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Correlation between β2- Microglobulin and MIA Syndrome in Chronic Hemodialysis Patients

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Abstract **Original Research Article**

Hemodialysis is a treatment that filters waste and water from the blood. Nonetheless this treatment has multiple side effects, such as producing Beta 2 micro globulin, inflammatory aftermath, in addition to changes to the lipid balance (hypertriglyceridemia+ reduction in cholesterol levels HDL) involved in the genesis of long term complications known as MIA syndrome (Malnutrition, Inflammation, Atherosclerosis). In this multicenteric cross-sectional study we gathered 135 patients (average age 52 years old, with average dialysis duration of 9 years and extremes from 1 to 21 years). The results of our study showed that the longer the hemodialysis treatment duration the higher the levels of Beta 2 micro globulin. After detailing the clinical and Para clinical results of the patients, 19% presented with malnutrition, 47% exhibited an inflammatory condition, and 51% were diagnosed with atherosclerotic damage). Our results as well indicate that a high serum level of this protein could have a role in the development of cardiovascular and atherosclerosis complications patients.

Keywords: β2- microglobulin, MIA syndrome, Chronic hemodialysis, Inflammation.

INTRODUCTION

Hemodialysis is the most common method of continuous renal replacement therapy. Nonetheless this technique has many side effects [1] relating to the chronic inflammatory condition caused by the the uremic state and the bio incompatibility of hemodialysis[2].

This chronic inflammatory state is visible through elevated levels of CRP, which is characterized by the release of pro inflammatory [3] cytokines that cause an increase in protein catabolism and inhibition of hepatic synthesis of the albumin, which will result in malnutrition [3].

In addition to that inflammation is a major contributor to atherosclerosis, which leads to a particular syndrome: MIA syndrome [4, 5].

Besides the secondary hyper parathyroidism, oxidative stress, high plasma levels of beta 2M in chronic patients constitute a major cardiovascular risk [6, 7]. The objective of this study is to detect the links between Beta 2- micro-globulin and malnutrition, inflammation and atherosclerosis in chronic patients.

MATERIALS AND METHODS

Multi enteric cross-sectional study, conducted in 2 hemodialysis centers in Marrakech.

Criteria of inclusion in this study are the following:

- HD period superior to 6 months.
- Age 18 years and above.
- Elevated Beta 2M levels.

We excluded patients with a recent dialysis treatment (less than 6 months) and infrequent HD individuals.

The statistical analysis of the data was done in excel using the correlation coefficient and SPSS using P value, a value inferior to 0.005 was considered significant.

RESULTS

We have included in this study 135 patients, average age 52 years old with extremes varying from 21 to 84 years old. We have noted a female predominance of a 0.96 ratio. Average dialysis duration was 9 years with extremes varying from 1 to 21 years, average hours of dialysis per week are 11h40min. The method used was conventional HD with low permeability

membrane, a room for water treatment, equipped with a mono-osmosis unit in one of the two hemodialysis centers, and a bi-osmosis unit in the other.

Within our 135 patients, 93 benefited from 2 weekly sessions which is 68.88% of the patients included in the study, while 42 patients benefited form 3 weekly sessions.

Regarding the Clinical Data

Average arterial pressure was 123 mmhg systolic and 61 mmhg diastolic. Body mass index (BMI) using dry weight was 21.05. However 20% of patients had a BMI of 18.5 which corresponds with malnutrition.

Regarding the Biological Data

There was anemia trend in addition to hyper phosphoremia, hyper parathyroid and inflammation with high levels of reactive C protein (CRP) in the studied population.

The average levels of albumin were 41g/l with extremes varying between 29 and 56 g/l. However 8.5% of patients had an albuminemia < 35g/l which is linked to malnutrition according to the global health organization.

The serum levels of the CRP recommended for chronic hemodialysis patients has to be inferior to 8mg/l, a level superior to 8 was detected in 25 patients average level of micro globulin was 37,6+_3, 17mg/l.

During the period of the study all patients benefited from a cardiovascular exploration where 51% had anomalies such as artierial calcification, atheroma plates in the carotids, an intima media thickness superior to 1mm. Which is considered a criteria for atherosclerosis.

Recommend Levels of Beta 2 - micro globulin in predialysis in chronic patients have to be inferior to 27mg/l, beyond that those levels are correlated to excess mortality, so we have split our patients in 3 groups:

Group A: between 11 to 15 time the norm (27.5-37.5) this group represents almost 35.33% of the patients.

Group B: between 15 and 20 times the norm (37.6-50) this group represents 57.22 of the patients.

