

Incidence of Intradialytic Hypotension in Patients on Hemodialysis in Al Kindy Teaching Hospital

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Abstract

Aim Of The Study: To Find Out The Incidence Of Intradialytic Hypotension In Esrd. Patients And Methods: From March To August 2010, (50) Patients With Esrd On Chronic Hemodialysis Program In Al Kindy Teaching Hospital Dialysis Unit Were Studied Cross Sectionally For Evidence Of Idh. The Patients Were On Hemodialysis Program For A Period That Ranged Between 1/4/2004 And 12/4/2010. The Study Sample Consists Of 25 Men And 25 Women With An Age From 18 To 80 Years And Their Body Weight Varied From 40 To 94 Kg And Height Varied From 140 To 186 Cm. Heparin Is Used As An Anticoagulant. Frequency Of Dialysis Differed From One Patient To Another Depending On Patient Condition, Availability Of Machine, It Ranged From Once Weekly To Thrice Weekly Lasting 3-4 Hours Per Session. The Blood Pressure Of All (50) Patients Were Measured Using Mercury Type Sphygmomanometer. The Blood Pressure Were Measured Pre Dialysis During And Post Dialysis. Ultrasound Of Abdomen Done For All (50) Patients. Idh Is Defined As A Decrease In Systolic Blood Pressure By ≥ 20 Mm Hg Or A Decrease In Map By 10 Associated With Symptoms That Include; Abdominal Discomfort, Yawning, Sighing, Nausea, Vomiting, Muscle Cramps, Restlessness, Dizziness Or Fainting And Anxiety[2].

Results: For 50 Patients The Following Results Obtained: The Total Number Is 20 Patients Developed Idh(40%). 25 Females, Of Them 12 Patients Developed Idh(48%). 25 Males, Of Them 8 Patients Developed Idh(32%), 6 Patient Of Age > 65 Years, Of Them 3 Patients Developed Idh(50%). 19 Patients Are Overweight (Bmi >25), Of Them 9 Patients Developed Idh(47.4%). 28 Patients With Normal Weight (Bmi=18.5-25), Of Them 10 Patients Developed Idh(35.7%), 3 Patients Are Under Weight (Bmi <18.5), Of Them One Patient Developed Idh(33.3%). 41 Patients Take Antihypertensive Treatment, Of Them 16 Patients Developed Idh(39%), 5 Patients Have Diabetes, Of Them 2 Patients Developed Idh(40%).

Discussion: Intradialytic Hypotension Is The Most Common Complication Associated With Hd, And Its Cause Is Multifactorial. Patients Subgroups Most Likely to Have Idh Include Those with Diabetic Ckd and Age > 65 Years. Both Normotensive And Hypertensive Dialysis Patients Can Develop Idh. The Degree Of Idh In The Same Patient May Vary From Tim To Time, Other Risk Factors For The Development Of Idh Include Female Sex, And The Use Of Nitrates Before A Dialysis Session & Overzealous Use Of Antihypertensive Agents.

Conclusion: Idh Is an Important Complication of Hemodialysis. there is a significant Number of Patients with Esrd Who Developed Idh.

Keywords: Intradialytic Hypotension, Hemodialysis, Al:Kindy Teaching Hospital

Introduction

Hemodialysis Is Now Considered A Routine Treatment, And Many Patients Now Are Dialyzed In An Outpatient Setting Without Direct Medical

Supervision, Or At Home Without Any Support. This Change In Practice Has Been Because Of The Technological Advances And Reliability Of Dialysis Machine Equipment, Vascular Access, Dialyzer Membranes, And Water Supply.

