selected demographic variables.

Hypothesis

- H_0: There will be no significant effect of intradialytic modified trendelenburg position on prevention of hypotension among patient undergoing hemodialysis.
- H_1: There will be significant effect of intradialytic modified trendelenburg position on prevention of hypotension among patient undergoing hemodialysis.

Population

Population refers to the entire aggregate of individuals or objects having common characteristics**.** In the present study, the population consists of clients undergoing hemodialysis in selected hospitals of PCMC.

Sample and sample size

Sample may be defined as representative unit of a target population, which is to be worked on by researchers during their study. Sampling is the process of selecting a representative segment of population under study.

In the present study, the sample consisted of 60 end-stage renal disease client undergoing hemodialysis (30 in each control and experimental group).

Setting of the study

"Setting" refers to the area where the study is conducted. Qualitative researchers deliberately strive to study their phenomenon in a variety of natural context (Polit, 1977).

The study was conducted in Dr. D. Y. Patil, Lokmanya, and Birla Hospital. The rationale for selection of these areas was their geographical proximity, economy in terms of time, easy transportation facilities, administrative approval, cooperation, and fulfilled the criteria of sampling technique which helped in maintaining the homogeneity. The people access transport facilities such as PCMT buses, auto rickshaws, and six seaters as there is a tar road passing by.

Sampling technique

In this study, sample is selected by non-probability purposive sampling technique. Because in a purposive sampling

investigator tries to create a representative sample without sampling at random. A particular group of people is targeted by purposive sampling.The desired population for the study is rare or very difficult to locate and recruit for a study. Hence, in this study, investigator targeted on patient undergoing hemodialysis.

Research approach

Research approach is a systemic, objective method of discovery with empirical evidence and rigorous control. The research approach spells out the basic strategies that the researcher adopts to develop information that is accurate and interpretable. The control is successfully brought about by holding conditions constant and varying only the phenomenon under study.

The research approach adopted for the present study was evaluative approach as the study aimed at the effect of intradialytic modified trendelenburg position on prevention of hypotension among patient undergoing hemodialysis.

Research design

Research designs is a blueprint to conduct a research study, which involves the description of research approach, study setting, sampling size, sampling technique, tools and method of data collection, and analysis to answer specific research questions. To meet the aims and objectives of the study, researchers must select the most appropriate design.[8]

A researcher's overall plan for obtaining answers to the research questions or for testing the research hypothesis was referred to as the research design. The research design selected for the study was quasi-experimental two groups' pre-test and post-test design.[9]

A research design incorporates the most important methodological decisions that a researcher makes in conducting a research study.[9]

Ethical consideration

After obtaining permission from the Research Committee of Ethical Committee, prior permission was obtained from the nursing superintendents of the Dr. D. Y. Patil, Lokmanya, and Birla hospital, and consent was taken from each participant who had participated in the study.

Criteria for sample selection

Inclusion criteria

In this study, the inclusion criteria are as follows:

1. This study included the patients undergoing hemodialysis in selected hospital of PCMC.
2. This study included patients who will be willing to participate in the research.
3. This study included the patients who understand Hindi, Marathi, or English.

Exclusion criteria

This study excluded the patients who are terminally ill.

Data collection technique and instrument

The phenomena in which a researcher was interested must ultimately be translated into data that can be analyzed. The task of defining the research variable and selecting or developing appropriate methods for collecting data was among the most challenging work in hand of a researcher. With high-quality data collection methods, the accuracy and robustness of the conclusions were always subject to challenge. Data collection is the most important and crucial aspect of any research, which provides answers to the questions under study. Data collection relies on instruments.

The instruments selected in a research should be as far as possible the vehicle that would best obtain data for drawing conclusion pertinent to the study.

The present study aimed at assessing the effect of intradialytic modified trendelenburg position on prevention of hypotension among patient undergoing hemodialysis. Thus, a checklist was prepared and used for the data collection.

Development of tool

The tool was developed after the review of literature on relevant topic, discussion with experts and respected guide.

Tool for this present study was checklist which includes the typical signs and symptoms of hypotension and vital signs.

Description of the tool

The tools used for the data collection in this study were as follows:

- Tool 1: The demographic variables consisted of six items such as age, education, gender, height, weight, and body mass index (BMI).
- Tool 2: In this checklist, vital sign which includes temperature, pulse, respiration, and B.P., and typical signs of hypotension which include dizziness or lightheadedness, fainting, blurred vision, nausea, cold skin, fatigue, and thirst.

Results

Organization of the data

Presentation of the data was organized in five parts.

