Serum Mannose-binding Lectin in Patients on Peritoneal Dialysis Compared With Healthy Individuals

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Introduction. The increased susceptibility to infection in patients with end-stage renal disease is probably secondary to the impaired immune defense in uremia. Mannose-binding lectin (MBL) has an important role in host defense through activation of the lectin complement pathway. The aim of this study was to measure serum MBL level in peritoneal dialysis patients and compare it with a healthy group.
Materials and Methods. Seventy peritoneal dialysis patients and 70 healthy individuals were enrolled in this study. Serum MBL levels were measured by an enzyme-linked immunosorbent assay kit using the mannan molecule. In addition, serum C-reactive protein and albumin levels were measured to determine whether there is a correlation between serum MBL level and these two parameters.
Results. The mean serum MBL level was 2.32 ± 2.54 µg/mL (range, zero to 6.93 µg/mL) in the patients group and 1.80 ± 2.14 µg/mL (range, zero to 6.97µg/mL) in the control group (P = .19). No significant correlation was detected between age and serum MBL level in either the groups. In the patients group, no significant correlation was found between serum MBL and C-reactive protein levels or MBL and albumin levels. There were no correlation between duration of peritoneal dialysis and MBL or dialysis adequacy and MBL, either.
Conclusions. This study did not find MBL deficiency in peritoneal dialysis patients as compared to the healthy individuals.

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INTRODUCTION

The role of the complement system in kidney disease has long been recognized, but there have been major advances in our understanding of its role over the past decade.[1] Mannose-binding lectin (MBL) is a member of the collectin family which is secreted by the liver. Mannose-binding lectin is a key component of the innate immunity and acts as a recognition molecule of lectin complement pathway. In human circulation, MBL is in complex with MBL-associated serine protease 2 and can activate the lectin pathway through binding to carbohydrate structures of wide range of microorganisms.[2-4] Mannose-binding lectin also acts as an acute-phase protein. During inflammatory process, the serum MBL level raises by 2 to 3 folds.[5]

Serum MBL level is highly variable among different individuals. This variation is due to *MBL* gene polymorphism. Low levels of serum MBL can raise the risk of infection in immunocompromised patients and transplant recipients.[2,3] Lam and coworkers reported lower serum MBL levels in peritoneal dialysis and hemodialysis patients compared with healthy individuals.[6] Satomura

and colleagues reported significant elevation of serum MBL levels in hemodialysis patients compared with healthy controls,[7] and the results of our previous study was the same too.[8] Ghods and Berger reported that serum MBL levels in CKD patients (undergoing renal replacement therapy) are similar to a healthy group.[9,10] Satomura and colleagues explained lower levels of functional MBL and higher levels of oligomer MBL in hemodialysis patients compared with healthy individuals.[11] They also reported the low MBL levels as an independent predictor of mortality in hemodialysis patients.[12]

Given the conflicting results of these studies, the aim of this study was to measure serum MBL levels in peritoneal dialysis patients and compare those with the levels in a control group in the Iranian population.

MATERIALS AND METHODS

Two groups of patients were included in this cross-sectional study: 70 peritoneal dialysis patients, who were selected randomly from Shafa Dialysis Center, Tehran, and a control group of 70 healthy volunteers with normal physical examination and basic laboratory tests, randomly selected from the general population of Tehran. Exclusion criteria were long period of peritoneal dialysis (more than 5 years) and technique failure.

In both groups, serum levels of MBL, C-reactive protein (CRP), albumin, and creatinine, as well as urea nitrogen, were measured. In order to measure MBL, serum samples were collected within 4 months (from March to June 2011) and were stored in -20°C. Serum levels of MBL were measured using enzyme-linked immunosorbent assay kits (Sanquin, Amsterdam, Netherland), based on capturing with mannan molecule. Serum levels of CRP were measured using the Turbidometry method. The study protocol was approved by the Ethics Committee of Babol University of Medical Sciences.

Data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 18.0, SPSS Inc, Chicago, Ill, USA). The Mann-Whitney test was used to compare serum MBL levels between the two groups of peritoneal dialysis patients and control group, overall and by sex. The Pearson correlation analysis was used for evaluation of the relationship between MBL and other parameters including age, CRP, and albumin levels, as well as the duration of peritoneal dialysis and KT/V. A *P* value less than .05 was considered significant.

RESULTS

Characteristic of the participants are shown in Table 1. In the patients group, the mean duration of peritoneal dialysis was 26.0 ± 20.1 months. The mean KT/V was 1.96 ± 0.14. The causes of CKD was DM in 20 of 70 patients, hypertension in 19, polycystic kidney disease in 4, Alport syndrome in 3, urinary calculus in 3, vesicoureteral reflux in 3, systemic lupus erythematosus in 2, nephrotic syndrome in 2, unknown in 9, and others in 5.