However, Adverse Events Do Still Occur During Dialysis, Which May Be Because Of Technical Problems With The Extracorporeal Treatment, Often Combined With Underlying Patient Comorbidity[1]. Hypotension Is The Most Common Acute Complication Of Hemodialysis, Particularly Among Diabetics[2]. Acute Hypotension Is An Important Complication Of Hemodialysis, But The Underlying Mechanisms Remain Poorly Understood [3]. A Symptomatic Reduction In Bp During Or Immediately After Dialysis Occurs In Approximately 20 To 30% Of Dialysis Sessions. The Treatment Includes Stopping Or Slowing The Rate Of Ultrafiltration, Placing The Patient In The Trendelenburg Position, Decreasing The Blood Flow Rate, And Restoring Intravascular Volume [4]. Cardiovascular Complications Of Idh Include: Ischemic (Cardiac Or Neurological) Events; Vascular Access Thrombosis; Dysrhythmias; And Mesenteric Venous Infarction [5]. Long-Term Effects Of Idh Include: Volume Overload Due To Suboptimal Ultrafiltration And Use Of Fluid Boluses For Resuscitation; Lvh, With Its Associated Morbidity And Mortality; And Interdialytic Hypertension[6]. Dialysis Hypotension Is The Result Of An Inadequate Cardiovascular Response To The Reduction In Blood Volume That Occurs When A Large Volume Of Water Is Removed During A Short Period Of Time. In A Typical Dialysis Procedure, An Ultrafiltrate Volume That Is Equal To Or Greater Than The Entire Plasma Volume Is Often Removed. Despite The Large Ultrafiltrate Volume, Plasma Volume Typically Decreases By Only Approximately 10 To 20%. This Ability To Maintain Plasma Volume During Ultrafiltration Requires Mobilization Of Fluid From The Interstitium Into The Intravascular Space. Vascular Refilling Is Influenced By Both Patient-Specific And Treatment-Related Factors That Dictate The Distribution Of Water Between The

Body Fluid Compartments[7]. The Approach To End-Stage Renal Disease (Esrd) Patients Who Develop Intradialytic Hypotension (Idh) Encompasses An Understanding Of The Pathophysiology, Appropriate Dialysis Prescription Modification, Application Of Newer Pharmacologic Therapies, And Development Of Strategies For Prevention [8]. Noncompliance And High Interdialytic Weight Gain In The Setting Of Left Ventricular Hypertrophy (Lvh) And Diastolic Dysfunction Can Increase The Risk Of Idh. Assessment Of Antihypertensive Medications Should Be Performed On A Regular Basis To Determine The Correct Dosing Schedule For Patients With Hypertension Who Develop Idh. Coronary Flow Reserve May Be Compromised In Patients With Lvh, Adding To The Risk For Perfusion Injury With Low Blood Pressure[8]. Many Factors May Contribute To Dialysis Hypotension, These Include:

- A Rapid Reduction In Plasma Osmolality, Which Causes Extracellular Water To Move Into The Cells [2].
- Rapid Fluid Removal In An Attempt To Attain "Dry Weight" Particularly Among Those With Large Interdialytic Weight Gains [9,10].
- Inaccurate Determination Of True "Dry Weight" [11].
- Autonomic Neuropathy [2].
- Diminished Cardiac Reserve [12].
- Use Of Acetate Rather Than Bicarbonate As A Dialysate Buffer [2].
- Intake Of Antihypertensive Medication That Can Impair Cardiovascular Stability [2].
- Sudden Release Of Adenosine During Organ Ischemia [13].
- Ingestion Of A Meal Immediately Before Or During Dialysis [2].

The Dialysis Prescription Can Have A Substantial Impact On The Frequency Of Idh. Plasma Volume Will Decline To A Greater Extent When The Ultrafiltration (Uf) Rate Is Rapid, Favoring Idh

[14].Clinical Training Sessions On Idh Risk Recognition And Appropriate Treatment Should Be Implemented Within The Dialysis Unit. Because Repeated Bouts Of Idh Can Be Disruptive To The Smooth Efficiency Of Unit Operations, Attention To Prevention As Well As Acute Intervention Of Idh Is Important. Preventive Strategies Can Be Developed In Each Unit To Decrease The Number Of Future Idh Events. Considering The Importance Of Hypotension In Overall Patient Survival, Attention To Identifying The Percentage Of Patients In Each Unit Who Experience Idh And/Or Who Present With Low Blood Pressure (Systolic <110 Mm Hg) Should Be Tracked As A Quality Assurance Initiative.[8]The Higher The Dialysate Sodium, The Smaller The Decline In Plasma Volume For Any Given Amount Of Uf. Use Of A Dialysate Temperature That Prevents A Positive Thermal Balance During Dialysis Will Allow Peripheral Vascular Resistance To Be Maintained And Minimize Idh. A Higher Ionized Calcium During Treatment Facilitates An Increase In Cardiac Output, A Benefit That May Be Particularly Notable In Patients With Depressed Cardiac Ejection Fraction. Low Dialysate Magnesium, Potassium, And Bicarbonate May All Favor Idh, Although Insufficient Data Are Available For Definitive Conclusions. The Choice Of Antihypertensive Medication And The Treatment Schedule Must Be Carefully Considered In Patients With Idh. The Future Integration Of Technology To Monitor Blood Pressure, Plasma Volume, And Thermal And Sodium Balance Into A Computer-Based Biofeedback System Will Very Likely Go A Long Way Toward Reducing The Frequency Of Idh [14].Cool Dialysate And Midodrine Appear To Improve Intradialytic Hemodynamic In Patients With Dialysis-Associated Hypotension, Mainly Through The Preservation Of Circulating Blood Volume And Cardiac Output, Rather Than Significantly Elevating Peripheral

