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Implementation of Nursing Evidence -Based Practices in managing Intradialytic Hypotension during Hemodialysis sessions: A Quasi-experimental study

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Abstract:
Background:*Intradialytic Hypotension (IDH) is considering an important clinical health problem and may increase of mortality rate. Nurses at the dialysis unit facing a great challenge to manage patients with IDH. Practically using nursing evidence-based practices (EBP) is required to provide appropriate nursing care and improve patient outcomes.* ***Aim:****The aim of this study was to evaluate the impact of applying nursing evidence-based practices in managing intradialytic hypotension (IDH) during hemodialysis sessions.* ***Methods:*** *The Quasi-experimental study was conducted in the dialysis unit of Hurghada government hospital (October-December 2017) on 47 patients 24-70 years old, on maintenance hemodialysis therapy. Data were collected using a developed structured questionnaire to assess patients' socio-demographic data, disease characteristics, and hemodialysis session records. The nursing evidence-based practices as developed based on literature and applied by the researcher.* ***Results:****The results have shown that patients' duration of dialysis mean ±SD (26.97±18.22) months and the main cause of ESRD among study sample was diabetes mellitus (38.3%), and the interdialytic weight gain ranged between 1 kg to 6 kg with mean±SD (2702.12±1369.93) grams. The blood pressure reading average highlighted that around 12% (n=6) were complaining of Intradialytic Hypotension (IDH) after assessment for 6 consecutive sessions. Moreover, the significant findings of the physical assessment for the patients with IDH was reported vomiting (67%), nausea (83%), cramps (83%). And other symptoms as headache (57%) and dizziness (67%). Statistically significant improvements were revealed between pre-post nursing intervention using EBP in the Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), and Mean Arterial Blood Pressure (MAP) scores, p<0.000.* ***In conclusion****, Nurses are playing a crucial role in the dialysis unit, implementation of EBP to managing patient with IDH was effective as guidelines to use cool Dialysate, high dialysate Ca concentration, reevaluate the dry weight, Trendelenburg position, slow Ultrafiltration rate, modification of dialysis session scheduling, provide continues Monitoring, aerobic exercise, prohibit eating during the dialysis session, fluid restriction, low salt diet, using of Midodrine and adjust antihypertensive drug.*

Keywords: *Evidence-Based Practice- Nursing care- Hemodialysis- Interdialytic Hypotension*

I. Introduction

Chronic renal failure has been growing worldwide, end-stage renal disease (ESRD) is defined as a permeant, irreversible in kidney function, eventually, it results to be treated by renal replacement therapy either hemodialysis or peritoneal dialysis and renal replacement for surviving.[1]

El-Zorkany, (2017), who was mentioned that the prevalence of dialysis patients in Egypt is 483 pmp in 2008, and the main cause is diabetic mellites, hypertension, chronic glomerulonephritis, unknown and pyelonephritis. [2,3]

Many studies highlighted that blood pressure fluctuations ordinary happen during dialysis therapy whether hypertension or intradialytic hypotension (IDH) and have an impact on patients' outcomes. Intradialytic hypotension occurs related to ultrafiltration throughout hemodialysis sessions and leads to increase mortality and mortality rate. [4,5]Intradialytic hypotension is defined as a decrease in the systolic blood pressure (SBP) equal or more than 20 mmHg or mean arterial pressure (MAP) equal or greater 10 mm Hg according to National Kidney Foundation Disease Outcomes and Quality Initiative (KDQOI).[6]

Flythe et al, (2015) were reported that a nadir systolic blood pressure of 90 mmHg (intradialytic hypotension) is considering the primary risk factor of mortality based on large cohort observational study.[7]

A recent study conducted by Buren, (2017), who has described the pathophysiology of IDH and explained that the hemodialysis therapy has dramatic side effect as other therapeutic intervention which leads to change in the patients' physiology related to the sudden reduction in the intravascular volume from aggressive ultrafiltration and changing in the serum osmolarity, moreover the impairment of baroreceptor sensitivity, and ends up by hemodynamic instability.[8]

Many studies reported the management patients with IDH and concluded that reassessment of the dry weight and unacceptable to focus on achieving the dry weight as treatment goal by using high ultrafiltration rate (UFR) instead of preventing IDH. [9] Whereas, the innovative method is required to ensure the UFR will not exceeding 10 mL/hr/kg in patients with high interdialytic weight gain (IDWG).[10]

