Short Article

Uremia Effect on White Blood Cell Count in Patients with Renal Failure

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A B S T R A C T

Introduction: It is believed that uremia causes destruction of white blood cells (WBC) and thus causes leukopenia. Therefore this study had an attempt to assess the effect of uremia on WBC count.

Materials and Methods: This case control study was conducted on 120 uremic patients and 100 samples as control group. All samples were examined for determination of urea and creatinine in their serum and complete blood counts were determined.

Results and Conclusion: In healthy individuals, the mean value of urea was 14.5 ± 1.9 mg/dL and the mean value of creatinine was 0.9 ± 0.2 mg/dL (male) and 0.66 ± 3.2 mg/dL (female). In the patient group, the mean value of urea was 83 ± 2.4 mg/dL. The mean value of creatinin in male and female were 2.4 ± 1.3 mg/dL and 2.1 ± 1.7 mg/dL respectively. The mean of WBC count in case and control groups were 6.08 ± 2.24 and $6.17\pm2.43\times10^9$/L respectively (p=0.71). Our results indicate that uremia cannot change leukocyte count.

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Introduction

The term uremia is used to describe the illness that is associated with kidney failure. It is known that uremia is due to accumulation of organic waste products which are normally cleared by kidneys. One of the most common components of urine is urea which is normally excreted in urine. Uremia is a complication of chronic kidney disease and acute kidney injury (known as acute renal failure) due to renal failure in excretion of urea and creatinine. As a result, the blood levels of urea and creatinine would be elevated in renal failure and uremia. It is apparent that kidney failure can lead to patients health problems[1]. In addition, uremia is associated with some hematologic abnormalities such as anemia, hemostatic disorder, granulocytic disorders and lymphocytic and platelet dysfunction. Excessive bleeding, hemostatic dysfunction and prolonged platelet tests results are common features of uremia [2]. Infections are seen in end-stage renal disease patients. It is said that infectious incidence increases with elevated level of uremia which is seen in treatment with azathioprine or cyclophosphamide. Also, it is reported that immunosuppressive effects are seen in uremic patients. Additionally, impaired defenses and developed infections are seen in patients with renal failure on dialysis. Previous studies have shown that Gram negative septicemia and fungal infections are major causes of morbidity and mortality in patients with acute renal failure[3]. It is known that leukocytes

play a major role in host defense response against life-threatening infections [4]. Leukocytes show impaired activity in patients with renal failure. Polymorphonuclears leukocytes (PMNLs) in patients with uremia fail to migrate properly and show defective phagocytosis [5]. It may be the cause of increased susceptibility to the infections in uremic patients [6]. It is of great importance to clarify the cause of higher occurrence of infections in uremic patients. In order to help patients to get rid of these complications by introducing some granulocyte products in the present study, we focused on the white blood cell counts and sought to determine the effect of uremia and its related toxins on white blood cell counts

Materials and Methods

This case control study was conducted on 120 uremic patients and 100 individuals as the control healthy group. A written consent form was obtained from each patient and healthy individuals. Inclusion criteria for patients were documented increased plasma urea and creatinine levels. Initially all individuals were examined for determination of urea and creatinine levels in their 3 milliliter serum performed by Hitachi clinical analyzer (Hitachi, Japan). Subsequently, 2ml of whole blood volume was taken for complete blood counts (CBC) performed by using EDTA added sample by Sysmex, KX21N (Sysmex CorporationKobe, Japan), automated hematology analyzer. CBC was performed on

each individual instantly and tests for creatinine and urea were carried out up to 2 hours after sampling. To this end, two samples were obtained from each patient and healthy individuals, one for measurement of urea and creatinine and the other for complete blood cell count.

Statistical Analysis

Statistical analysis was performed by SPSS version11. The results were compared with each other and evaluated via student t-test.

Results and Discussion

There were 76 (63%) men and 44 (37%) women in the case group and 62 (62%) men and 38 (38%) women in the healthy group.

The age average of men and women participants was 48 ± 2.4 and 44 ± 3.1 years respectively. In healthy individuals, the mean value of urea in males and females was 14.5 ± 1.9 mg/dL and the mean value of creatinine was 0.9 ± 0.2 mg/dL in males and 0.66 ± 3.2 mg/dL in females. In the patient group, the mean value of creatinine in males and females was 2.4 ± 1.3 mg/dL and 2.1 ± 1.7 mg/dL respectively. The mean value of urea was 83 ± 2.4 mg/dL in the patient group. The mean of WBC count in case and control groups were 6.08 ± 2.24 and $6.17\pm2.43\text{x}10^9$/L respectively As shown in table 1, the comparison between the patients and control groups revealed that there is no significant difference between the WBC counts of these two groups (p=0.71).

Table 1. WBC count and urea level in patients with uremia and healthy control.

	Groups	Number	Mean ± SD	P Value
Urea	Control	100	$14.5 \pm 1.9^*$	0.009
	Case	120	83 ± 2.4	
White blood cells	Control	100	$6.17 \pm 2.43^{**}$	0.71
	Case	120	6.08 ± 2.24	

*mg/dL $^{**}10^9$/L

Uremia is one of the complications of kidney disorders which is associated with the accumulation of waste products in patients plasma. Uremic patients face increased levels of Hb, RDW and MCV[7]. Uremia associated with immune dysfunction has been described in some studies[4]. Moreover, some immune system functional abnormalities are reported due to accumulation of uremic toxins. A repertoire of immune system dysfunctions are oxidative burst disorders, chemotaxis and phagocytosis abnormalities [4]. In addition, there are some problems with antigen

presenting processes in uremic patients [4]. Most of the studies focus on the functional abnormalities of WBC. In the present study, we sought to determine the correlation between white blood cell count and increased level of urea and other toxins in uremic patients. In addition, it is important to investigate if the urea influences the white blood cell counts in cell counter. Minnaqanti et al. have expressed that patients with kidney disorders impair host defenses [8]. Baqdasarian et al. have shown that patients with renal disease on dialysis are faced with

infection which is a major cause of mortality and morbidity [3]. These studies reveal that there is an association between kidney disorder and infection. Agrawal et al. have reported that antigen presenting dendritic cells diminish in uremia [9]. Reduced number of B lymphocytes and their capacity for producing antibody has been reported in uremic patients by Pahl et al. [10]. Depletion of naive and memory T cells in uremic conditions has been reported by Moser et al. [11].

Conclusion

Our findings indicate that uremia is not associated with decreased white blood cell count. More investigations should be done to clarify the relation between WBC and uremia.

Conflict of Interest
The authors declare that they have no conflicts of interest

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