- Section I - Description of samples in experimental and control group according to demographic characteristics.
- Section II - Analysis of data related to hypotension before and after intradialytic modified trendelenburg position.
- Section III - Analysis of data related to the effect of intradialytic modified trendelenburg position on prevention of hypotension in experimental group.
- Section IV - An analysis of data to compare the effect of intradialytic modified trendelenburg position on prevention of hypotension in two groups (experimental and group)
- Section V - An analysis of data to assess effect of position and selected demographic variables.

Section I

This section deals with the analysis of the demographic data of selected variables such as age, educational status, gender, height, weight, and BMI.

Table 1 shows that 14 (46.7%) of the samples were with age above 48 years, 7 (23.3%) of them were from age group 39–48 years, 8 (26.7%) of them were from age group 29–38 years, and remaining 1 (3.3%) of them were from age group 18–28 years. 15 (50%) of them were higher secondary, 13 (43.3%) of them were graduates, and remaining 2 (6.7%) of them were postgraduates. 23 (76.7%) of them were male and remaining 7 (23.3%) of them were female. 18 (60%) of them were of height 170–190 cm and remaining 12 (40%) of them were with height 150–170 cm. 11 (36.7%) of them were with weight 70–80 kg, 10 (33.3%) of them were having weight 60–70 kg, and remaining 9 (30%) of them had weight below 60 kg. 28 (93.3%) of them had BMI in the range of 15–20, 1 (3.3%) of them were having BMI below 15, and remaining 1 (3.3%) of them had BMI in the range of 20–25.

Table 2 shows the description of samples in control group according to demographic characteristics (age, education status, gender, height, weight, and BMI) by frequency and percentage.

Table 1: Description of samples in experimental group according to demographic personal/characteristics by freque-ncy and percentage (n=30)

Demographic variable	Category (years)	Frequency (%)
Age	18–28	1 (3.3)
	29–38	8 (26.7)
	39–48	7 (23.3)
	49 years and above	14 (46.7)
Education status	Higher secondary	15 (50.0)
	Graduation	13 (43.3)
	Postgraduation	2 (6.7)
Gender	Male	23 (76.7)
	Female	7 (23.3)
Height (cm)	150–170	12 (40.0)
	170–190	18 (60.0)
Weight (kg)	Below 60	9 (30.0)
	60–70	10 (33.3)
	70–80	11 (36.7)
BMI	Below 15	1 (3.3)
	15–20	28 (93.3)
	20–25	1 (3.3)

Table 2: Description of samples in control group according to demographic characteristics by frequency and percentage (n=30)

Demographic variable	Category	Frequency (%)
Age	18–28 years	2 (6.7)
	29–38 years	4 (13.3)
	39–48 years	11 (36.7)
	49 years and above	13 (43.3)
Education status	Secondary	2 (6.7)
	Higher secondary	12 (40.0)
	Graduation	15 (50.0)
	Postgraduation	1 (3.3)
Gender	Male	22 (73.3)
	Female	8 (26.7)
Height (cm)	150–170	12 (40.0)
	170–190	18 (60.0)
Weight (kg)	Below 60	6 (20.0)
	60–70	12 (40.0)
	70–80	11 (36.7)
	Above 80	1 (3.3)
BMI	Below 15	2 (6.7)
	15–20	25 (83.3)
	20–25	3 (10.0)

Section II

Analysis of data related to hypotension before and after intradialytic modified trendelenburg position.

Table 3 shows that all 100% of patients undergoing hemodialysis before intradialytic modified trendelenburg position were having good score, whereas after intradialytic modified trendelenburg position all 100% of patients undergoing hemodialysis were having good score,[12-14] which indicates that the modified trendelenburg position was effective.

The hypotension scores of the samples before and after intradialytic modified trendelenburg position are good[12-14] of the experimental group, which indicates that the intradialytic modified trendelenburg position is effective in improving hypotension of patient undergoing hemodialysis.

The scores of the samples worsen for the control group, which indicates that without intradialytic modified trendelenburg position, scores do not improve among patients undergoing hemodialysis.

Section III

Analysis of data related to the effect of intradialytic modified trendelenburg position on prevention of hypotension in experimental group [Tables 4-9].

Researcher applied paired *t*-test to check difference between average score before and after intradialytic modified trendelenburg position. $P < 0.05$ ($P = 0.000$) difference in scores is statistically significant. Researcher concluded at 5% level of significance and 29° of freedom that patient undergoing hemodialysis who has received intradialytic modified trendelenburg position had higher scores than that before. Sample who have received intradialytic modified trendelenburg position had higher scores than that before. Therefore, null hypothesis is rejected and accepted research hypothesis. It can be concluded that the intradialytic modified trendelenburg position is effective in improving signs and symptoms of hypotension.

