

Effect of Nursing Intervention on Prevention of Intradialytic Hypotension among Hemodialysis Patients

Amal A. El-Sheikh¹, Om-Mohamed A. Abed elatar¹

¹Department of Medical Surgical Nursing, Faculty of Nursing, Menoufia University, Shebin El-Kom, Egypt

Abstract: Intradialytic hypotension is a common complication of hemodialysis and is associated with increased patient death and cardiovascular problems. The aim of this study was to identify the effect of nursing intervention on prevention of intradialytic hypotension among hemodialysis patients. A quasi experimental research design was utilized to achieve the aim of this study. The study was conducted at hemodialysis unit in Shebien El Koom Teaching Hospital, Menoufia governorate. Purposive sample of all patients demonstrating intradialytic hypotension in selected setting, 80 patients. Two tools were utilized for data collection: Structured interviewing questionnaire and physiological measurement. The results revealed that 75% of patients had hypotension before intervention while after intervention 17.5% of them had hypotension. There were highly statistical significant difference between pre intervention and post intervention regarding hypotension and hypotension symptoms. The current study concluded that nursing intervention during hemodialysis decreases the occurrence of intradialytic hypotension and hypotension symptoms. These symptoms include nausea, headache, muscular cramp and vomiting. Comprehensive nursing intervention during hemodialysis must be carried out for the patients to decrease intradialytic hypotension and hypotension symptoms.

Keywords: Hemodialysis, Intradialytic Hypotension, Nursing Intervention.

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I. Introduction

End-stage renal disease leads to permanent renal failure for which patients necessitate management with dialysis or kidney transplantation to stay a live^[1]. Hemodialysis is one of most important mode of renal replacement therapy^[2].

“According to the united states renal data system annual report 2011 the prevalence of end stage renal disease varies worldwide. It can be high as in Taiwan 2447 patients per million populations (pmp), Japan 2205 pmp, and United States 1811 pmp and it can be low as in Philippines 110 pmp, Bangladesh 140 pmp and Russia 173 pmp^[3]. In developing countries like Egypt, there is an increase in prevalence of end stage renal disease from 225 pmp in 1996 to 483 pmp in 2004^[4]. “ in Egypt estimated annual incidence of end stage renal disease is around 74 per million, and the total prevalence of patients on dialysis is 264 pmp”^[5]. In El minia governorate the prevalence is 367 pmp^[6]. In Damietta governorate the prevalence is 611 pmp^[7]. According to the most recent Egyptian renal registry in 2008, the total recorded number of end stage renal disease on dialysis is 40000. Ninety-eight percent of these patients are on hemodialysis and are treated using about 3000 machines in just over 600 dialysis units, of which 25% are government run and 75% are private and poses a tremendous burden on health care finances^[8].

Hemodialysis is a safe process but it has unfavorable complication^[9]. Intradialytic hypotension is most frequent complication of hemodialysis^[10]. It estimated to occur between 5% to 30% of hemodialysis^[11, 12], even in some patients it has been reported up to 50%^[13].

Intradialytic hypotension is the result of an insufficient cardiovascular reaction to decrease of blood volume that occurs as a result of removing of large amount of water in a short time. In a classic dialysis process an ultrafiltrate volume, that is the same as or larger than the plasma volume, removed. Although the larger ultrafiltrate volume the plasma volume diminishes by only 10 to 20%, this capability to preserve plasma volume throughout ultrafiltration requires movement of fluid from interstitial into the intravascular space. Vascular refilling is affected by both patient specific and dialysis management associated factors that dictate water distribution between the body fluid compartments^[12].

“Intradialytic hypotension is classified as systolic blood pressure < 100 mmhg, even in the absence of symptoms, or fall in systolic blood pressure > 10% of pre-dialysis reading in association with any symptom classically associated with hypotension”^[14]. “Intradialytic hypotension is defined as decrease in systolic blood pressure by ≥ 20 mmhg or a decrease in mean arterial pressure by 10 mmhg”^[15].