Vascular Resistance [15].It Is Becoming Increasingly Important To Identify Patients At "High Risk" For Idh, To Customize The Hd Prescription To The Individual Patient, To Use Drug Therapy To Prevent Idh Events, And To Track The Prevalence Of Chronic Hypotension And The Incidence Of Idh Complications In The Dialysis Unit[16].

Aim Of The Study: To Find Out The Incidence Of Intradialytic Hypotension In Esrd.

Patients and Methods

From March To August 2010, (50) Patients With Esrd On Chronic Hemodialysis Program In Al Kindi Teaching Hospital Dialysis Unit Were Studied Cross Sectionally For Evidence Of Idh. The Patients Were On Hemodialysis Program For A Period That Ranged Between 1/4/2004 And 12/4/2010.The Study Sample Consists Of 25 Men And 25 Women With An Age From 18 To 80 Years And Their Body Weight Varied From 40 To 94 Kg And Height Varied From 140 To 186 Cm. Heparin Is Used As An Anticoagulant. Frequency Of Dialysis Differed From One Patient To Another Depending On Patient Condition, Availability Of Machine, It Ranged From Once Weekly To Thrice Weekly Lasting 3-4 Hours Per Session.The Blood Pressure Of All (50) Patients Were Measured Using Mercury Type Sphygmomanometer. The Blood Pressure Were Measured Pre Dialysis During And Post Dialysis. Ultrasound Of Abdomen Done For All (50) Patients. Idh Is Defined As A Decrease In Systolic Blood Pressure By ≥ 20 Mm Hg Or A Decrease In Map By 10 Associated With Symptoms That Include ; Abdominal Discomfort, Yawning, Sighing, Nausea, Vomiting, Muscle Cramps, Restlessness, Dizziness Or Fainting And Anxiety[2].The **Mean Arterial Pressure (Map)** Is A Term Used In Medicine To Describe An Average Blood Pressure In An Individual[17]. It Is

Defined As The Average Arterial Pressure During A Single Cardiac Cycle.Mean

Arterial Pressure Can Be Determined From:[18] [19][20][21]

$$MAP \simeq DP + \frac{1}{3}(SP - DP)$$

Or Equivalently

$$MAP \simeq \frac{2}{3}(DP) + \frac{1}{3}(SP)$$

Or Equivalently

$$MAP \simeq \frac{(2 \times DP) + SP}{3}$$

Or Equivalently

$$MAP \simeq DP + \frac{1}{3}PP$$

Where PP Is The Pulse Pressure, $SP - DP$

Results

The Changes In Blood Pressure Showed Considerable Inter-Individual Variability. Table No.1 Shows The Predialytic (Systolic And Diastolic) Blood Pressure And The Changes In Blood Pressure That Occurred During Hemodialysis For The Total 50 Patients. For 50 Patients The Following Results Obtained:

