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Association of interdialytic weight gain and glycosylated hemoglobin in chronic hemodialysis patients

Narges-Sadat Zahed[1], Adineh Taherkhani[2*], Zahra Davoudi[3]

[1]Department of Nephrology, Loghman Hakim Hopital, Shahid Beheshti Medical University, Tehran, Iran
[2]Department of Internal Medicine, Loghman Hakim Hopital, Shahid Beheshti Medical University, Tehran, Iran
[3]Department Of Endocrinology, Loghman Hakim Hospital, Shahid Beheshti Medical University, Tehran, Iran

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ABSTRACT

Introduction: The most common cause of mortality among chronic hemodialysis (HD) patients is cardiovascular disease. Hypervolemia is an important risk factor for hypertension and cardiovascular mortality in HD patients that include chronic volume overload and interdialytic weight gain (IDWG).
Objectives: The objective of this study is to assess the role of blood glucose in IDWG.
Patients and Methods: In this cross-sectional study we enrolled 231 adult chronic HD patients. Patients with congestive heart failure, hypoalbuminemia, cirrhosis, hypothyroidism and recent blood transfusion were excluded. We weighted patients at the end of dialysis and before initiation the next dialysis in midweek dialysis sessions. Glycosylated hemoglobin (HbA1C) was measured in all patients. Patients were divided into three groups according HbA1C levels (<6%, 6-7%, >7%). Additionally IDWG of three groups was compared using analysis of variance (ANOVA) method.
Results: HbA1C was <6% in 158 (68%) patients (group A), 6-7% in 40 (17%) patients (group B) and >7% in 33 (14%) patients (group C). Mean IDWG was 2.44 kg in group A, 2.25 kg in group B and 2.71 kg in group C. In this study, no significant difference of IDWG in patients with different values of HbA1C was detected ($P=0.206$).
Conclusion: Our study showed that blood glucose level had no significant role in IDWG in chronic HD patients.

Implication for health policy/practice/research/medical education:
In a cross-sectional study on 231 adult chronic hemodialysis patients, we found, blood glucose level had no significant role in IDWG in chronic hemodialysis patients.
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Original

Introduction

Chronic hemodialysis (HD) patients have chronic volume overload and interdialytic weight gain (IDWG). In patients with chronic volume overload before every dialysis time (extra cellular volume ≥15% more than normal that is equal with mean volume >2.5 L) mortality risk is two times of other patients (1-4). IDWG was associated with higher mortality risks. Additionally, high-risk mortality only is seen with severe IDWG (1), however, there are several other studies that showed, the association of even less IDWG with increasing mortality. In these studies the amount of IDWG that associated with increased mortality was >4.8% body weight (5), >5.7% body weight (6) and ≥4% body weight (7). IDWG is associated with different nutritional factors and dialysis variables. Increased IDWG is an independent risk factor for mortality in diabetic end-stage renal disease (ESRD) patients, while in non-diabetic HD patients not shown this association. This result can be due to association of IDWG with other risk factors such as increased blood pressure, cardiovascular disease and inadequate glycemic control (8).
In the study by Chazot et al, no association between

***Corresponding author**: Adineh Taherkhani, Email:adinehtaherkhani.80@gmail.com

hypertension and IDWG was detected (9) while several studies showed various degrees of association between volume overload and hypertension (10,11).

The most potent factor for IDWG is the amount of oral fluid intake that results from oral sodium intake (1). However, other factors such as dialysate sodium concentration, intravenous (IV) fluid administration, hyperglycemia in diabetic patients (12), hypokalemia, angiotensin II and psychologic factors was also interacted (13). Ifudu et al showed that diabetic patients have IDWG 20% more than non-diabetic patients (14). In another study xerostomia was an important factor in IDWG in both diabetic and non-diabetic patients. In diabetic patients the percent of increasing IDWG along with higher HbA1C was associated with severity of xerostomia. It is possible that insulin deficiency at HbA1C ≥9% has a synergistic effect with xerostomia (15).