The mean serum MBL level was 2.32 ± 2.54 µg/mL (range, zero to 6.93 µg/mL) in the patients group and 1.80 ± 2.14 µg/mL (range, zero to 6.97µg/mL) in the control group (*P* = .19; Table 2). The mean serum MBL levels were slightly higher in the men than the women in both groups, but there was no difference by sex between the two groups (Table 2). No significant correlation was detected between age and serum MBL level in either the patients group (r = 0.012, *P* = .92) or the control group (r = 0.155, *P* = .20).

Table 2. Mean Serum Mannose-binding Lectin Levels of Participants

Participants	Mannose-binding Lectin, µg/mL		*P*
	Peritoneal Dialysis Patients	Healthy Individuals	
All	2.32 ± 2.54	1.80 ± 2.14	.19
Men	2.56 ± 2.67	2.04 ± 2.07	.40
Women	2.04 ± 2.40	1.64 ± 2.20	.77

Table 1. Demographic Characteristic of Participants

Characteristic	Participants	
	Peritoneal Dialysis Patients	Healthy Individuals
Mean age (range), y	50.4 ± 15.7 (16 to 75)	37.0 ± 13.2 (19 to 71)
Sex (%)		
Male	38 (54.3)	28 (40.0)
Female	32 (45.7)	42 (60.0)

In the patients group, no significant correlation was found between serum MBL and CRP levels (r = 0.036, *P* = .67) or MBL and albumin levels (r = 0.018, *P* = .84). There were no correlation between duration of peritoneal dialysis and MBL (r = 0.147, *P* = .22) or KT/V and MBL (r = 0.083, *P* = .49), either.

DISCUSSION

Increased susceptibility to infection in end-stage renal disease is attributed to uremia-dependent immune system compromise. Mannose-binding lectin, as a part of innate immunity, accelerates phagocytosis and activates the complement system.[13] This study was performed to determine serum MBL level in peritoneal dialysis patients and compare with healthy individuals. Based on the results of this study, no significant difference was found between the two groups in a sample from the Iranian population.

Similar to our result, Erken and colleagues reported comparable mean values for serum MBL of 2536.5 ng/mL in patients on peritoneal dialysis, 2088.7 ng/mL in hemodialysis patients, and 1924 ng/mL in healthy controls from a Turkish population.[14] Serum level of MBL is influenced by the *MBL* gene polymorphisms. In this study, MBL genotyping of the two groups were not studied. Lam and colleagues reported the serum MBL levels of peritoneal dialysis hemodialysis patients lower than a healthy group.[6] They also believed that the low serum level of MBL in peritoneal dialysis patients was due to loss via the peritoneal route. Lam and colleagues also studied the *MBL* gene polymorphisms and reported that the studied groups were similar in *MBL* gene mutations and were comparable to the control group.[6] Satomura and colleagues reported a significant elevation of serum MBL levels in hemodialysis patients compared with healthy controls.[7] They concluded that the difference in their results was due to differences in the method of measurement.[11] In our previous study, we reported serum MBL levels higher in hemodialysis patients compared with healthy controls.[8] Satomura and colleagues explained lower levels of functional MBL and higher levels of oligomer MBL in hemodialysis patients compared with healthy individuals. They believed that functional MBL or high-molecular-weight MBL acted as a component of lectin complement pathway and it reduced in CKD patients due to uremia; on the other hand, oligomer MBL or low-molecular-weight MBL acted as an acute-phase protein and increased in CKD patients.[12]

It is suggested that serum MBL level may predict the results of kidney transplantation. Berger and colleagues revealed the association between low pretransplant MBL levels and long-term graft survival in kidney recipients.[10]

Peritoneal dialysis patients are susceptible to various infections like peritonitis. Lam and colleagues did not find any relationship between MBL gene polymorphism, serum MBL level, and peritonitis in peritoneal dialysis patients.[6] Considering the MBL as an acute-phase protein, we studied the relationship between serum MBL and CRP, which acts as a positive acute-phase protein, and serum MBL and serum albumin, which acts as a negative acute-phase protein. There were no correlation between serum MBL and CRP level or serum MBL and albumin level. In the present study, there was no relationship between MBL level and peritoneal dialysis among the men and the women. In Erken and colleagues' study, there was no difference in the frequency of MBL deficiency between men and women in the peritoneal dialysis and control groups.[14]

CONCLUSIONS

Serum MBL levels was not significantly different between peritoneal dialysis patients and healthy individuals; in other words, in our population, there was no MBL deficiency in the peritoneal dialysis patients compared to the healthy individuals. As a limitation, this study had a low sample size and the sample was from a regional center; the results may not be directly comparable to all Iranian patients. Further studies are needed to be confirm these findings.

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CONFLICT OF INTEREST

None declared.

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