- 14 Patients Have Decrease In Systolic Blood Pressure ≥ 20 Mm Hg, 16 Patients Have Decrease In Map ≥ 10 , The Total Number Is 20 Patients Developed Idh , And The Percentage Is 40 (Table No. 2).
- 25 Females, 8 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 Mm Hg, 9 Of Those 25 Have Decrease In Map ≥ 10 , The Total Number Is 12 Patients Develop Idh, And The Percentage Is 48 (Table No. 3).
- 25 Males, 6 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 , 7 Of Those 25 Have Decrease In Map ≥ 10 , The Total Number Is 8 Patients Develop Idh, And The Percentage Is 32 (Table No. 4).
- 6 Patients Of Age ≥ 65 Years, 3 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 , And The Same 3 Patients Have Decrease In Map ≥ 10 , So The Total Number Is 3 Patients Develop Idh, And The Percentage Is 50 (Table No. 5).
- 19 Patients Are Overweight (>25)[22][23], 7 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 Mm Hg, 8 Of Those 19 Have Decrease In Map ≥ 10 , The Total Number Is 9 Patients Develop Idh, And The Percentage Is 47.4 (Table No. 6).
- 28 Patients With Normal Weight (18.5-25)[22][23], 6 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 Mm Hg, 7 Of Those 28 Have Decrease In Map ≥ 10 , The Total Number Is 10 Patients Develop Idh, And The Percentage Is 35.7 (Table No. 7).
- 3 Patients Are Underweight (< 18.5)[22][23], 1 Of Them Has Decrease In Systolic Blood Pressure ≥ 20 Mm Hg And The Same Patient Has Decrease In Map ≥ 10 , So The Total Number Is One Patient Develop Idh, And The Percentage Is 33 (Table No. 8).
- 41 patientstakeantihypertensive Treatment, 11 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 Mm Hg, 13 Of Those 41 Have Decrease In Map ≥ 10 , The Total Number Is 16 Patients Develop Idh, And The Percentage Is 39 (Table No. 9).
- 5 Patients Have Diabetes, 2 Of Them Have Decrease In Systolic Blood Pressure ≥ 20 , And The Same 2 Patients Have Decrease In Map ≥ 10 , So The Total Number Is 2 Patients developidh,andthepercentage Is 40 (Table No. 10).