The dialysate concentration particularly for non-hypercalcemic patients, preferable to use the high concentrated calcium dialysate (<140 mEq/L) has been contributing with lowing IDWG, contrariwise, demonstrating high dialysate sodium (<140 mEq/L) or sodium modeling is increasing the IDWG, therefore it should be avoided.[11,12]

The cool dialysate can prevent the incidence of IDWG, literature review in about 26 clinical trials, recommended to use cooled dialysate based on findings, the IDH was decreased about two-third (68%) compared to who was using standard temperature.[13]

Midodrine is a selective alph-1 antagonist that can be prescribed to prevent IDH and dose should be given 30 minutes before the beginning of the dialysis session, in addition, to stop the antihypertensive drug.[14]

Biofeedback equipment as monitoring devices for continuous monitoring and establish as assessment, flow up progress curve as biofeedback ultrafiltration and bioimpedance. [14,15]

Modification of duration and frequency of dialysis schedule may help to decrease the risk of IDH, by adding scheduling dialysis sessions will contorting the IDWG and slow ultrafiltration by providing a longer time per session.[16] In addition, other management modalities as aerobic exercise to achieve the stability of the blood pressure level.[17]

The intradialytic hypotension has been occurring frequently and about one-fifth of the reviews reported that the scenario of IDH is repetitive with patients on maintenance hemodialysis therapy.[18]

Nurses in dialysis units playing a crucial role, and understanding the pathophysiology of IDH, prevention, and management strategies need to be highlighted to decrease the fetal complication during dialysis session. Practically, the existing shreds of evidence are recommended to apply an evidence-based practice approach while managing these conditions to improve patient outcomes.[19]

II. Significance of the Study

Intradialytic hypotension (IDH), is considering one of a common complication during hemodialysis sessions, and the incidence ranged between 15 % to 25% of total patients on maintenance hemodialysis.[19] Therapy, recurrence of hypotension may lead to fetal complication as organ hypoperfusion, myocardial infarction, stroke, seizures, and permanent organ damage, in the long-term lead to an increase in the mortality rate.[7,21]

Causland et al (2013) explored the signs and symptoms with IDH as headache, cramps, nausea, and vomiting.[22] Ultimately, patients unable to continue the dialysis session and can't receive an adequate amount of dialysis. Implementation of evidence-based nursing practice is required to convert updated knowledge based on updated research findings into practice in terms of mode of care delivery based on services, capabilities which are available in health care facilities.

III. Conceptual Framework

Implementation of evidence-based practice defiantly will guide nurses to improve quality of care and patients' outcomes. The Iowa Model; is a conceptual model that has been developed to convert a research finding into clinical application. Whereas, the patients on maintenance hemodialysis therapy complain of many complications during dialysis sessions and nurses should be able to manage, using a knowledge-based, problem-solving approach, critical thinking to improve patients' outcomes. One of the highlighted recurrent clinical conditions is intradialytic hypotension during dialysis sessions. Therefore, the first step to applying the "Iowa Model", identify the health problems, integrate the knowledge with a clinical condition. thereby, search for the new trends and practices in the research results to find out an appropriate solution for the clinical question. The second step determines the level of microsystem dialysis unit and macrosystem health care facility to identify the priority, cost-effectiveness, apply benchmarking with the same pint of view. The third step which is the implementation stage to conduct all steps of evidence-based practice to answer the PICOT Question (Population, Intervention, Comparison, Outcomes, Time).[23]

IV. Methods

Aim: The study aimed to evaluate the impact of applying nursing evidence-based practices in managing intradialytic hypotension (IDH) during Hemodialysis sessions.

Research design: A Quasi-experimental intervention design was applied to assess the improvement in the purposive sample.

Study Setting: Hemodialysis unit at Hurghada government hospital, Red Sea City.

Study period: The study was conducted between October 2017 and December 2017.

Study Sample: Purposive sample consisted of all patients (n=47) on maintenance hemodialysis therapy, the intervention group only 6 patients who were having Intradialytic hypotension.
Inclusion Criteria: Patient's age between 18 to 60 years, for at least 12 months on maintenance hemodialysis therapy, the participants were identified after measuring the blood pressure for 6 consecutive sessions with Systolic Blood Pressure (SBP) > 20 mmHg and Mean Arterial Pressure (MAP) > 10 mmHg. Willing to participate in the study and attend all the program.
Research question: Is there an improvement post-application of nursing evidence-based practices for managing patients with intradialytic hypotension during dialysis sessions?