Hypotension symptoms include unsettled stomach, vomiting, diaphoresis, cramp, chest pain, dysrhythmias, loss of consciousness, seizure and cardiac arrest^[16,14]. Prevention of intradialytic hypotension is

necessary for managing hemodialysis patients because intradialytic hypotension is connected with enlarged morbidity and death^[17]. The actions that are established to be useful in improving fluid management in hemodialysis patients with repeated intradialytic hypotension include ultrafiltration profile, restricting ultrafiltration to 4% of body weight, decreasing dialysate temperature, focusing patient instruction on salt and fluid restriction and increasing diuretic use, as tolerated, in patients with residual renal function, can be employed to decrease the occurrence of intradialytic hypotension in many hemodialysis patients^[15].

Nurses educate, motivate, and inspire patients to adhere to treatment programs to achieve better health^[18]. Patient education provided by nurses remains an essential and instrumental component in health care that influences patient outcomes. Nurses will need to work in collaboration with the nephrologists, nutritionists, social workers, patients, and patient's family. Nutritional education is an important factor with hemodialysis patients that must be stressed to reduce the consumption of sodium in the diet and to adhere to fluid restrictions^[19].

Significance of the study:

In developing countries such as Egypt, there is an increase in the prevalence and the incidence of ESRD, exerting a considerable burden on the health system. In Menoufia governorate the prevalence of end stage renal disease patient on regular hemodialysis is 330pmp^[20]. Hemodialysis is the most common method for kidney replacement treatment. Intradialytic hypotension is the major complication of hemodialysis occurring in 20% to 30% of dialysis sessions^[21]. It requires aggressive resuscitative measures and premature termination of hemodialysis. It is also a significant independent factor affecting mortality in hemodialysis patients. Complications due to dialysis including hypotension can be prevented and patients' quality of life can improve with suitable nursing cares through the treatment. The nurse plays an important role in control, protection and training of the patient to prevent dialysis induced hypotension.

II. Subjects and Methods

2.1. Aim of the Study

The aim of this study was to identify the effect of nursing intervention on prevention of intradialytic hypotension among hemodialysis patients.

2.2. Research Hypotheses

The following research hypotheses were formulated in an attempt to fulfill the purpose of the study.

- a. The occurrence of intradialytic hypotension among study subjects after conducting nursing intervention will decrease than before nursing intervention.
- b. The occurrence of hypotension symptoms among study subjects after conducting nursing intervention will decrease than before nursing intervention.

2.3. Design

A quasi experimental research design (pre and post test) was utilized to achieve the aim of this study.

2.4. Setting

The study was conducted at hemodialysis unit in Shebien El Koom Teaching Hospital, Menoufia governorate.

2.5. Subjects

A purposive sample of all patients with intradialytic hypotension was selected. These patients were followed consistently for three months. Patients who were demonstrating intradialytic hypotension in more than 50% of their dialysis sessions were identified and included in the study. The sample size was 80 subjects. Subjects were eligible for the study if they adult patient aged from 21 to 60 years, had chronic renal failure, be mentally and physically able to communicate with research staff, and willing to participate in the study.

2.6. Tools: two tools were utilized for data collection:

2.6.1. Tool I: Structured Interviewing Questionnaire

It was developed by the researcher based on the reviewing of relevant literature^[7, 15, and 22]. It was used to assess patients' socio-demographic characteristics and medical data. It consisted of 3 parts:

- **Part 1: socio-demographic characteristics:** Demographic data were collected from patient's medical record and interview. The demographic variables include age, gender, educational level and occupation.
- **Part 2: medical data:** It includes years of hemodialysis, duration of hemodialysis, frequency of dialysis /week, and co-morbidities.
- **Part 3:** It includes hypotension symptoms.

2.6.2. Tool II: physiological measurement tool

This tool was developed by the researcher to assess blood pressure. The systolic and diastolic blood pressure will be measured via mercury sphygmomanometer. Sphygmomanometer will be tested for accuracy.

2.7. Methods

2.7.1. Preparatory phase:

2.7.1.1. Administrative and ethical considerations:

An official permission was obtained by the researcher from the Directorate of shebien El Koom teaching hospital and the head of hemodialysis unit at Menoufia governorate. Patients' formal agreement to participate in the study was obtained after explanation of the study purpose. Each patient was reassured that confidentiality and privacy will be maintained and his or her right to withdraw at any time.

