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ORIGINAL ARTICLE

Effects of Recurrent Intradialytic Hypotension on Physical and Mental Health Domains in End-Stage Renal Disease Patients Undergoing Hemodialysis

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Abstract

Background: *Recurrent intradialytic hypotension (rIDH) happens quite often and can be a significant issue for patients with End-Stage Renal Disease (ESRD) undergoing hemodialysis (HD). We know how it affects them in the short term, but we really need to look deeper into how it impacts both their physical and mental well-being in a community setting.*

Objectives: *To determine the prevalence of rIDH and assess its effects on the physical and mental health outcomes of ESRD patients undergoing maintenance HD.*

Methods: *We carried out a study at a community medical college in Bangladesh from January to July 2025. We focused on a specific group of 103 adult patients with end-stage renal disease (ESRD) who were on regular hemodialysis. We defined resistant intradialytic hypotension (rIDH) as having a lowest systolic blood pressure below 90 mmHg during at least 30% of their dialysis sessions over a month. To gather data, we used a structured questionnaire and the SF-36 health survey to evaluate health-related quality of life, along with information from hospital records for clinical details. For the analysis, we utilized SPSS software version 25.0.*

Results: *We found that recurrent IDH was fairly common, affecting about 38.8% of the 40 patients we looked at. Those with rIDH tended to be older, had been on dialysis for longer, and had more health issues overall ($p<0.05$). They also reported significantly more negative symptoms, like cramping—72.5% compared to just 19.0% in others ($p<0.001$). Plus, the SF-36 scores showed that their quality of life was really suffering, with scores much lower in both physical and mental health areas ($p<0.001$).*

Conclusion: *Recurrent low blood pressure during dialysis is really common and can take a toll on both the physical and mental well-being of patients undergoing hemodialysis. It's really important to put proactive management strategies in place to enhance their overall quality of life and improve clinical results for these patients.*

Keywords: *End-stage renal disease, Hemodialysis, Intradialytic hypotension, Mental health, Quality of life*

Introduction

End-Stage Renal Disease (ESRD) is the last and permanent stage of chronic kidney disease, which means patients need some form of renal replacement therapy to survive. Hemodialysis (HD) is the most common treatment options globally, as it helps fix metabolic issues and gets rid of extra fluid that builds up between dialysis sessions[2]. That said, the HD procedure can put a lot of stress on the heart, which often results in many complications related to the treatment[3]. One of the most common and tricky issues we face during dialysis is intradialytic hypotension (IDH), which occurs in around 20-30% of all dialysis sessions[4].

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It's usually considered low blood pressure when the systolic reading drops below 90 mmHg, or if there's a drop of more than 20 mmHg from what it was before dialysis. This can often come with symptoms like cramping, dizziness, nausea, and feeling really tired[5]. IDH results from several factors working together. It can be caused by a quick ultrafiltration rate, issues with how the autonomic system responds, heart problems, and shifts in osmolarity. All of these can end up reducing how well the heart pumps blood and affecting how well the blood vessels can resist flow[6]. When these episodes keep happening, known as rIDH, it shows a long-term issue with blood flow that can lead to serious problems. The immediate effects of rIDH are pretty clear and include a higher chance of blood clots at access points, heart damage from repeated lack of blood, and a greater risk of death[7,8]. Besides the obvious physical issues, there's more awareness now of how rIDH affects what patients report about their well-being. The ongoing episodes of low blood pressure can really take a toll, possibly causing a notable drop in their quality of life[9]. The physical domain is directly impaired through symptoms like profound fatigue and muscle wasting, limiting functional capacity[10]. Meanwhile, when it comes to mental health, there's a lot of fragility. The ongoing worry and fear of facing the next low blood pressure episode can really take a toll, leading to more psychological issues like depression and anxiety issues that are already quite common among those with end-stage renal disease[11,12]. Even though we know that rIDH affects clinical outcomes, there's been a real shortage of recent research, especially in South Asia, that looks at how it impacts both physical and mental health at the same time using proper tools. Most studies tend to focus on just one side of things, and there's not much data from community settings in Bangladesh. Figuring out this overall impact is really important for creating better patient care strategies that go beyond just keeping people alive to actually improving their quality of life. So, in this study, we're looking to fill that gap by examining how recurrent intradialytic hypotension affects both physical and mental health in ESRD patients who are getting regular hemodialysis at a major care center in Bangladesh.

Methods

This prospective cross-sectional study was conducted at the Hemodialysis Unit of Community-Based Medical College, Bangladesh, from January 2025 to July 2025. The study population consisted of 103 adult End-Stage Renal Disease patients undergoing maintenance hemodialysis, selected via purposive sampling.

Inclusion criteria: We included patients who were at least 18 years old, had been undergoing hemodialysis three times a week for at least three months, and were considered clinically stable. It was also necessary for them to provide written informed consent to take part.

Exclusion criteria: We didn't include people in the study if they had serious cognitive issues, any active cancer, current infections, or if they were hospitalized for heart problems in the month leading up to when we collected the data.