Tools of the study:
Part I: Socio-demographic characteristics of patients: included (Age, Gender, level of education, and working status.
Part II: Disease characteristics of patient: consisted of (Duration of dialysis, the main cause of the end-stage renal disease (ESRD), interdialytic weight gain (IDWG) and hemoglobin level)
Part III: Clinical patients session record: consisted of blood pressure reading average, significant physical assessment findings (Based on Airway, Breathing, Circulation, Disability) developed based on Jarvis, C. (2016). [24] Record of symptoms associated hypotension, Machine parameters (Blood flow rate/min, Dialyzer surface area, type of dialysate, Adequacy of dialysis (KT/V), type of vascular access
Part IV: Nursing Intervention plan based on evidence-based practices based on literature review [Chou ,Kalantar-Zadeh , Mathew, (2017) and Reilly; (2014)] [2, 25]
Nursing Management:
- Cool Dialysate.
- Use dialysate high concentration of Ca (< 2.25 mmol/L).
- Not recommended to use high sodium dialysate concentration (<140 mEq/L).
- Reevaluate the dry weight.
- Slow Ultrafiltration rate (UFR).
- Modification of dialysis session scheduling (duration and frequency).
- Continues Monitoring (Biofeedback equipment if available).
- Using a Trendelenburg position. [Acute Management].
- Aerobic exercise.
- Using Dialyzer with a large Surface area.
- Administration of intravenous fluids (Isotonic solation (NS 0.9%) [Acute Management]

Pharmacological Therapy:
- Administer Oxygen therapy if needed. [Acute Management]
- Adjust the antihypertensive drugs.
- Using of Midodrine

Patient Education:
- Eat a low salt diet (> 5 g/day).
- Eating during dialysis sessions is prohibited.
- Fluid restriction (chew ice chips, candy).

Validity of the instruments:
All tools reviewed by five expertise in the field to ensure the validity of the tools
Operational Framework:
Phase I: this phase was starting with ethical approval for conducting the study, meticulous assessment of all patient health status, determine the focused group of the study based on comprehensive assessment. it has been done within continues 6 sessions the time was allocated based on the research plan.
Phase II: The nursing intervention plan was carried out based on evidence-based practices. The time frame was allocated over 6 continuous sessions.
Phase III: Reassess post nursing intervention implementation. Six sessions were allocated for reassessment.
Ethical considerations:
This study was approved by the director of Hurghada government hospital, Red-Sea City, an oral verbal consent from patients who were undergone the study was obtained prior to demonstrating the nursing intervention after given a full explanation of the purpose of the study. Moreover, the head nurse and nursing staff were informed about the purpose of the study, and the researcher was explained that the participation not obligatory and they had the right to refuse to participate, and all right of confidentiality was maintained.

Statistical Analysis:
Data entry was done using the statistical package for social sciences (SPSS-22.0) for data entry and analysis. statistical software packages. Data were presented using descriptive statistics in the form of frequencies, percentages, means, and standard deviations for quantitative variables. Quantitative continuous data were compared using the Student t-test in case of comparisons between the two groups.

V. Results

Table 1. Socio-demographic characteristics of patients in the study sample (n=50)

	Frequency	Percent
Age (years):		
20-39	14	29.8
40-59	23	48.9
60-69	8	17.0
≥70	2	4.3
Range	24.0-70.0	
Mean±SD	48.17±13.07	
Gender:		
Female	26	55.3
Male	21	44.7
Education:		
Illiterate	7	14.9
Basic	14	29.8
Secondary	20	42.6
University	6	12.8
Marital status:		
Single	23	49.0
Married	24	51.0
Job status:		
Unemployed/housewife	32	68.0
Working	15	32.0

The socio-demographic characteristics of patients in the study sample are described in table (1) Patients' age ranged between 24 and 70 years, with a mean±SD (48.17±13.07) years. Gender distribution was almost equal, with slightly more females (55.0%). Education was mostly secondary (42.0%) levels. More than half of the patients were married (51.0%), and unemployed or housewives (68.0%).