Objectives

There are several studies that showed increased mortality rate in diabetic nephropathy and diabetic HD (patients with HBA1C>8% (16). In this study we evaluated the association of IDWG with HbA1C regardless the presence or absence of past history of diabetes or use of glucose lowering agent.

Patients and Methods

Patients

We studied 231 adult chronic HD patients (patients who were under dialysis for at least 3 months). All patients were weighted at the end of dialysis and before the start of next dialysis with the same weight scale balance (Omron) and the same person in the midweek session of dialysis. HbA1C was measured in all patients with the immunoturbidimetric method. Patients were divided into three groups based on HbA1C level.

Group A (HbA1C<6%), B (6%< HbA1C <7%), C (HbA1C >7%). Patients with hypoalbuminemia, congestive heart failure, cancer, hypothyroidism, and recent transfusion were excluded. We measured IDWG of each patient and calculated mean IDWG.

Ethical issues

The proposal of this study was approved by the research committee of Internal Medicine Department of Loghman Hakim Hospital (Shahid Beheshti University of Medical Sciences, Tehran, Iran). In all stages of research, the provisions of the Declaration of Helsinki and the directives of the ethics committee of the ministry of health were observed. All participants signed an informed consent.

Statistical analysis

Data variable are summarized as mean ±standard deviation (SD). We used the analysis of variance (ANOVA) method to evaluate the association of IDWG and HbA1C. A *P* value <0.05 was recognized statistically significant.

Table 1. Demographic and clinical characteristics of patients

Group	Total	Female	Male	Age (y)	Weight (kg)	BMI*(kg/m²)
A	158	91	67	58±15.4	66.6±14.5	25±4.3
B	40	22	18	62.3±10	67.7±8.2	26.6±2.7
C	32	19	14	60±15	69.2±12	28.1±5.8
P					0.06	0.036

Table 2. Association between IDWG and HbA1C

Group	HBA1C	Mean IDWG (kg)
A	<6%	2.44
B	6-7%	2.25
C	>7%	2.71
P value		0.206

Results

Demographic characteristics of patients are shown in Table 1. Mean IDWG was 2.44 kg in group A, 2.25 kg in group B and 2.71 kg in group C. In this study, no association between IDWG and HbA1C was detected (Table 2) (*P*= 0.206).

Discussion

IDWG is a risk factor for mortality in chronic HD patients (6-8). Several factors such as nutritional state and dialysis-dependent factors can increase IDWG such as excessive fluid and mostly salt intake. Pre-dialysis hyponatremia has been linked to overhydration and increases IDWG (16). Higher dialysate sodium improves hemodynamic tolerance to ultrafiltration; however, it may lead to increase inter-dialytic weight gain (16,17). Hyperglycemia and HbA1C in diabetic patients (12), hypokalemia, angiotensin II, psychologic factor (13) and xerostomia (15) are risk factors for increasing IDWG in different studies. In our study no association between HbA1C and IDWG was detected. It seems that other risk factors such as intradialytic hypotension and IV fluid administration or high salt intake are more important risk factors in our patients. The difference of our study with the previous can be the method of HbA1C measuring or the cut off for HbA1C.

Conclusion

There is no association between inter-dialytic weight gain and glycosylated hemoglobin in chronic hemodialytic patients.

Limitation of the study

The main limitation of our study was the low proportion of patients with HbA1C>6%. Moreover, this study is observational. It seems that prospective studies with an appropriate proportion of patients with different levels of HbA1C should be conducted to evaluate the correlation between blood glucose and IDWG.

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Authors' contribution

ZNS, TA and DZ performed the research and contributed to design of the study. ZNS prepared the primary draft. TA contributed to data analysis. ZNS, TA and DZ edited the final draft.

Conflicts of interest

All the authors declared that they have no conflicts of interest.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy) have been completely observed by the authors.