Group C: superior to 20 times the norm (superior to 50.1), this group represents 7.45% of the patients.

The longer and older the Hd is the higher the level of Beta 2- micro globulin. There was no correlation between the IMC and the serum levels of the Beta 2- micro globulin with a coefficient of correlation next to 0 (Table 1).

Table-1: Correlation between β2-microglobulin and the different clinical variables

Variables	β2-M	
	R	P
Age	-0,08	0,57
Dialysis duration	0,94	<0,001
Arterial pressure systolic	0,094	0,41
BMI	-0,05	0,22

Even though no correlation was detected between Beta 2M and inflammation, our results indicate that a high serum level of this protein is correlated with dyslipidemia levels. Therefore with being diagnosed with cardiovascular issues (atherosclerosis) (Table-2).

Table-2: Correlation between β2-M and the paraclinical parameters

paraclinical parameters	β2-M	
	R	P
Albumin	0,042	<0,05
CRP	0,08	<0,01
HDL	-0,62	<0,005
LDL	0,36	<0,001
TG	0,93	<0,001
Calcemia	0,11	<0,01
Phosphoremia	0,53	<0,001
PTH	0,68	<0,001
cardiac evaluation: Atherosclerosis	0,84	<0,001

In comparing the 3 groups previously stated, we notice that the higher the serum level of Beta 2M, the greater the cardiovascular risk (Fig-1).

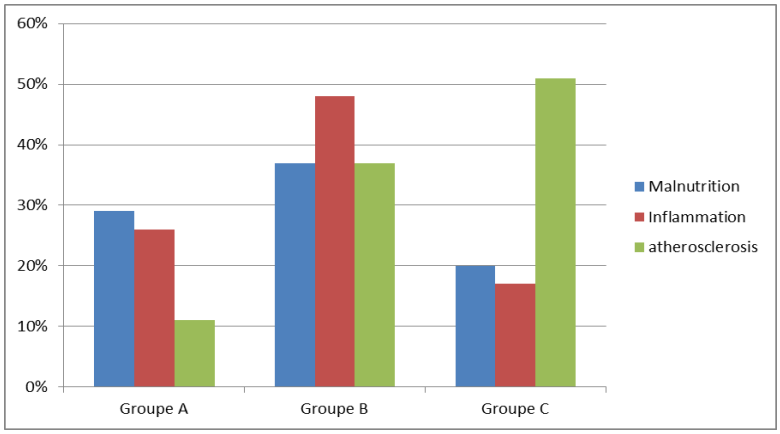

Fig-1: Comparison of the 3 groups A, B and C according to the clinico-paraclinical data

DISCUSSION

The accumulation of Beta 2 M in the extra cellular space is necessary criteria but not enough for the occurrence of inflammation or cardiovascular issues[8–10].

The positive correlation between the serum levels of Beta 2- micro globulin in pre dialysis with the age of dialysis (board 1) concur with what was previously reported in other studies[11, 12[which joins the hypothesis that the longer the period of dialysis is the more prevalent the amyloidosis and higher levels of Beta 2M[11–13].

A correlation between inflammation in hemodialysis and high serum levels of Beta 2M is detected[14,15]. However we found no correlation between Beta 2M and CRP ($r=0.08$, $p<0.01$) which matches the findings from other studies [16–18].

The triglycerides started to increase since the early stages of chronic renal failure, and kept increasing greatly in chronic hemodialysis [5]. Hypertriglyceridemia generated small athrogenic particles (dense LDL) [17–19].

Our results suggest that the plasma concentration of the Beta 2M is directly correlated to the triglycerides concentration. Causing a major risk of atherosclerosis in our patients ($p<0.001$). This agrees with previous findings from other studies such as Topçiu–Shufta V and al, Kim KM and al, and Kyriaki D and al [16,20,21].

Mineral and bone issues are associated with accelerated atherosclerosis[22,23], which is the mane cause in the mortality of chronic hemodialysis patients[24]. In our study the serum concentration of beta 2- micro globulin is positively correlated with phosphorus concentration and PTH.

In the kosovian study of prishtina published in 2013, showed in opposition to our results a negative correlation between Beta 2M and albuminemia with a significant P value [25].

CONCLUSION

Even though there was no correlation between Beta 2M and inflammation, our results indicate a high serum level of this protein which could have a major impact in the development of cardiovascular complications and atherosclerosis. A study with a larger number of patients is necessary.

Conflict of Interests

The authors declare that there is no conflict of interest.

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