Table 2. Disease characteristics of patients in the study sample (n=47)

	Frequency	Percent
Duration of dialysis (months):		
≤6 M	1	2.1
6≤12 M	8	17.0
12≤36 M	22	46.8
36≤60 M	11	23.4
> 60 M	5	10.6
Range	5.0-84.0	
Mean±SD	26.97±18.22	
Causes of ESRD		
DM	18	38.3
HTN	13	27.7
Systemic Lupus	1	2.1
Polycystic Kidney Disease	3	6.4
Urinary tract problem	4	8.5
Glomerulonephritis	5	10.6
pyelonephritis	3	6.4
Interdialytic Weight Gain (Gram)		
1000	9	19.1
2000	12	25.5
2500	6	12.8
3000	9	19.1
4000	6	12.8
5000	2	4.3
6000	3	6.4
Range	1000-6000	
Mean ±SD	2702.12±1369.93	
Hemoglobin level:		

7< 8 mg/dl	3	6.4
8< 9 mg/dl	7	14.9
9<10 mg/dl	24	51.1
10<11 mg/dl	13	27.7
Range	07-11	
Mean ±SD	9.45±0.85	

Table (2) shows that most of the patients were on dialysis from 12 to 36 months (46.8%). Their dialysis duration ranged from 5 to 84 months, with a mean±SD of 26.97±18.22 months. The main cause of ESRD among the study sample was diabetes mellitus (38.3%), the interdialytic weight gain ranged between 1 kg to 6 kg with mean±SD (2702.12±1369.93). Moreover, more than half of the patients the Hemoglobin level from 9-10 mg/dl (51.1%) with Mean ±SD (9.45±0.85).

Table 3. Hemodialysis session characteristics of patients in the study sample (n=47)

	Frequency	Percent
Machine Blood Flow Rate		
200- 249 ml/min	3	6.4
250 -299 ml/min	12	25.5
300-349 ml/min	27	57.4
350-400 ml/min	5	10.6
Range	200-350	
Mean±SD	286.17±37.15	
Session time:		
< 3 hrs.	13	27.7
3-4 hrs	34	72.3
Dialyzer Surface area ($m^{2)}$		
FX-80 (1.8 m^2)	40	85.1
FX-100 (2.2 m^2)	7	14.9
Type of Dialysate		
Acetate	12	25.5
Bicarbonate	35	74.5
Adequacy of dialysis (KT/V)		
> 1.2	22	46.8
>=1.2	25	53.2
Vascular Access:		
Arteriovenous fistula	40	85.0
Arteriovenous graft	2	4.0
Double lumen catheter	5	11.0

Hemodialysis session characteristics among patients were reported in table 3 to show the blood flow rate was ranged between 200-350 ml/min with Mean±SD (286.17±37.15), and about three quarter receiving hemodialysis therapy 3-4 hrs/session, three times weekly, using classic low flux dialyzer surface area FX-80 (85.1%) and Bicarbonate dialysate (74.5%). Furthermore, most of the patient having arteriovenous fistula vascular access.

Figure 1: Blood pressure reading average among patient (n=47)