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References

1. Chazot C, Collonge C, Charra B. Low sodium diet for dialysis patients: myth or reality? Nephrol Ther. 2007;3:S137-40.
2. Sung J-M, Kuo S-C, Guo H-R, Chuang S-F, Lee S-Y, Huang J-J. Decreased salivary flow rate as a dipsogenic factor in hemodialysis patients: evidence from an observational study and a pilocarpine clinical trial. Clin J Am Soc Nephrol. 2005;16:3418-29.
3. Chuang S-F, Sung J-M, Kuo S-C, Huang J-J, Lee S-Y. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005;99:689-95.
4. Figaro MK, Mack GW. Regulation of fluid intake in dehydrated humans: role of oropharyngeal stimulation. Am J Physiol Regul Integr Comp Physiol. 1997;272:R1740-R6.
5. Foley R, Herzog C, Collins A. United States Renal Data System. Blood pressure and long-term mortality in United States hemodialysis patients. USRDS Waves. 2002;3:1784-90.
6. Saran R, Bragg-Gresham JL, Rayner HC, Goodkin DA, Keen ML, Van Dijk PC, et al. Nonadherence in hemodialysis: associations with mortality, hospitalization, and practice patterns in the DOPPS. Kidney Int. 2003;64:254-62.
7. Kalantar-Zadeh K, Regidor DL, Kovesdy CP, Van Wyck D, Bunnapradist S, Horwich TB, et al. Fluid retention is associated with cardiovascular mortality in patients undergoing long-term hemodialysis. Circulation. 2009;119:671-9.
8. Kimmel PL, Varela MP, Peterson RA, Weihs KL, Simmens SJ, Alleyne S, et al. Interdialytic weight gain and survival in hemodialysis patients: effects of duration of ESRD and diabetes mellitus. Kidney Int. 2000;57:1141-51.
9. Chazot C, Wabel P, Chamney P, Moissl U, Wieskotten S, Wizemann V. Importance of normohydration for the long-term survival of hemodialysis patients. Nephrol Dial Transplant. 2012;27:2404-10. doi: 10.1093/ndt/gfr678.
10. Wabel P, Moissl U, Chamney P, Jirka T, Machek P, Ponce P, et al. Towards improved cardiovascular management: the necessity of combining blood pressure and fluid overload. Nephrol Dial Transplant. 2008;23:2965-71.
11. Dionisio P, Valenti M, Bergia R, Caramello E, Stramignoni E, Berto IM, et al. Influence of the hydration state on blood pressure values in a group of patients on regular maintenance hemodialysis. Blood Purif. 1997;15:25-33.
12. Tzamaloukas AH, Levinstone AR, Gardner Jr KD. Hyperglycemia in advanced renal failure: sodium and water metabolism. Nephron. 1982;31:40-44
13. Bots CP, Brand HS, Veerman EC, Valentijn-Benz M, Van Amerongen BM, Valentijn RM, et al. Interdialytic weight gain in patients on hemodialysis is associated with dry mouth and thirst. Kidney Int. 2004;66:1662-8.
14. Ifudu O, Dulin AL, Friedman EA. Interdialytic weight gain correlates with glycosylated hemoglobin in diabetic hemodialysis patients. Am J Kidney Dis. 1994;23:686-91.
15. Sung J-M, Kuo S-C, Guo H-R, Chuang S-F, Lee S-Y, Huang J-J. The role of oral dryness in interdialytic weight gain by diabetic and non-diabetic haemodialysis patients. Nephrol Dial Transplant. 2006;21:2521-8.
16. Hahr GLBA, Koya RKD, Prischl MMFC, Thajudeen GSB. Managing Diabetic Nephropathies in Clinical Practice. 2017;117-129. doi: 10.1007/978-3-319-08873-0_6.
17. Zahed NS, Gharooi O, Gachkar L, Nikbakht H. The evaluation of relationship between blood pressure and dialysate Na concentration in chronic hemodialysis patients. J Renal Inj Prev. 2016;5(3):118-122. doi: 10.15171/jrip.2016.25.