



Gender Effect on Some Blood Parameters in Patients Undergoing Haemodialysis in North Western Algeria



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ABSTRACT

Replacement therapy for chronic kidney disease using haemodialysis involves the elimination of excessive toxic fluids and toxic metabolic end products from the body. Worldwide, gender significant differences exist with regard to the epidemiological aspect, evolution and blood parameters of chronic renal failure disease. In the present retrospective study, 289 medical files of adult patients (154 men and 135 women) aged 20 to 78 years were investigated to understand the relationship between gender difference and blood parameters in patients with chronic renal failure undergoing haemodialysis in north western Algeria. Our results revealed significant higher levels of haemoglobin ($p=0.003$), haematocrit ($p=0.005$), creatinine ($p<0.001$) and uric acid ($p=0.037$) in men comparing to women. However, women serum samples were characterized by higher significant level of platelets ($p=0.002$). No significant differences ($p>0.005$) were observed between the two genders regarding the other parameters of blood count formula, liver function parameters, urea, mineral status (calcemia and phosphoremia), basic biochemical levels (glycaemia and lipids), C-reactive protein (CRP) and parathyroid hormone (PTH). In dialysis patients, and despite the fact that some serum parameters vary significantly, the majority of the parameters recorded were often high in the males compared to the female gender. This finding may be due to the existence of specific confounding prognostic factors for each sex, which may or may not compensate for each other, therefore, ultimately, leading to overall non-significance.

Keywords: haemodialysis, blood parameters, gender difference, north western Algeria.

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1 Introduction

Currently, nearly 2.6 million patients worldwide have different kidney diseases [1], the major problem in these patients remains the risk of developing different complications such as heart disease, high blood pressure, anaemia and inflammation [2]. However, when kidney failure becomes chronic, through gradual progression - over a period of weeks, months or years - the kidneys slowly stop functioning, there is a terminal kidney disease [3]. An adequate treatment protocol must take into account gender differences, since not only demographic characteristics, but also many clinical, laboratory and therapeutic parameters can affect morbidity and mortality and differ considerably between the two genders [4].

Haemodialysis is one of the kidney replacement treatments [5]. The technique plays an essential role in the process of extracorporeal elimination of waste when the kidneys are affected. The haemodialysis procedure is performed two to three times a week over two to four hours. The duration of dialysis varies according to many factors, including kidney function, the waste amount in the body, the level of salts and body weight [6]. Our present study was performed in order to understand the relationship between gender difference and blood parameters in patients with chronic renal failure undergoing haemodialysis in north western Algeria.

2 Materials and Methods

2.1 Patients and study localization

This retrospective study involved two hundred and eighty-nine blood samples, of patients with chronic renal failure undergoing haemodialysis, collected from Tabia Hospital "BOURAS Miloud", in Sidi-Bel-Abbès, north-western Algeria. Ethical approval for performing the present study was taken from the scientific council of the faculty of natural and life sciences, Djillali LIABES University. The patient's medical records were checked respecting the rules of anonymity with protecting the personal information of each patient.

2.2 Studied parameters

Results of blood samples analysis were taken from patients' medical record. The following blood parameters were considered: blood count formula, liver function parameters (ASAT and ALAT), renal parameters (urea, creatinine and uric acid), mineral status (calcemia and phosphoremia), basic biochemical levels (glycaemia and lipids), C-reactive protein (CRP) and parathyroid hormone (PTH).

2.3 Statistical Analysis

The Statistical Package for Social Sciences (SPSS, version 24.0) program was used in this study. All values were expressed as Mean \pm Standard Deviation (SD). The Student 't' test for independent variables was considered significant when the probability (p) was less than 0.05 ($p > 0.05$).

3 Results and Discussion

The study population consisted of 154 men and 135 women, their mean age was 52.52 ± 12.31 years (48.51 ± 9.88 years, in men *vs.* 57.09 ± 13.22 years, in women) and ranged from 20 to 78 years. Our results show a significant higher level ($p < 0.05$) of haemoglobin, haematocrit and platelets in men comparing to women (table 1). However, higher non-significant levels of red blood cells, mean cell volume (MCV), leucocytes and mean corpuscular haemoglobin concentration (MCHC) were observed in women. Several studies have shown that there are differences between males and females in hematological parameters like sodium, potassium, calcium, creatinine, amylase, total protein, albumin, phosphate and liver enzymes. The levels of these parameters are usually higher in males. Parameters like platelets, eosinophils, basophils, red cell counts, hemoglobin and hematocrit tend to vary among sex and age group [7, 8].