2.7.1.2. Content validity and reliability:

The tool I & II developed by the researcher after reviewing the related literature ^(7,15,22).they were written in English and tested for content validity by three experts in the field of Medical Surgical Nursing, Faculty of Nursing, Menoufia University, and two experts in the field of Medicine, Faculty of Medicine, Menoufia University, and modifications were done accordingly.

The tool I was tested for reliability using test retest method to determine stability, and internal consistency of the measurement over the time. The researcher administered the same instruments to study subjects on two occasions; the two occasions were separated by two weeks. The scores on the repeated testing are compared. This comparison is expressed through correlation coefficient alpha it was 0.90.

2.7.1.3. Pilot study:

It was conducted prior to data collection on 10% of the study sample. This was performed in order to test the clarity and applicability of the tool and necessary modifications were done. Data obtained from the pilot was excluded from the study.

2.7.1.4. Field work

Data were collected over a period of eight months from October 2015 to May 2016. The researcher educated 4 nurses in order to help in data collection. All patients who meet the inclusion criteria and agreed to participate in the study were interviewed individually at hemodialysis unit in Shebien El Koom Teaching Hospital. A structured interview with patients was utilized in order to collect the data. The interview was conducted by introducing the researcher and the nurses themselves to the patients and giving them simple explanation about the aim of the study and assured them information will be confidential and will be used only for the purpose of the study.

The teaching was given for each patient individually and explained through modified lectures, discussions, based on his or her needs and level of understanding. Teaching was done in 2 sessions. Each session took approximately 30-45 minutes.

2.7.2. Implementation phase:

Teaching was done in 2 sessions: first session for health education about renal failure and hemodialysis, second session about diet and medication; dietary education on limitation of fluid and salt intake for limiting interdialytic weight gain. Limiting dietary sodium intake is therefore recommended especially for patients who gain excess (>2 kg) weight in the interdialytic period. Reducing salt intake (2 g /90 mmol Na or 6 g NaCl) can reduce inter-dialytic weight gain and may play a role in the prevention of intradialytic hypotension. Also teach patient about medication especially for hypertensive patient ask patients to take their single-dose medications preferably at night and ask those who were on multiple antihypertensive medications to hold some of them prior to dialysis. Also the researcher provides each participant a written booklet

The following interventions were performed during hemodialysis session

1. Limit UF to <4% of body weight during each dialysis session.
2. Lower dialysate temperature to 36 °C.
3. Minimize use of BP-lowering medications prior to dialysis session.
4. Conduct dietary education on limitation of fluid and salt intake.
5. Discourage eating immediately before or during dialysis would reduce the frequency of hypotension that may be triggered by eating
6. Bicarbonate dialysis should be used to prevent intradialytic hypotension.

The researchers' telephone number was given to studied patients while patients' telephone number was taken to contact them and ensure that they carry health education.

2.7.3. Evaluation phase:

- 1- Participants were assessed immediately on hemodialysis unit admission by using tool I for collecting the demographic, clinical data and hypotension symptoms. Also blood pressure was assessed five times by using tool II (before hemodialysis, every one hour during hemodialysis and after hemodialysis) pre intervention as a baseline.

- 2- Blood pressure were assessed five times by using tool II (before hemodialysis , every one hour during hemodialysis and after hemodialysis) post interventions.
- 3- Hypotension symptoms were assessed by using tool I part 3 post interventions.

Statistical design:

Upon completion of data collection, each variable in the study tools was manually scored. Computerized data entry and statistical analysis were fulfilled using the statistical package for social sciences (SPSS). Descriptive statistics were first applied (e.g., frequency, percentage, mean and standard deviation). Tests of significance were used to compare mean. Statistical significance was set at p value < 0.05⁽²³⁾.

III. Results

Table1 showed that, the mean age of studied sample was 39 ±11.4 years. More than half of them (55%) were male. In relation to educational level, half of studied sample had secondary education (50%). Regarding occupation, about one third of them were either house wife or administrative work (27.5% and 32.5% respectively). Regarding co-morbidities and years of hemodialysis more than half of studied sample (55%, 52.5%) had hypertension and hemodialysis since ≤ 5 years respectively. All studied sample (100%) had 3 session of hemodialysis per week and each session take 4 hours.

Figure1 presented that three third of studied sample (75%) had hypotension before intervention. While after intervention 17.5% of them had hypotension. There were highly statistical significant difference between pre intervention and post intervention regarding hypotension (P=0.0000).