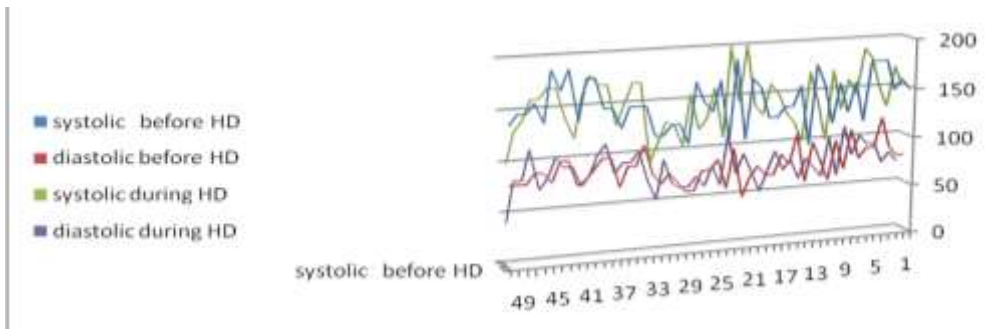


Table 1. The Bp For The Total 50 Patients Pre And During Hemodialysis

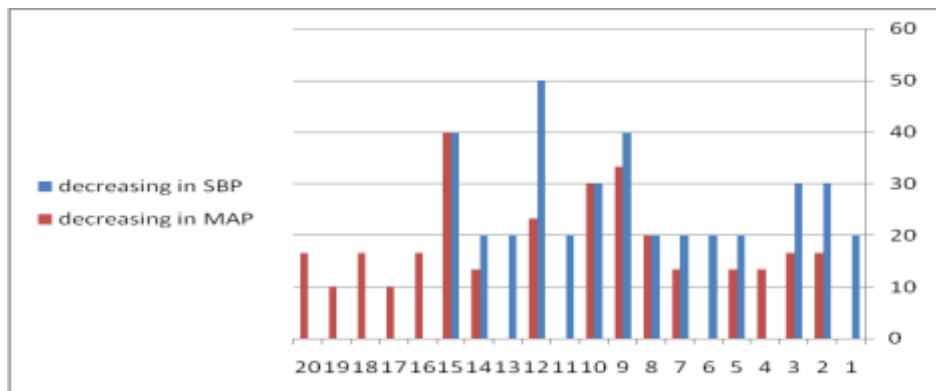


Table 2. Patients Develop Idh

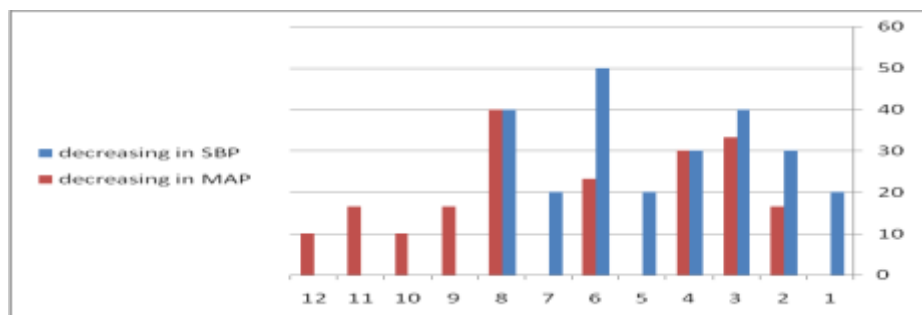


Table 3. Female Patients That Develop Idh

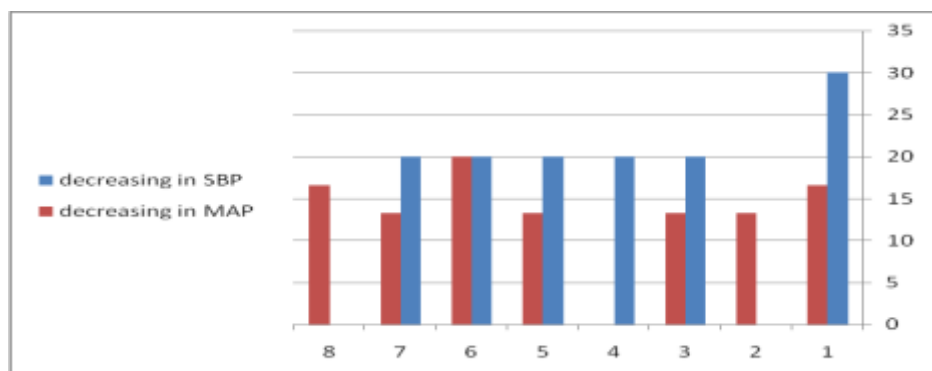


Table 4. Male Patients That Develop Idh

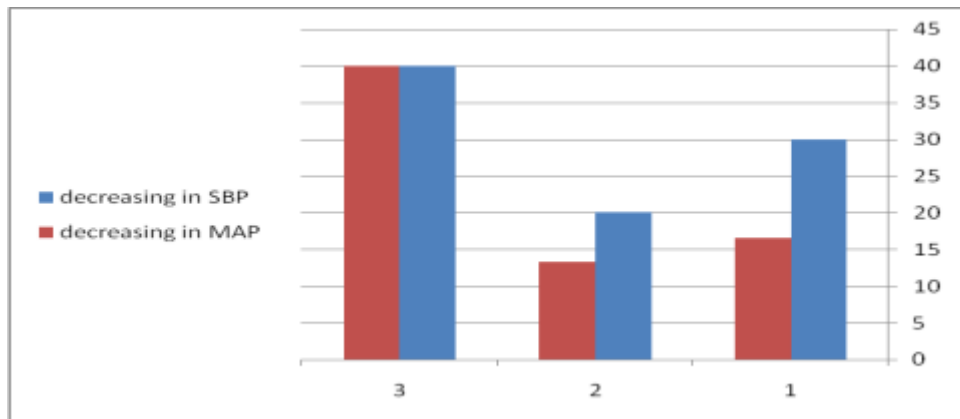


Table 5. Patients With Age ≥ 65 That Develop Idh

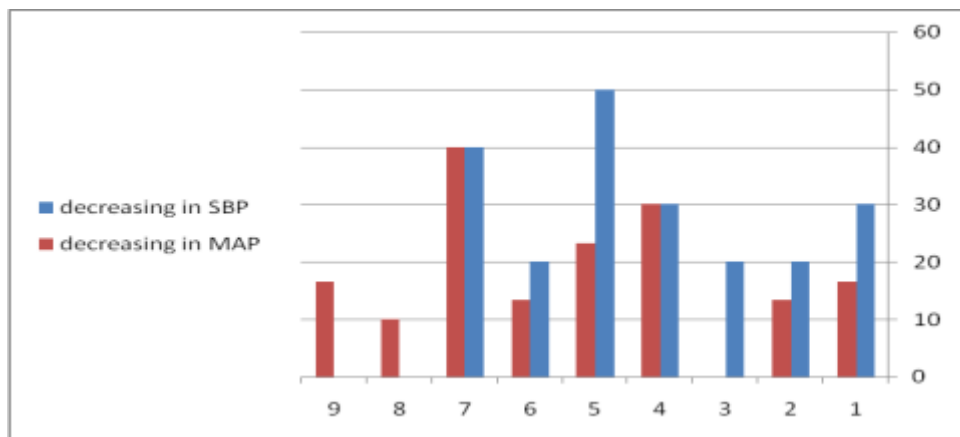


Table 6. Overweight Patients That Develop Idh

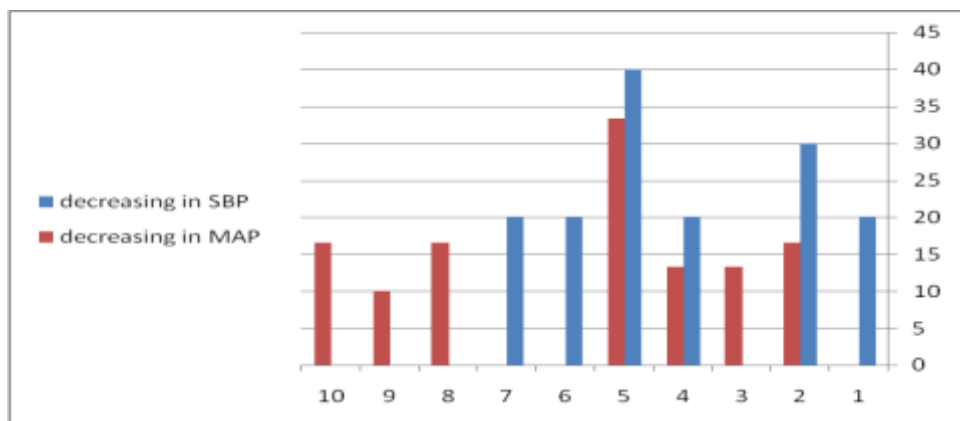


Table 7. Normal Weight Patients That Develop Idh



Table 8. Underweight Patient That Develop Idh

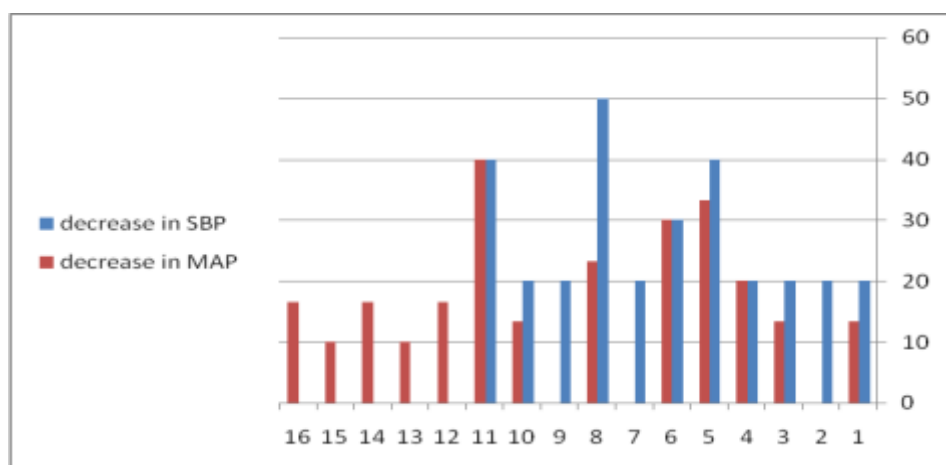


Table (9) Patients Take Antihypertensive Treatment And Develop Idh

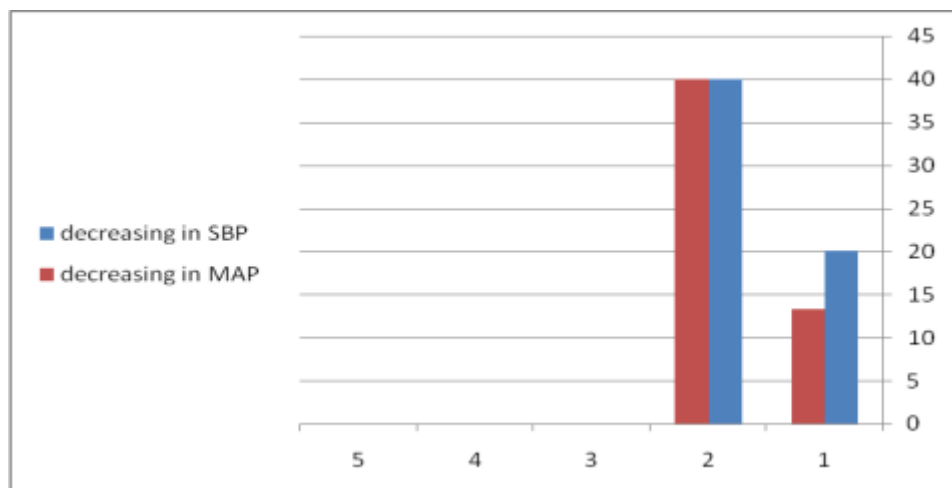


Table (10) Patients Have Diabetes And Develop Idh

Discussion

Intradialytic Hypotension Continues To Play A Significant Role In The Morbidity And In Some Cases The Mortality Associated With Maintenance Hd [24].

Intradialytic Hypotension Is The Most Common Complication Associated With Hd, And Its Cause Is Multifactorial [25].During The Past 10 Years, Despite Improvement In Dialysis Technology, The Frequency Of Idh Has Remained