Our results indicate that the vast majority of our patients have anaemia. Similar results were reported by Anees et al., 2018 who found that 91.2% of kidney failure patients had anaemia [9]. Indeed, the endogenous

erythropoietin deficiency, the uremic inhibitors and the shortened red blood cells survival are the main cause of anaemia in haemodialysis patients [10]. However, anaemia aggravates exercise tolerance, cognitive competence and reduces quality of life in dialysis patients [11]. Several authors stated that the haemoglobin is one of the most affected haematological parameters in patients with kidney failure [2, 12, 13].

Table 1. Comparison of the complete blood count results between men and women

	All patients	Males	Females	p value*
Red Blood Cells (millions/mm ³)	3.69±0.17	3.62±0.74 [4.2-5.7]	3.78±0.25 [4.0-5.3]	0.518
Haemoglobin (g/100ml)	10.66±1.97	10.99±1.81 [14.0-17.0]	10.28±2.08 [12.5-15.5]	0.003
Haematocrit (%)	37.77±7.28	33.22±7.14 [40-52]	29.84±7.07 [37-46]	0.005
Mean Cell Volume (MCV) (μ ³)	88.76±11.98	88.14±12.93 [80-95]	89.55±10.79 [80-95]	0.603
Leukocytes (/mm ³ ×1000)	6.66±0.24	6.46±0.23 [4.0-10.0]	6.91±0.25 [4.0-10.0]	0.203
Mean Corpuscular Haemoglobin Concentration (MCHC) (%)	26.11±1.22	25.66±1.32 [30-35]	27.08±1.04 [30-35]	0.779
Platelets (/mm ³ ×1000)	214.43±71.87	200.65±75.70 [150-400]	229.82±64.25 [150-400]	0.002

(*) p value of student t test, a p<0.05 was considered as significant. In square brackets, the target values.

According to Pandian et al. (2017), anaemia due to a reduction in haemoglobin levels is a common complication encountered in dialysis patients [14]. The same conclusions have been done by Suega et al. (2005) [15] and Bhatta et al. (2011) [16].

Table 2 displayed a comparison of liver enzymes serum levels (Aspartate Transaminase “ASAT” and Alanine Aminotransferase “ALAT”) between men and women. Normal low rates have been recorded for both enzymes in our patients, although, these rates are high in women comparing to men. Several recent studies have revealed that serum ALT levels are lower in dialysis patients [17-19]. All the same, in their study done in Italy, Fabrizi et al. (2001) found lower ASAT and ALAT levels among dialysis patients compared to predialysis ones [20]. According to van Beek et al. (2013), in haemodialysis patients, the observed variations between males and females in ASAT and ALAT serum may be partly due to hereditary factors and are impacted by the biological effects of chronic renal failure disease and the patient environment. The latter would comprise metabolic risk issues such as dyslipidaemia, inflammation, alcohol use, smoking, vitamin D levels and coffee consumption [21].

Table 2. Effect of sex differences on the liver transaminases

	All patients	Males	Females	p value*
Alanine Aminotransferase (ALAT) (IU/L)	14.34±1.04	13.71±0.99 [8-45]	14.98±1.09 [6-35]	0.565
Aspartate Transaminase (ASAT) (IU/L)	19.37±1.01	17.92±0.86 [10-40]	20.94±1.14 [10-35]	0.142

(*) p value of student t test, a p<0.05 was considered as significant. In square brackets, the target values.

In numerous studies, a strong association was observed between serum creatinine and serum urea levels among renal failure patients undergoing or not haemodialysis. However, both serum creatinine and serum urea are accepted putative indices to evaluate the renal functions. Our results, summarized in table3, indicate a higher significant level of urea, creatinine (p<0.001) and uric acid (p=0.037) in male dialysis patients comparing to females. These results are consistent with those of Ul Amin et al. (2014) where creatinine and urea levels were commonly higher in male dialysis patients than women [22]. Several Scientifics affirmed

that, every day, 2% of creatine is converted into creatinine, that's why the normal values for creatinine are in the range of (male: 20 to 25 mg/kg/day; female 15 to 20 mg/kg/day) [2]. This difference between males and females is explained by the greater muscle mass in men comparing to women.