Researcher applied paired t-test to compare difference between average score on two administrations to control group. $P < 0.05$ ($P = 0.000$) difference in scores is statistically significant. Researcher concluded at 5% level of significance and 29° of freedom that patients undergoing hemodialysis who did not receive intradialytic modified trendelenburg position had lower scores as that before. Therefore, null hypothesis is rejected and research hypothesis is accepted. It can be concluded that the scores lower significantly in the absence of intradialytic modified trendelenburg position.

Section IV

Researcher applied two-sample *t*-test to compare the effect of intradialytic modified trendelenburg position on prevention of

Table 3: Distribution of signs and symptoms of hypotension in frequency and percentage obtained for the experimental group (n=30)

Days	Grade	Frequency (%)	
		Before	After
1	Poor	0 (0.0)	0 (0.0)
	Average	0 (0.0)	0 (0.0)
	Good	30 (100.0)	30 (100.0)
	Total	30 (100.0)	30 (100.0)
2	Poor	0 (0.0)	0 (0.0)
	Average	0 (0.0)	0 (0.0)
	Good	30 (100.0)	30 (100.0)
	Total	30 (100.0)	30 (100.0)
3	Poor	0 (0.0)	0 (0.0)
	Average	0 (0.0)	0 (0.0)
	Good	30 (100.0)	30 (100.0)
	Total	30 (100.0)	30 (100.0)

Table 4: Mean and standard deviation of seven parameters on signs and symptoms of hypotension in experimental group

Days	Before/after	Mean±SD	T	Df	*P*
1	Before	14.000±0.000	−4.958	29	0.0000
	After	13.433±0.626			
2	Before	14.000±0.000	−1.682	29	0.0516
	After	13.867±0.434			
3	Before	14.000±0.000	−2.693	29	0.0058
	After	13.800±0.407			

SD: Standard deviation

Table 5: Mean and standard deviation of seven parameters on signs and symptoms of hypotension in control group

Days	B/A	Mean±SD	T	Df	*P*
1	Before	14.000±0.000	−10.770	29	0.0000
	After	12.400±0.814			
2	Before	14.000±0.000	−6.679	29	0.0000
	After	12.667±1.093			
3	Before	14.000±0.000	−5.869	29	0.0000
	After	12.967±0.964			

SD: Standard deviation

Table 6: Analysis of data to compare effect of intradialytic modified trendelenburg position on prevention of hypotension in two groups (experimental and group)

Days	Group	Mean±SD	T	Df	*P*
1	Exp.	0.567±0.626	5.513	29	0.0000
	Control	1.600±0.814			
2	Exp.	0.133±0.434	5.587	29	0.0000
	Control	1.333±1.093			
3	Exp.	0.200±0.407	4.361	29	0.0001
	Control	1.033±0.964			

hypotension in two groups with that of control group. $P < 0.05$ ($P = 0.000$) difference in average scores of experimental and control groups is statistically significant. Researcher concluded at 5% level of significance and 29° of freedom that the patient undergoing hemodialysis in experimental group who has received intradialytic modified trendelenburg position had higher effect on score. Hence, we reject null hypothesis

Table 7: Following table gives the summary of ANOVA results

Demographic variable	F	*P*	Remarks
Age	1	0.41	No effect
Education status	0.77	0.47	No effect
Gender	2.31	0.14	No effect
Height (cm)	1.68	0.21	No effect
Weight (kg)	5.51	0.01	Significant
BMI	0.25	0.78	No effect

Table 8: Percentage of seven signs and symptoms in experimental group

Dizziness	Day 1 (%)		Day 2 (%)		Day 3 (%)	
	Before	After	Before	After	Before	After
Score						
1	13.6	0.0	6.7	0.0	13.3	0.0
2	87.7	100	93.3	100	86.7	100
Fainting						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	100	100	100	100	100	100
Blurred vision						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	100	100	100	100	100	100
Nausea						
1	30.0	0.0	0.0	0.0	3.3	0.0
2	70.0	100	100	100	96.7	100
Pale skin						
1	10.0	0.0	3.3	0.0	0.0	0.0
2	90.0	100	96.7	100	100	100
Fatigue						
1	0.0	0.0	0.0	0.0	3.3	0.0
2	100	100	100	100	96.7	100
Thirst						
1	0.0	0.0	0.0	0.0	3.3	0.0
2	100	100	100	100	96.7	100

and accept research hypothesis. It can be concluded that the intradialytic modified trendelenburg is proved to be effective in improving.

Section V

An analysis of data assesses the effect of position and selected demographic variables. The association between the effect of position and demographic variables was assessed using ANOVA.

Only weight is the demographic variable which was found to have statistically significant association with the effect of trendelenburg position.