It seems from table2 that there was significant association between years of hemodialysis, education and occupation of studied patients and their suffering from hypotension (P = 0.001, 0.002 and 0.03 respectively).On the other hand there was non significant association between age, sex of studied patients and their suffering from hypotension (P>0.05).

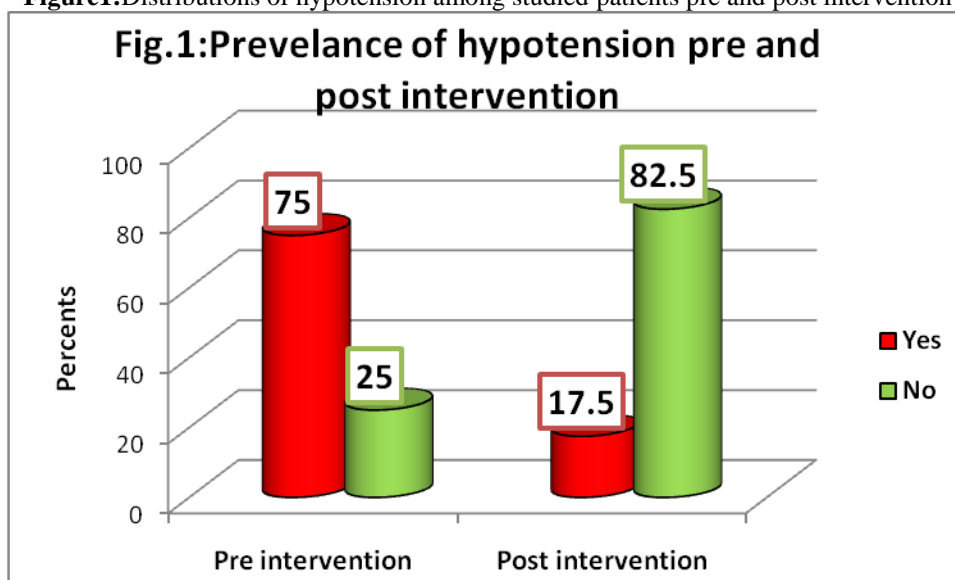
It seems from table 3 that: Older patients were suffering from hypotension then younger ones (mean 47.9±14, 37.1 ±12.0 years respectively). Also male patients showed higher percentage (27.3%) of suffering from hypotension than female patients (5.6%). On the other hand there was non significant association between years of hemodialysis, education, and occupation of studied patients and their suffering from hypotension (P>0.05). Table 4 reports that: Headache and headache with muscle cramps were the highest symptoms pre intervention (33.3% and 30% respectively), while headache with muscle cramps was improved but remain the highest symptom post intervention. Nausea & Vomiting as well as headache alone were 0% post intervention.

Figure 2 reveals that: Less than half (44%) of the studied patient had hypotension after two hours while 6% of the studied patient had hypotension after one hours and at the end of hemodialysis session. Figure 3 presents that: 11% of studied sample had hypotension after 3 hours of hemodialysis while 1% of the studied patient had hypotension after one hours of hemodialysis session.

Table1: Distributions of sociodemographic and medical characteristics of studied patients

Variable	Frequency	Percent
Age ($\bar{x} \pm SD$)	39 ±11.4 years	
Gender		
Male	44	55.0
Female	36	45.0
Education:		
Illiterate	16	20.0
Secondary	40	50.0
University	24	30.0
Occupation:		
Housewife	22	27.5
Manual work	20	25.0
Administrative work	26	32.5
No work	12	15.0
Years of hemodialysis:		
≤ 5 years	42	52.5
6 - 10 years	38	47.5
Duration of hemodialysis per session		
4 hours	80	100.0
Frequency of dialysis per week:		
3 times / week	80	100.0
Comorbidities		
Free from disease	28	35.0
Diabetes mellitus	4	5.0
Hypertension	44	55.0
Hypertension &diabetes	4	5.0
Total	80	100.0

Figure 1: Distributions of hypotension among studied patients pre and post intervention



P value: $\chi^2=52.8, P=0.0000$ HS

Table 2: Relation between sociodemographic characters and hypotension of studied patients pre intervention (N=80)