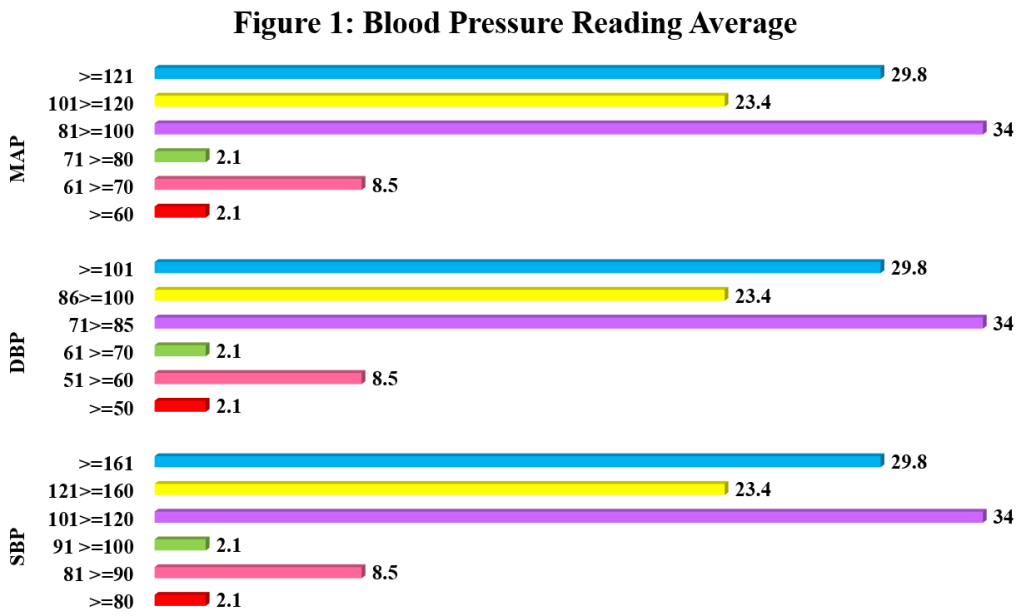
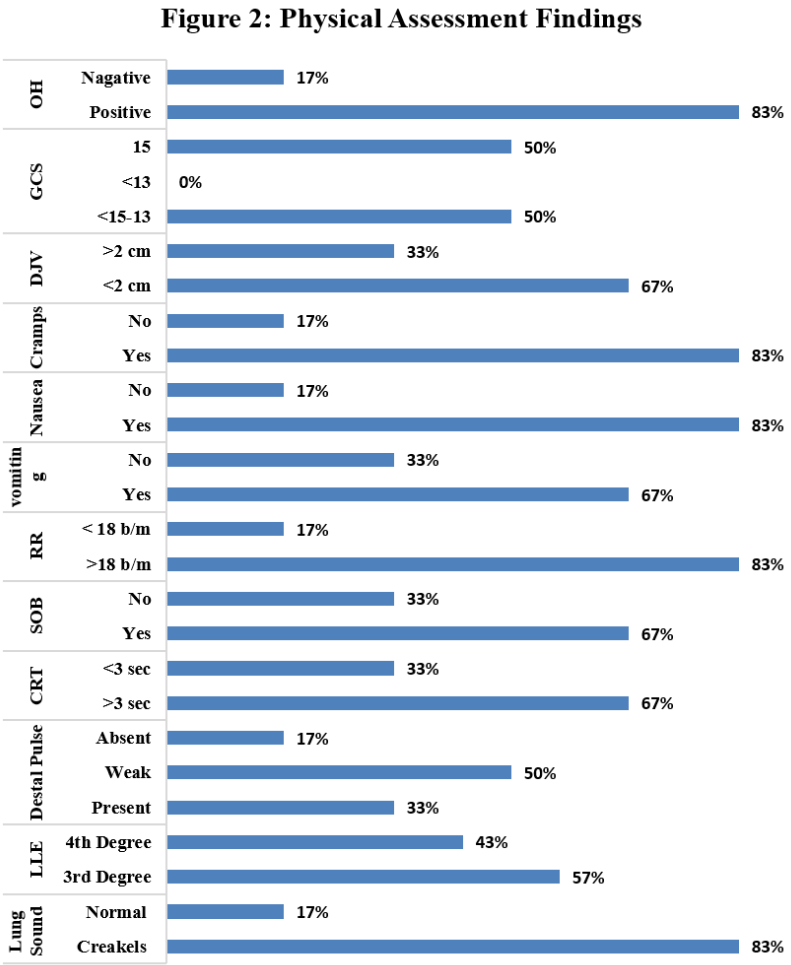


Figure (1) illustrates the blood pressure reading average and shows around (12%) of the study sample were complaining of Intradialytic Hypotension (IDH).

Figure 2: The significant finding of the physical assessment for the patients with hypotension:



The significant findings of the physical assessment for the patients with hypotension (n=6) were described in Figure (2), which shows throughout the demonstration of physical assessment for continuous 6 sessions found that, the patient of study sample (83%) had creacked lung sound with shortness of breathing (67%) and respiratory rate more than 18 breaths/min. whereas, more than half of the patients had lower limb edema (LLE) 3rd grade (57%) and 4th degree (43%) weak distal pulse (50%), capillary refill time (CRT) more than 3 seconds (67%). For assessing level of consciousnessthe Glasgow coma scale (GCS) was reported from 13 to less than 15 around one-third of the study sample. Interestingly, more than three quarter (83%) had positive orthostatic hypotension.

