



Evaluation of Serum Albumin in Dialysis Patients Before and After Intervention in Diet and Nutrition Education

Morteza Ramezani¹, Umm ul-Banin Narenji², Azam Hashemzadeh^{3*}

¹ Internal Medicine Specialist, Umm ul-Banin Narenji, Bachelor of Nursing, Haemodialysis Matron,

² Bachelor of Nursing, Haemodialysis Matron.

³ Bachelor of Nursing, Master of Psychology, Supervisor.

*Corresponding Author

Abstract: *Objective: The lack of proper nutrition and decreases in blood protein and albumin levels are common problems of hemodialysis patients, which is related to rises in the hospitalization rate and mortality of these patients. This study aimed to investigate blood albumin levels in hemodialysis patients before and after alterations in their diets and nutrition education. Methods: In the present descriptive study, laboratory data were extracted from the records of 46 patients (23 males and female 23) undergoing hemodialysis at Ahar Bagher-Al-Oloum Hospital in 2014. Albumin concentrations were measured in three stages. The first and second stages were before and after diet intervention and nutrition education, and the third period was 3 months after intervention in diet and nutrition education. The results of albumin blood tests were compared before and after the alterations, and the data were analyzed by SPSS software. Findings: Average blood albumin level was 3.32 before the alterations, which rose to 3.59 after alterations, and to 3.84 after 3 months of the alternations ($P > 0.05$). Conclusion: There were significant differences between albumin measurements in the dialyzed patients before and after diet alterations and nutrition education ($P < 0.05$). However, there were no significant differences following the alterations and after three months of the intervention ($P < 0.05$).*

Keywords: *Albumin, Hemodialysis, Diet.*

INTRODUCTION

Hemodialysis was first employed in the early 1960s for the patients in the end stage renal disease due to its important role in increasing the longevity of such patients (Chazot, Jean and Medscape, 2009), which is a type of kidney replacement therapy for the treatment of renal failure (Zakeri Moghadam et al., 2003). In addition to some advantages, this treatment method causes such problems as poor quality of life and undesirable nutritional status in hemodialysis patients (Valderrabano et al., 2001; Walters et al., 2002). Based on the estimates of the Charity Foundation for Special Diseases in Iran, a total of 15,448 patients are undergoing hemodialysis treatment. To improve the condition of their illness, these patients need to observe an appropriate ration besides the use of medicines prescribed by a specialist physician¹. Protein-energy malnutrition (PEM) is common in hemodialysis patients, which is one of the most common risk factors for

¹ <http://www.cffsd.org/articles/16>

cardiovascular disease in such patients (Tirmentajn-Jankovic et al., 2004; Kalantar-zadeh et al., 2004). In addition to PEM, hemodialysis patients suffer from the lack of micronutrients 6).

Recently, protein-deficient malnutrition and its effects on the pathogenesis and mortality of patients undergoing hemodialysis treatment have gained a greater interest. Among these nutritional problems, reduction in protein intake is more important due to its role in the survival of patients undergoing hemodialysis therapy².

Reduction of albumin in renal failure may result from increased plasma volume, so it is recommended that the amount of albumin should be measured on a monthly basis³. Albumin is quantitatively the most abundant plasma protein, occurring between 300 and 500 g in human body. A daily albumin level of 15 g is produced in the liver, and when the body needs more albumin synthesis, its production rises up to 2-fold with consumption of nutrients⁴.

The half-life of albumin is 20 days in the body, with a degradation rate of approx. 4% per day. Albumin levels decrease in renal diseases with defective protein retention. A similar decrease is observed in malnutrition due to the lack of protein intake in such diseases as Kwashiorkor. Albumin reduction also occurs in inflammation associated with increasing cortisol levels. In the latter case, the urea cycle activity will be maximal. In all cases where the amount of blood albumin decreases, calcium and magnesium are lowered, but this reduction has no effect on ionized calcium remaining constant (Ahmadi Gheshlaghi and Ghorbanali, 2008).

Reductions in serum albumin is a determining index of mortality and hospitalization rates in patients undergoing dialysis. Mortality risk rises when serum albumin levels decrease to less than 4 dl (Zakeri Moghadam et al., 2003). If serum albumin levels decline to less than 3 dl, the dialysis patient requires hospitalization (Ahmadi Gheshlaghi and Ghorbanali, 2008). Other than nutritional status, however, serum proteins have relationships with other parameters. Yet, studies have shown that serum albumin concentrations are strongly influenced by protein intake rates (Zakeri Moghadam et al., 2003). Considering the important role of nutrition in dialysis patients, this study evaluated and compared blood albumin levels in dialysis patients before and after diet alterations and nutrition education.