Socio demographic data	Hypotension pre intervention						P value
	Yes		No		Total		
	No.	%	No.	%	No.	%	
Age ($\chi \pm SD$)	40.6 \pm 13.3 years		34.2 \pm 11.3 years		39 \pm 11.4 years		t=1.90,P=0.06 NS
Mean years of hemodialysis ($\chi \pm SD$)	6.5 \pm 2.3 years		4.6 \pm 1.0		6.0 \pm 2.2 years		t=3.4,P=0.001 Sig.
Gender							
Male	36	81.8%	8	18.2%	44	100%	X ² =2.4,P=0.11, NS
Female	24	66.7%	12	33.3%	36	100%	
Education:							X ² =12.7,P=0.002, Sig.
Illiterate	12	75%	4	25%	16	100%	
Secondary	36	90%	4	10%	40	100%	
University	12	50%	12	50%	24	100%	
Occupation:							X ² =6.1,P=0.03, Sig.
Housewife	14	63.6%	8	36.4%	22	100%	
Manual work	16	80%	4	20%	20	100%	
Administrative work	18	69.2%	8	30.8%	26	100%	
No work	12	100%	0	0	12	100%	
Total	60	75%	20	25%	80	100%	

Table 3: Relation between sociodemographic characters and hypotension of studied patients post intervention

Socio demographic data	Hypotension post intervention						P value
	Yes		No		Total		
	No.	%	No.	%	No.	%	
Age ($\chi \pm SD$)	47.9 \pm 14 years		37.1 \pm 12.0 years		39 \pm 11.4 years		t=2.9,P=0.004 Sig.
Mean years of hemodialysis ($\chi \pm SD$)	7.0 \pm 2.2 years		5.8 \pm 2.2 years		6.0 \pm 2.2 years		t=1.84,P=0.07 NS
Gender							
Male	12	27.3%	32	72.7 %	44	100%	X ² =6.5,P=0.01, Sig
Female	2	5.6%	34	94.4%	36	100%	
Education:							LR=2.4,P=0.30, NS
Illiterate	4	25%	12	75%	16	100%	
Secondary	8	20%	32	80%	40	100%	
University	2	8.3%	22	91.7%	24	100%	
Occupation:							LR=3.1,P=0.38, NS
Housewife	2	9.1%	20	90.9%	22	100%	
Manual work	4	20%	16	80%	20	100%	
Administrative work	4	15.4%	22	84.6%	26	100%	
No work	4	33.3%	8	66.7%	12	100%	
Total	14	17.5%	66	82.5%	80	100%	

Table 4: Distributions of hypotension symptoms among studied patients pre and post intervention after hemodialysis.

Hypotension symptoms	Hypotension symptoms after hemodialysis								P value
	Pre intervention				Post intervention				
	Yes		No		Yes		No		
	No	(%)	No	(%)	No	(%)	No.	(%)	
No symptoms	0	0%	20	100%	0	0%	66	100%	Fisher exact P=0.04 Sig.
Nausea & headache	10	16.7%	0	0%	4	28.6%	0	0%	Fisher exact P=0.000 HS
Headache	20	33.3%	0	0%	0	0%	0	0%	-----
Headache & muscular cramp	18	30%	0	0%	10	71.4%	0	0%	Fisher exact P=0.000 HS
Nausea & Vomiting	12	20%	0	0%	0	0%	0	0%	-----
Total	60	100%	20	100%	14	100%	66	100%	