Figure 3: Associated Symptomes with hypotension as assessed among patients in the study sample:

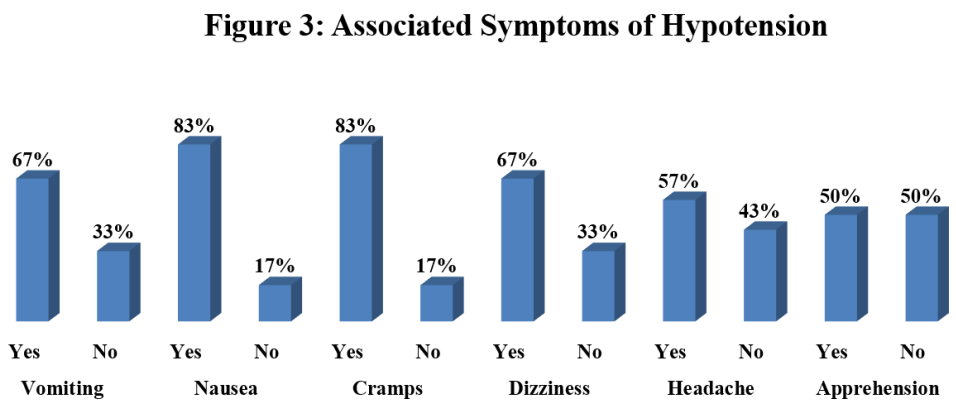


Figure (3) illustrates the associated symptoms were reported by the patient with hypotension are vomiting (67%), nausea (83%), cramps (83%). And other symptoms as headache (57%) and dizziness (67%).

Table 4: Pre-post Nursing intervention among patients with Hypotension in the study sample (n=6)

Clinical Parameters	Scores (mean±SD)		Paired t-test	p-value
	Pre (n=6)	Post (n=6)		
Interdialytic Weight Gain (IDWG)	4666.66±816.49	1783.33±248.32	11.432	<0.000*
Pulse	56.16±4.44	72.50±5.35	8.801	<0.000*
Systolic Blood Pressure (SBP)	80.83±7.35	118.33±6.05	17.516	<0.000*
Diastolic Blood Pressure (DBP)	52.50±5.24	74.16±3.76	10.277	<0.000*
Mean Arterial Blood Pressure (MAP)	61.83±6.04	88.83±4.16	14.36	<0.000*

Table 4 describes the pre-post nursing intervention in the clinical parameters scores as assessed among patients in the study sample. It points to statistically significant increases in the Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), and Mean Arterial Blood Pressure (MAP) scores, p<0.000.

VI. Discussion

Many patients on hemodialysis therapy are complaining of intradialytic hypotension (IDH) which still considering an important clinical health problem, whereas may lead to multi-organ dysfunction and increase mortality rate. Nurses at the dialysis unit facing a great challenge to manage patients with IDH. Practically using nursing evidence-based practices (EBP) is required to provide appropriate nursing care and improve patient outcomes.

Recent studies have shown an association between recurrence IDH during dialysis session and mortality rate and suggesting that these measures do matter. [4,5,10]

The present study was carried out on a purposeful sample of 6 out of 47 patients. Although not randomly selected, their personal and disease characteristics are similar to those of regular hemodialysis patients in Egypt. Thus, patients' mean age was about 48 years, with slightly more females. The age is close to that reported by El-Zorkany (2017) where the mean age was 53 years, Nevertheless, as regards the duration of dialysis, the author has reported a lower mean of dialysis duration was 26.97 months and more than one-third reported that cause of ESRD was diabetes mellitus.[2] The incidence of IDH among hemodialysis patient, the findings of the present study reported that 12% of patients had IDH, this aforementioned finding is in agreement

with Sands et al (2014) have investigated around 44.807 patients and found 17.2% in the total study sample had episodes of IDH.[26] Another study done by Okaka and Okwuonu (2017) have reported out of 217 patients about 19.8% had IDH [4]

The application of evidence-based practices to manage patients with IDH and carried out by nurses at dialysis sessions has been reported in many pieces of research finding who have highlighted the acute and preventive management. [10,25]

Reilly (2014) has demonstrated on A 65-year-old developed IDH and applied to use cool dialysate and increase patients' dry weight, thereby found over the subsequent two months, increase in the SBP, and blood pressure has been stable.[26] Moreover, Ayoub and Finlayson demonstrate cool temperature dialysate on intervention group (n=5 patients) were had IDH with associated symptoms as vomiting, muscle cramps, dizziness, and changes in the level of conciseness and their finding showed an improvement in the SBP and overall hemodynamic stability.[27]These findings in congruence with the study results after the application of using cool dialysate and reevaluating the dry weight with patients in the present study.