Unchanged At About 25% Of All Hd Sessions[26]. In This Study Idh Is Found In 28% On Patients On Chronic Hemodialysis From March To August 2010. The Incidence Of Idh Will Continue To Increase As An Increasing Number Of Elderly Patients Will Develop Ckd, And Also Due To The Progressive Increase In The Number Of Diabetic Patients With Ckd. Patient Subgroups Most Likely To Have Idh Include Those With Diabetic Ckd And Age ≥ 65 Years[26]. In This Study We Found A Similar Relation Between Patients Of Age ≥ 65 years and idh[26]. Hypotension Is The Most Common Acute complication of hd, particularly among Diabetics[2][26]. In This Study Idh Was More Common In Diabetic Patients With Ckd. A Small Group Of Patients (5%-10%) May Have Low Systolic Blood Pressure (< 100 Mm Hg) At The Initiation Of Dialysis[27]. This Group Includes Anephric Patients, Those Who Are On Dialysis For A Longer Period, And Diabetic Patients With Persistent Orthostatic Hypotension Due To Autonomic Dysfunction. Patients On Dialysis With Autonomic Dysfunction Show An Exaggerated Drop In Systolic And Diastolic Blood Pressures, Compared To Those Without Underlying Autonomic Dysfunction[28]. In Our Study Only One Patient Had Predialysis Systolic Blood Pressure 100 Mm Hg Which Remained Stable All Through The Sessions. Both Normotensive Or Hypertensive Dialysis Patients Can Develop Idh. The Degree Of Idh In The Same Patient May Vary From Time To Time[6]. In This Study We Found A Similar Relation With Decrease In Blood Pressure During Hemodialysis In Both Normotensive And Hypertensive Patients, With Variation In The Degree Of Idh In The Same Patient From Time To Time. Other Risk Factors For The Development Of Idh Include Female Sex, And The Use Of Nitrates Before A Dialysis Session[6]. In This Study We Found A Similar Relation Between Female Sex And Idh. One Of The Causes Of Idh Is

Overzealous Use Of Antihypertensive Agents[2]. In Our Study We Found A Significant Relation Between The Use Of Antihypertensive Drugs And Idh.

Conclusion

Idh Is An Important Complication Of Hemodialysis. There Is A Significant Number Of Patients With Esrd Who Develop Idh. The Patients Medications List Should Be Verified Very Carefully To Prevent Development Of Idh. Patients With Episodes Of Idh Are Advised To Stop Taking Anti-Hypertensive Treatment At The Night Or In The Morning Of Hd.

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