Figure 2. Distribution of time of occurrence of hypotension pre intervention

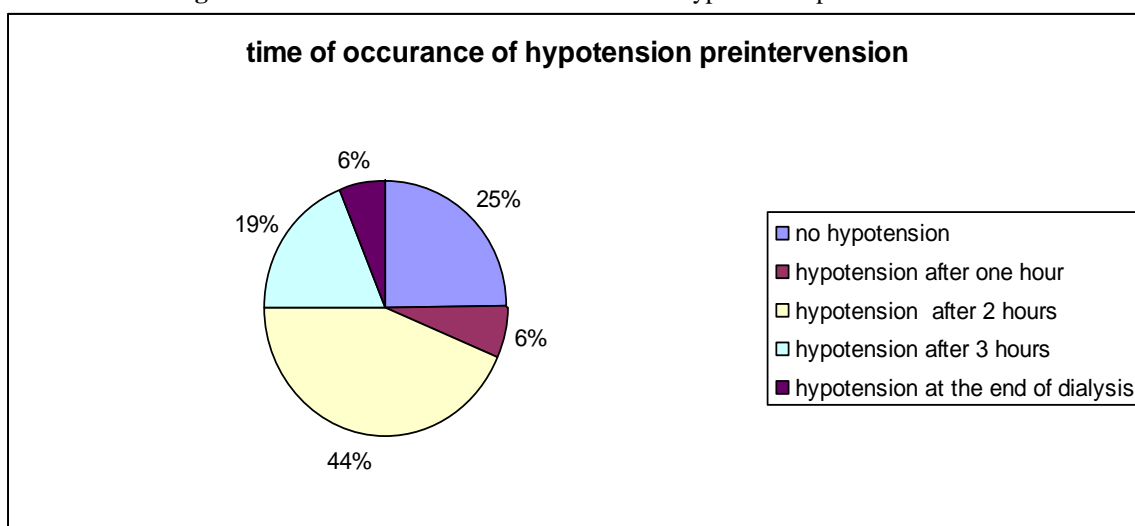
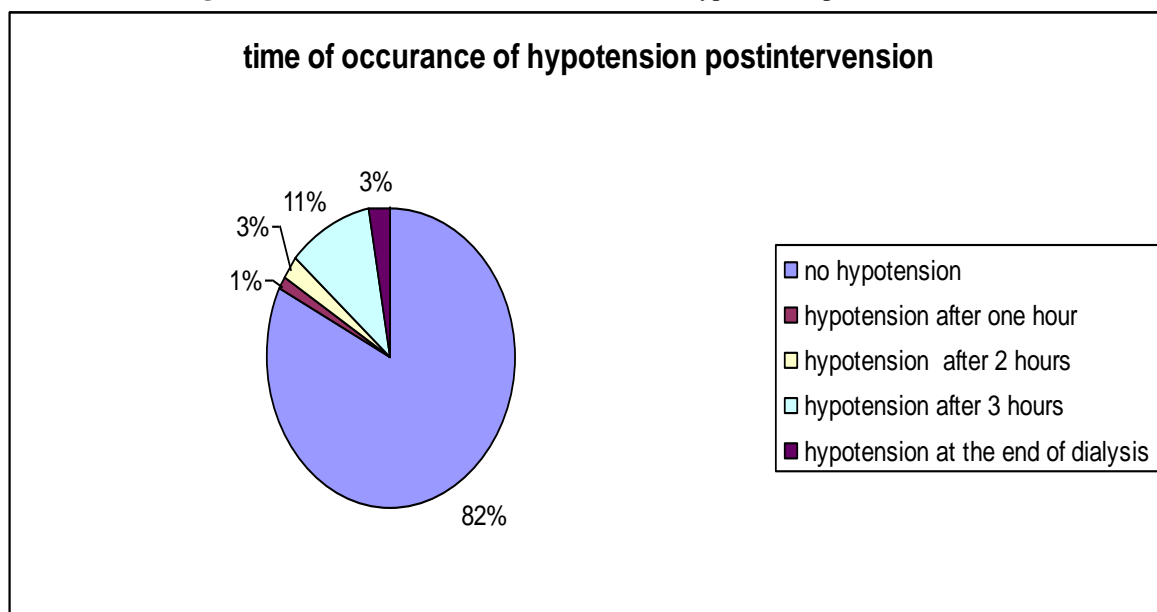


Figure 3. Distribution of time of occurrence of hypotension post intervention



IV. Discussion

Intradialytic hypotension can lead to increased incidence of cardiovascular and cerebral ischemia, vascular access thrombosis, arrhythmias, fluid overload, and interdialytic hypertension due to inadequate ultrafiltration (UF). Most of all affect the well-being and quality of life of these patients [24,25]. Intradialytic hypotension can result from various causes, including rapid fluid removal; decreased cardiac reserve; take medications that alter cardiovascular stability, and use of low-sodium dialysate or eat immediately before or

during dialysis. This problem contributes to the increased morbidity that is associated with the dialysis session [15].