The foregoing present study finding concerning dialysate with a high concentration of calcium and bicarbonate was used as one of the intervention modalities, obviously, the effect on the level of SBP was improved accompanied by a management plan. In the agreement with Gabutti et al (2009) who have measured the effectiveness of using bicarbonate and calcium concentration in dialysis to improve the hemodynamic status.[28] Meanwhile, the KDOQI discouraged to demonstrate high dialysate sodium concentration and sodium machine profile to manage IDH[29].

The beneficial of demonstrating simple exercises during dialysis session has been proved by Kess et al (2012) and recommended the exercise program may improving and controlling the arterial blood pressure [17] as applied in the present study by applying leg extension and flexion and using of stress ball in the freehand it was effective and was included in the intervention plan.

The ultrafiltration rate is considering the key to achieve equilibrium states, thus rapid fluid ultrafiltration causes hemodynamic instability and IDH.[30] Slow ultrafiltration rate was applied with increasing duration of dialysis, this approach was effective with IDH, in this respect, Leug et al (2014) have demonstrated a randomized controlled trial by using ultrafiltration biofeedback to control the ultrafiltration rate guided by blood volume monition and highlighted the primary and secondary outcomes was to reduce the incidence of IDH during a dialysis session. [15]

The orthostatic hypotension is more common among hemodialysis patients after a dialysis session, in the same line recent study done by Polinder et al(2014) have reported around 9-41% of hemodialysis patients had an incidence of falls post-dialysis session. [31]

Positioning patients with IDH in the Trendelenburg position as a preventive measure very helpful and oxygen and fluid administration as acute management would be required as supported by Konol et al (2004).[32] These recommendations were included in the holistic plan in the present study and the results included in the post-implementation of EBP nursing intervention.

Pharmacological therapy is an operating the part to the plan of adjusting of the antihypertensive drug for patients who is using and using midodrine with typically use before dialysis session or maybe divided the dose into two doses before and mid of dialysis session. From the researchers' point of view, it should be as a medical description, only the researcher role to request to add in the intervention plan, it was applied as pharmacological part, furthermore, the improvement was reported and aligned with Prakash (2004) have reported that the use of midodrine is effective to reduce the event of IDH. [14]

Since many old and recent pieces of research have been published and emphasized on the following of restricted fluid intake and diet with low sodium intake meanwhile provides an alternative for helping patients to be compliant with regimen therapy. Patient education regards to diet is helpful to decrease IDWG, in consequences decrease episodes of IDH. [33-35]

Comprehensive Physical assessment should be done pre-post dialysis session,[33] is very important to identify patients 'status and based on significant findings, establishing the nursing care plan using SMART patient outcomes. As applied at the present study, the comprehensive physical assessment was done, and the significant data is supported

VII. Conclusion:

Analysis of the results of the present study has shown the differences pre-post implementation of Evidence-Based Nursing Practices among patients with IDH. Nurses are playing a crucial role in the dialysis unit, based in critical review the implementation of EBP to managing patient with IDH was effective as guidelines to use cool Dialysate, high dialysate Ca concentration, reevaluate the dry weight, Trendelenburg position, slow Ultrafiltration rate, modification of dialysis session scheduling, provide continues Monitoring, aerobic exercise, prohibit eating during the dialysis session, fluid restriction, low salt diet, using of Midodrine

and adjust antihypertensive drug. In conclusion, application of the evidence-based practices has been required further implementation in the multi-dialysis centers to be widespread use.

VIII. Recommendations

In the light of the study findings, the following is recommended:

- The application of Evidence-Based Nursing Practices and guidelines to manage patients with IDH in the dialysis unit should be implemented on a wider scale and continuously reevaluated to improve patients' outcomes and quality of care.
- Holistic physical assessment should be conducted by nurses in the dialysis unit pre-during-post dialysis session.
- Identified patients with recurrent IDH in each dialysis unit for further assessment and analysis of lab investigation.
- Encourage nurses to understand and demonstrate the EBP by answer the PICOT Question, highlighting patients' problem and solve it using a scientific approach.

IX. Limitation of The Study

- Limited study sample size.
- Patients compliance to fluid restriction and stop eating during dialysis session.
- Dialysis schedule amendment as increase of dialysis duration and/or adding one more dialysis session.

Conflict of Interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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