Table 3. Comparison of renal function tests between the two genders

	All patients	Males	Females	p value*
Urea (g/L)	1.57±0.50	1.65±0.53 [0.1-0.55]	1.47±0.45 [0.1-0.55]	0.772
Creatinine (mg/L)	81.30±2.85	89.97±3.03 [5-15]	71.75±2.30 [5-15]	<0.001
Uric acid (mg/L)	47.19±2.17	50.04±2.30 [40-60]	43.66±1.95 [40-60]	0.037

(*) p value of student t test, a $p < 0.05$ was considered as significant. In square brackets, the target values.

As shown in table 4, we compared serum calcium and phosphorus between males and females undergoing dialysis. Our results displayed normal higher non-significant levels of both serum calcium ($p=0.430$) and phosphorus ($p=0.519$) in males comparing to females. There is controversy over the association of gender with the mineral parameters in patients with chronic kidney disease. In contrast to our study, Artan et al. (2016) reported that control of serum phosphorus was better in women compared to men [4]. The main reasons are probably the efficiency of dialysis, which results in greater phosphorus clearance, compliance with a strict diet and/or better adhesion to phosphate binders [4]. According to the JSDT clinical practice guidelines, the management of serum phosphorus is of greater priority [23]. Collinson et al. (2014) reported that the gender difference may be a factor influencing the control of chronic kidney disease-related minerals [24].

Table 4. Gender effect on mineral status

	All patients	Males	Females	p value*
Calcemia (mg/L)	99.75±3.29	102.57±2.68 [85-105]	96.62±3.88 [85-105]	0.430
Phosphoremia (mg/L)	37.39±2.32	38.36±2.46 [30-40]	36.15±2.12 [30-40]	0.519

(*) p value of student t test, a $p < 0.05$ was considered as significant. In square brackets, the target values.

Our outcomes about glycaemia, total cholesterol and triglycerides indicates normal range of these parameters in our population (table 5), except the higher level of triglycerides in females. However, the comparison between males and females revealed non-significant differences ($p > 0.005$). Similar results have been reported by Rusul Arif et al. (2000) [3]. All, the same no significant effect of gender was observed on C-reactive protein (CRP) and parathyroid hormone (PTH) levels in our study population (table 6). Though, the levels of these two parameters in men were higher than those observed in women in accordance with previous reports [25]. The explanation for this result is ambiguous; probably, poorer control of phosphorus serum level and less regular vitamin D usage may explain this conclusion.

Table 5. Comparison of basic biochemical parameters between males and females

	All patients	Males	Females	p value*
Fasting glycaemia (g/L)	1.02±0.51	0.99±0.48 [0.8-1.0]	1.06±0.54 [0.8-1.0]	0.321
Total cholesterol (g/L)	2.39±1.21	1.42±0.38 [1.15-2.7]	3.79±1.89 [1.15-2.7]	0.179
Triglycerides (g/L)	1.31±0.80	1.36±0.12 [0.6-1.7]	1.24±0.84 [0.6-1.7]	0.453

(*) p value of student t test, a $p < 0.05$ was considered as significant. In square brackets, the target values.

Table 6. Comparison of C-reactive protein and Parathyroid hormone levels between men and women

	All patients	Males	Females	p value*
C-reactive protein (CRP) (mg/L)	339.25±19.05	422.66±20.41 [<10]	267.76±17.32 [<10]	0.166
Parathyroid hormone (PTH) (pg/L)	463.55±48.77	499.19±57.24 [132.0-640.0]	392.26±26.58 [132.0-640.0]	0.623

(*) p value of student t test, a $p < 0.05$ was considered as significant. In square brackets, the target values.

4 Conclusion

In dialysis patients, and under the light of above results, serum parameters vary significantly and the majority were often higher in males compared to the female gender. A firm relationship was observed between male gender and higher levels of hemoglobin, hematocrits, renal function tests, mineral status and parathyroid hormone. It is imperative to raise the feasibility of using single target for all patients undergoing hemodialysis under different conditions.

5 Declarations

5.1 Acknowledgements

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5.2 Ethical Approval

Ethical approval for performing the present study was taken from the scientific council of the faculty of natural and life sciences, Djillali LIABES University. The patient's medical records were checked respecting the rules of anonymity with protecting the personal information of each patient.

5.3 Competing Interests

No conflict of interest exists in this publication.

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