Materials and Methods

In the present descriptive study, the population included patients with advanced renal disease undergoing chronic hemodialysis at dialysis ward of Bagher-Al-Oloum Hospital (Ahar, Iran) in 2015. A total of 46 records was selected containing complete laboratory data of hemodialysis patients. Blood albumin levels of these patients (baseline and before dietary changes) were obtained from the existing records in June 2015. These data were then compared with tests after dietary changes, nutrition education, and three months after dietary changes. It should be explained that dietary changes and nutrition education comprised those made in the diets of dialysis patients with dropped albumin levels during the above period. These included using eggs, white meat, and kebab in the breakfast of admitted patients, as well as training the use of the same diet at home and, in general, the use of albumin-containing diets. According to the results of laboratory tests, these dietary changes had no effects on the routine laboratory results (e.g., Na, K, pH, etc.) of dialysis patients. They did not have infectious diseases, were not in the waiting list for kidney transplantation, and usually dialyzed three times weekly each for 4 h. The collected data were analyzed by SPSS software. A significance level of $P < 0.05$ was considered in all the tests.

² <http://www.cffsd.org/articles/16>

³ http://www.iran_blood.org/association/albumin

⁴ Ibid

Findings

There were 50% males and 50% females among 46 patients undergoing hemodialysis. Tables 1, 2, and 3 represent albumin frequency distribution before and after the intervention, and three months after the intervention.

Table 1. Distribution of albumin frequency before the intervention

Albumin before	Frequency	Percentage
< 3	15	32.6
3 - 4	28	60.9
> 4	3	6.5
Total	46	100

Table 2. Distribution of albumin frequency after the intervention

Albumin before	Frequency	Percentage
< 3	7	15.2
3 - 4	35	76.1
> 4	4	8.7
Total	46	100

Table 3. Distribution of albumin frequency three months after the intervention

Albumin 3 months later	Frequency	Percentage
< 3	3	6.5
3 - 4	30	65.2
> 4	13	28.3
Total	46	100

Blood albumin was measured in three stages. The first and second stages were before and after the intervention in the diet and training, and the third stage was three months after dietary changes and training. Mean blood albumin levels before and after the intervention were 3.32, 3.32, and 3.59, respectively, and 3.84 after three months of the intervention. The results of repeated measures ANOVA showed significant differences between blood albumin levels of dialysis patients before and the after dietary changes and nutrition education ($p = 0.001$, $\eta = 0.26$, $F = 7.81$). Moreover, the levels of albumin increased above 4 units from 6.5% before the intervention to 8.7% after the intervention, and to 28.3% following three months. The results of LSD post hoc test revealed that average blood albumin concentrations elevated significantly after the intervention and also three months after the dietary changes compared to those recorded before the intervention. However, no significant differences were observed in the levels of albumin after the intervention and three months after dietary changes and nutrition education ($P < 0.05$).

Table 4. The results of repeated measures ANOVA for blood albumin in three stages of measurements

Source of variation	Mean	SD	Hotelling's trace	F	Df (H)	Df (E)	Sig.	η^2
Albumin before	3.322	0.6207	0.355	7.811	2,000	44,000	0.001	0.262
Album after	3.587	0.5924						
Albumin 3 months later	3.836	0.5467						

Table 5. The results of LSD post hoc test for paired comparisons

Albumin (I)	Albumin (J)	Mean Difference (I-J)	Difference SE	Sig.
Albumin before	Album after	*-0.265	0.124	0.038
	Albumin 3 months after intervention	*-0.514	0.129	0.000
Album after	Albumin 3 months later	-0.249	0.125	0.052

Discussion and Conclusion

Blood albumin analysis in dialysis patients showed significant differences in albumin level increases between before and after dietary changes, and nutrition education (Table 4). Low levels of albumin are important mortality factors in hemodialysis patients. Although hypopalbuminemia is associated with malnutrition, inflammation can also affect albumin levels in patients undergoing dialysis (Fernandez-Reyes et al., 2002). Factors inducing hypopalbuminemia in hemodialysis patients include malnutrition, decreased synthesis, stress, and inflammation (Teixeira Nunes et al., 2008). In a study by Yen and Kaysen, dropped synthesis of albumin was reported to be the major factor of hypopalbuminemia in hemodialysis patients, resulting in malnutrition and inflammation⁵. The main problem in determining the levels of albumin as a pure nutritional index is its direct association with inflammation. Hypoalbuminemia results from inflammation and inadequate protein and energy intake. Accordingly, hemodialysis patients with a good nutrition may develop hypoalbuminemia because of inflammation. Therefore, although albumin is not a reliable indicator of nutritional status, it is useful in identification of patients at risk of malnutrition (Galland et al., 2001).⁶