Discussion

The discussion of the present study was based on the research findings. The findings in this study have been discussed with reference to the objectives and hypothesis stated in Chapter- I and with findings of other studies. Analysis of the first section revealed that in experimental group majority 14 (46.7%) of the samples were with age above 48 years. Majority 15 (50%) of them were higher secondary. Majority 23 (76.7%) of them were male. Majority 18 (60%) of them were of height 170–190 cm. Majority 11 (36.7%) of them were with weight 70–80 kg.

Table 9: Percentage of seven signs and symptoms in control group

Dizziness	Day 1 (%)		Day 2 (%)		Day 3 (%)	
	Before	After	Before	After	Before	After
Score						
1	53.3	0.0	36.7	0.0	43.3	0.0
2	46.7	100	63.3	100	56.7	100
Fainting						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	100	100	100	100	100	100
Blurred vision						
1	0.0	0.0	0.0	0.0	0.0	0.0
2	100	100	100	100	100	100
Nausea						
1	53.3	0.0	43.3	0.0	33.3	0.0
2	46.7	100	56.7	100	66.7	100
Pale skin						
1	46.7	0.0	30.0	0.0	6.7	0.0
2	53.3	100	70.0	100	93.3	100
Fatigue						
1	0.0	0.0	3.3	0.0	3.3	0.0
2	100	100	96.7	100	96.7	100
Thirst						
1	6.7	0.0	20.0	0.0	16.7	0.0
2	93.3	100	80.0	100	83.3	100

Majority 28 (93.3%) of them had BMI in the range of 15–20. Moreover, in control group, majority 13 (43.3%) of the samples were with age above 48 years. Majority 12 (40%) of them were higher secondary. Majority 22 (73.3%) of them were male. Majority 18 (60%) of them were of height 170–190 cm. Majority 11 (36.7%) of them were with weight 70–80 kg. Majority 25 (83.3%) of them had BMI in the range of 15–20.

There were 60 people in a sample both in control and experimental group. Each of them was assessed for seven parameters on signs and symptoms of hypotension. Their information about seven parameters was recorded.

Researcher applied paired *t*-test to check difference between average score before and after intradialytic modified trendelenburg position. $P < 0.05$ ($P = 0.000$) difference in scores is statistically significant. Researcher concluded at 5% level of significance and 29° of freedom that the above data give sufficient evidence to conclude that patient undergoing hemodialysis who has received intradialytic modified trendelenburg position had higher scores than that before. Hence, we reject null hypothesis and accept research hypothesis. It can be concluded that the intradialytic modified trendelenburg position is proved to be effective in improving scores.

The recent study was conducted by Jimmy Wales, 2009. Hemodialysis was underway. The pump and a timer were started. Periodically (every half hour, nominally), BP was taken. As a practical matter, fluid was also removed during dialysis. Most dialysis patients are on moderate-to-severe fluid restrictive diets (in addition to other dietary restrictions) since kidney failure usually includes an inability to properly regulate fluid levels in the body. A session of hemodialysis may typically remove 2–5 kg (5–10 pounds) of fluid from the patient. The amount of fluid to be removed was set by the dialysis nurse according to the patient's "estimated dry weight." During dialysis, occasionally, patients have low BP and lose consciousness. Often, this is temporary and passes after the head is placed down (trendelenburg position) for a short time.[5]

Ostrow, in which little evidence indicates that changing a patient's body position to the head lower than feet, conducted the study or the modified trendelenburg (only the legs elevated) position significantly improves BP or low CO. This intervention is still used and is the first measure implemented for management of hypotension. The purpose of this research was to assess the degree of use of trendelenburg positions by nurses, the clinical uses of these positions, and the sources of knowledge and beliefs of nurses about the efficacy of the positions. A survey was mailed to 1000 nurses whose names were randomly selected from the membership list of the American Association of Critical-Care Nurses. The return rate was 49.4%. 99% of the respondents had used the trendelenburg position, and 80% had used the modified trendelenburg position, mostly for the treatment of hypotension. Most used this intervention as an independent nursing action, and most learned about these positions from their nursing education, nurse colleagues, supervisors, and physicians. The trendelenburg position was used for many non-emergent reasons; the most frequent use was for insertion of central IV catheters. Although 80% of the respondents believed that the use of the trendelenburg position increases hypotension almost always or sometimes, many respondents recognized several adverse effects associated with the use of this position.[10] The results provide evidence that tradition-based therapy still underlies some interventions used in the care of critically ill patients and that some nurses may be relying on an outdated knowledge base that is not supported by the current literature.

Conclusion

This study concluded that the intradialytic modified trendelenburg position is proved effective in improving scores.

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