Study procedure: We gathered data using a detailed questionnaire to get information on demographics and clinical profiles. During each dialysis session, we kept an eye on blood pressure to spot any cases of intradialytic hypotension (IDH). This was flagged when the systolic BP dropped below 90 mmHg or if there was a fall of more than 20 mmHg from the baseline before dialysis, especially if symptoms were present. To evaluate both physical and mental health, we also used the SF-36 questionnaire.

Data analysis: We used IBM SPSS Statistics version 25.0 for our statistical analysis. Descriptive stats helped us summarize the demographic data. To compare continuous and categorical variables between groups—those with recurrent IDH and those without—we applied independent t-tests and Chi-square tests. Anything with a p-value under 0.05 was deemed statistically significant.

Results

In this study, we enrolled a total of 103 patients who were on maintenance hemodialysis. We found that 38.8% of them (that's 40 patients) experienced recurrent intradialytic hypotension (rIDH), while the other 63 patients (61.2%) were in the non-rIDH group. Comparing the two groups showed some significant differences in key demographic and clinical traits. The rIDH patients tended to be older, with an average age of 58.4 years compared to 51.7 years for the non-rIDH group ($p=0.003$). They also had been on dialysis longer, averaging 4.8 years versus 3.5 years ($p=0.002$). When we looked at their comorbidities, diabetes was present in 65.0% of the rIDH group compared to just 38.1% in the other group ($p=0.009$), and congestive heart failure was significantly more common among rIDH patients (32.5% vs. 12.7%, $p=0.016$). Interestingly, we didn't find any notable differences in gender distribution or hypertension rates between the groups. Dialysis prescriptions showed that rIDH patients had a significantly higher ultrafiltration rate (12.5 vs. 10.1 mL/kg/h, $p<0.001$), which resulted in a lower mean intradialytic weight gain, although this wasn't statistically significant. Moreover, adverse symptoms during dialysis were reported more

frequently by the rIDH patients. For example, muscle cramps affected 72.5% of them compared to just 19.0% in the non-rIDH group ($p<0.001$), and dizziness was seen in 65.0% of rIDH patients versus 14.3% in the other group ($p<0.001$). We also noted a higher incidence of nausea or vomiting among rIDH patients (37.5% vs. 9.5%, $p<0.001$). Additionally, using the SF-36 survey to assess health-related quality of life revealed a significant negative impact on the rIDH group, who reported lower scores in all eight domains ($p<0.001$). The most striking deficits were in physical functioning (42.3 vs. 68.9), general health (35.8 vs. 58.2), vitality (38.5 vs. 62.1), and social functioning (44.1 vs. 71.2), indicating a serious impairment in both their physical and mental health.

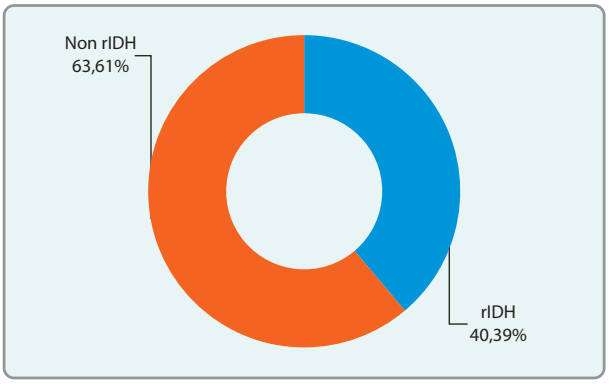

Figure 1: *Prevalence of recurrent intradialytic hypotension (rIDH)*

Table-I

Comparison of demographic and clinical characteristics between study groups

Characteristic	rIDH (n=40)	Non-rIDH (n=63)	p-value
Age (years), Mean ± SD	58.4 ± 11.2	51.7 ± 10.8	0.003
Gender, n (%)			
Male	24 (60.0)	34 (54.0)	0.441
Female	16 (40.0)	29 (46.0)	
Dialysis Vintage (years), Mean ± SD	4.8 ± 2.1	3.5 ± 1.9	0.002
Comorbidities, n (%)			
Diabetes Mellitus	26 (65.0)	24 (38.1)	0.009
Hypertension	35 (87.5)	58 (92.1)	0.433
Congestive Heart Failure	13 (32.5)	8 (12.7)	0.016

Data analysis tests: Independent samples t-test (for Age, Dialysis Vintage); Chi-square test (for Gender, Comorbidities

Table-II

Comparison of dialysis prescription parameters

Parameter	rIDH (n=40)	1Non-rIDH (n=63)	p-value
Ultrafiltration Rate (mL/kg/h), Mean ± SD	12.5 ± 2.8	10.1 ± 2.5	<0.001
Intradialytic Weight Gain (kg), Mean ± SD	2.1 ± 0.7	2.3 ± 0.6	0.121
Dialysate Temperature (°C), Mean ± SD	35.8 ± 0.4	36.0 ± 0.3	0.065