In this study, serum albumin levels in hemodialysis patients increased significantly from 3.323 to 3.83 at the end of study. In a similar study by Yang et al., rising dialysis round led to significant elevations in serum albumin levels (Yang et al., 1996). Galland et al. also reported that increasing dialysis frequency significantly raised serum albumin levels. It seems that increasing dialysis frequency improves appetite and intake of nutrients by hemodialysis patients, ultimately leading to enhanced nutritional status (Galland et al., 2001).

Although positive effects of dialysis frequency, improved appetite, and intake of nutrients on albumin levels have been demonstrated in most studies, Goldfarb et al. found no significant differences in serum albumin concentrations (Goldfarb-Rrummyantzev et al., 2006).

Acknowledgements

The authors would like to appreciate Dr. Ramezani and Dr. Dalir for their scientific comments on this manuscript. Further thanks go to Ms. Sarkhosh, the honorable matron of the hospital for her comprehensive support, and also the nutrition unit of the hospital.

References

1. Ahmadi Gheshlaghi, Ghorbanali (2008). Hemodialysis. Tibriz: Ghazi Jahani, Tehran: Golban 2007. P. 75.
2. Chazot c, Jean G. and Medscape. The advantages and challenges of increasing the duration and frequency of maintenance dialysis sessions. *Nat Clin Pract Nephrol* 2009;5:34-44.
3. Fernandez-Reyes MJ, Alvarez-Ude F, Sanchez R, Mon C, Iglesias P, Diez JJ. And Vazquez A. Inflammation and malnutrition as predictors of mortality in patients on hemodialysis. *J Nephrol* 2002; 15:136-143.
4. Galland R, Traeger J, Arkouche W, Cleaud C, Delawari E, and Fouque D, Short daily hemodialysis rapidly improves nutritional status in hemodialysis patients. *Kidney Int* 2001;60:1555-1560.
5. Goldfarb-Rrummyantzev AS, Leypoldt JK, Nelson N, Kutner NG. and Cheung AK. A Crossover study of short daily haemodialysis. *Nephrol Dial Transplant* 2006; 21:166-175.
6. Kalantar-zadeh K, Kopple JD, Humphreys MH. And Block G, Comparing outcome predictability of markers of malnutrition-inflammation complex syndrome in haemodialysis patients. *Nephrol Dial Transplant* 2004; 19:1507-1519.

⁵ <http://www.cffsd.org/articles/16>

⁶ <http://www.iran-blood.org/association/albumin>

7. Kalantar-Zadeh K.and Kopple JD,Trace Elements and Vitamins in Maintenance Dialysis patients. *Adv Ren Replace Ther* 2003; 10:170-182.
8. Teixeira Nunes F,de Campos G,Xavier de paula SM, Merhi VA,Portero-McLellan KC, da Motta DG.and de Oliveira MR, Dialysis adequacy and nutritional status of hemodialysis patients. *Hemodial Int*2008; 12:45-51.
9. Tirmentajn-Jankovic B. and Dimkovic N, simple methods for nutritional status assessment in patients treated with repeated hemodialysis.*Med pregl* 2004; 57:439-444.
10. Valderrabano F,Jofre R.and Lopez-Gomez JM,Quality of life in end-stage renal disease patients.*Am J kIdney Dis*2001;38:443-464.
11. Walters BA,Hays RD,spritzer KL,Fridman M. and Carter WB,Health-related quality of life, depressive symptoms,anemia, and malnutrition at hemodialysis initiation. *Am J Kidney Dis*2002; 40:1185-1194.
12. Yang C-S,Chen S-W,Chiang C-H, Wang M, Peng S-J. AND Kan Y-T, Effects of increasing dialysis dose on serum albumin and mortality in hemodialysis patients. *AM J Kidney Dis*1996; 27:380-386.
13. Zakeri Moghadam, Masoumeh and Ali Asgharpour, Mansoureh (2003). Special nursing care in CCU, ICU, and Dialysis wards. Tehran: Andisheh Rafie.