It was noticed from the results of the present study that the mean age of the patient was 39 years (SD, 11.4), fewer percent was diabetic. These findings were not in agreement with **Rocha, Sousa, Teles, Coelho, And Xavier, 2015** [26] they found mean age was 66.6 years (SD, 13.2), and almost one third were diabetic. This different result could be due to differences in the study design, the use of different measures, different study population and perhaps timing of data collection. This study showed that more than half of patient was male. This result was in agreement with **Tabrizi, Mehri, Samiey, Einollahi & Babaei 2009** [22] who found in their study more than half of the patients were male. However this result was contradicted with **Sands, Usvyat, Sullivan, Segal, Zabetakis, Kotanko, et al., 2014** [27] whose found that female gender was independently associated with increased intradialytic hypotension frequency in hemodialysis patients.

The current study revealed that there was no statistical significant difference between patients with intradialytic hypotension and patient without intradialytic hypotension in relation to age and gender before conducting nursing intervention. This results are in agreement with **Al-Etreby, Abd El-Aziz, El-Waseef, and El-Moselhy 2016** [28] whose showed that there was no significant difference between patients with intradialytic hypotension and patients not developed intradialytic hypotension in relation to age and gender.

The current study revealed that there was a significant difference between before and after conducting nursing intervention for occurrence of hypotension during hemodialysis that indicates lowering of hypotension from three fourth of patients before intervention to only one six of patients after intervention. Also the current study showed that there was a significant difference between before and after conducting nursing intervention for hypotension symptoms as nausea, headache, muscular cramp and vomiting. This result was in agreement with **Tabrizi et al., 2009** [22] whose found in their study there is a significant difference between before and after Performance of programmed nursing cares for hypotension, nausea and vomiting, headache and muscles cramp.

Several interventions can potentially reduce the incidence of intradialytic hypotension. These interventions are limiting interdialytic weight gain through dietary sodium restriction [29] fasting during dialysis – especially avoiding carbohydrate-rich food, [30] and cool dialysate are often recommended for prevention of intra-dialytic hypotensive episodes [31].

As for dietary sodium restriction, Use less salt and eat fewer salty foods may help to control blood pressure and reduce weight gains between dialysis sessions. In addition, high sodium intake has been directly related to higher water consumption, expansion of extracellular volume and higher levels of interdialytic weight gain.

As for fasting during dialysis, oral intake of food and fluid prior to or during hemodialysis has been associated with intradialytic hypotension [32]. This may be because of when eating, blood supply to the stomach and intestines increase for digestion, less blood are flowing to the heart and cause decrease in blood pressure. Food ingestion is often prohibited during the hemodialysis procedure. In addition, peripheral vascular resistance decreases and baroreceptor responses are impaired after glucose ingestion. Patients with autonomic dysfunction are particularly prone to hypotension after eating.

Decreasing the dialysate temperature from 37°C to 34-35°C reduces the body core temperature. This leads to peripheral vasoconstriction and increases cardiac output, so reducing hypotension and associated symptoms. This advantage is resulting from increased sympathetic tone. This intervention is beneficial even in patients who have excessive weight gains [33-35].

Also using bicarbonate solution during hemodialysis prevents hypotension. This may be because of acetate solution consider vasodilator that induce hypotension. **Elrashedy, Mohammed, Mohammed, Abdel-Aziz, & Abd El Naser, 2014** [36] reported that the majority of the patients had experienced hypotension in acetate solution, but in bicarbonate solution about thirty percent had experienced hypotension during dialysis session. This agreement with **Santoro, Mancini & London, 2012** [37] whom reported that, acetate dialysis causes hypotension during hemodialysis session. In this respect **Shastri, 2010** [38] who recommended that avoid taking any hypertensive drug before dialysis, avoid eating during dialysis, correction of anemia, use bicarbonate dialysate solution that increase in blood pressure to prevent hypotension.

V. Conclusion

The current study concluded that nursing intervention during hemodialysis decreases the occurrence of intradialytic hypotension and hypotension symptoms. These symptoms include nausea, headache, muscular cramp and vomiting.

VI. Recommendation

Comprehensive nursing intervention during hemodialysis must be carried out for the patients to decrease intradialytic hypotension and hypotension symptoms. Similar study must be carried out in multi center with longer duration of follow up for larger sample size for generalization of the result.

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