Data analysis test: Independent samples t-test

Table-III

Frequency of dialysis-related adverse symptoms

Symptom	rIDH (n=40), n (%)	Non-rIDH (n=63), n (%)	p-value
Muscle Cramping	29 (72.5)	12 (19.0)	<0.001
Dizziness	26 (65.0)	9 (14.3)	<0.001
Nausea/Vomiting	15 (37.5)	6 (9.5)	<0.001
Headache	10 (25.0)	11 (17.5)	0.351

Data analysis test: Chi-square test

Table-IV

Comparison of SF-36 physical health domain scores (Mean ± SD)

SF-36 Domain	rIDH (n=40)	Non-rIDH (n=63)	p-value
Physical Functioning	42.3 ± 10.1	68.9 ± 12.4	<0.001
Role-Physical	38.1 ± 9.8	65.4 ± 11.9	<0.001
Bodily Pain	47.6 ± 11.2	70.3 ± 13.1	<0.001
General Health	35.8 ± 8.9	58.2 ± 11.1	<0.001

Data analysis test: Independent samples t-test

Table-V

Comparison of SF-36 mental health domain scores (Mean ± SD)

SF-36 Domain	rIDH (n=40)	Non-rIDH (n=63)	p-value
Vitality	38.5 ± 9.2	62.1 ± 10.8	<0.001
Social Functioning	44.1 ± 10.5	71.2 ± 13.6	<0.001
Role-Emotional	40.8 ± 8.7	66.7 ± 12.3	<0.001
Mental Health	41.2 ± 9.5	64.5 ± 11.7	<0.001

Data analysis test: Independent samples t-test

Discussions

This study offers strong evidence about the harmful effects that recurrent intradialytic hypotension (rIDH) can have on the physical and mental health of ESRD patients getting hemodialysis in community settings. Notably, we found that rIDH is quite common, occurring in 38.8% of patients, and it's linked to worse overall health conditions, more severe symptoms, and a significantly lower quality of life in all areas we looked at. This 38.8% rate matches what's been reported globally, which typically ranges from 20-30%, although we often see even higher rates in groups with more health issues[4,14]. Our research backs up what we already know about the demographic and clinical risk factors for rIDH. It clearly shows that older age, longer time on dialysis, and conditions like diabetes and congestive heart failure are all linked to rIDH. This aligns with how rIDH works, involving issues like autonomic dysfunction, lower cardiac reserve, and capillary leakage often caused by diabetic microangiopathy[6,15]. The much higher ultrafiltration rate in the rIDH group is a key risk factor that can be changed. A fast fluid removal rate is a major cause of hemodynamic instability during dialysis[2,16]. One of the most important things we discovered in this study is how strongly rIDH is linked to a lower quality of life. The rIDH group scored much lower across all eight areas of the SF-36, especially when it comes to physical functioning, energy levels, and social interactions. This really highlights how much of a toll this complication takes on overall well-being. The physical challenges stem from the repeated ischemic attacks caused by low blood pressure, which can lead to muscle fatigue, tiredness, and possibly speed up the process of frailty[10,17]. The frequent symptoms of cramping and dizziness really affect physical well-being and cause a lot of distress. Plus, this study shows that the effects go way beyond just physical health. The really low scores in mental health areas indicate that dealing with rIDH can be quite traumatic. Always worrying about a hypotensive episode can lead to ongoing anxiety and fear, which might also contribute to feelings of depression and pulling away from social situations[11,18]. This creates a vicious cycle where the mental distress may exacerbate the perception of physical symptoms, further diminishing overall well-being. Our results are consistent with previous, smaller studies linking IDH to poor quality of life[9], but this study adds weight to those findings by employing a comprehensive, validated tool and controlling for key confounders in a distinct demographic. These findings could really impact clinical practice in Bangladesh and places like it. It's crucial to shift our perspective on rIDH, seeing it not just as a short-term issue but as a key factor affecting patients' overall outcomes. We need to adopt proactive management

strategies, like improving dry weight assessments, using bioimpedance spectroscopy for better volume control, applying lower ultrafiltration rates through dietary sodium advice, and opting for cooler dialysate[19,20]. By putting these measures in place, we might be able to cut down on rIDH occurrences. This could really help not just with survival rates but also with the overall daily experience for people on hemodialysis.

Limitations

This study was done at a single center and looked at data from a specific group of people, which might make it hard to apply the results to a broader population. While the design of the study can show connections, it doesn't prove that recurring low blood pressure during dialysis directly causes the health outcomes we observed.

Conclusion

Recurrent intradialytic hypotension is quite common and really affects the physical and mental health of patients on hemodialysis. It's linked to a greater burden of other health issues, more negative symptoms, and a noticeable drop in quality of life. To help improve the overall well-being and clinical results for these patients, it's essential to adopt proactive management strategies. This could mean optimizing ultrafiltration rates and using cooler dialysate.

Recommendation

It's important to put in place some proactive strategies for patient care, like personalized ultrafiltration profiles, using cooler dialysate, and offering dietary advice to help keep weight gain between sessions down. Regularly checking on patients' quality of life can really help manage the challenges related to low blood pressure during dialysis.

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