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Research Article

Evaluation of Ultrasensitive CRP as a Marker of Cardiovascular Risk in Type 2 Diabetic Patients in Brazzaville: A Case-Control Study

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Abstract

Background and Aim: Type 2 diabetes mellitus is a metabolic disease characterized by insulin resistance which gives it the place of chronic inflammatory disease. The aim of this study was to show the value of assaying us CRP in Type 2 Diabetics (T2DM) in the prediction of proathherogenic inflammation.

Methods: This is a case-control study carried out in 33 T2DM followed in the metabolic diseases service of the University Hospital of Brazzaville (CHUB) between October and December 2020 and 30 controls separated into two subgroups, 15 subjects at risk intermediates and 15 professional athletes.

Results: The comparison of the means of the concentrations of the biological parameters between the controls and the diabetic subjects of group I and group II showed a significant difference for CRP-us ($p = 0.002$), fasting blood glucose ($p < 0.0001$) , the level of HBA1c ($p < 0.0001$). A significant difference for creatinine was observed only for group II and controls.

Conclusion: A correlation was obtained between CRP-us and fasting blood sugar, HBA1c, LDL-C and BMI. CRP-us is an excellent marker to predict the onset of vascular disease.

Keywords: CRP-us; Type 2 diabetes; Dyslipidemia; Obesity

Introduction

The role of biomarkers is now exponentially growing in guiding decisions about personalized medicine [1]. Type 2 diabetes mellitus is a metabolic disease characterized by chronic hyperglycemia resulting from a defect in insulin secretion and/or insulin action [2,3]. It is well known that there is a relationship between the occurrence of diabetes mellitus, cardiovascular disease, and inflammation [4,5]. It is therefore essential to assay diagnostic and monitoring biomarkers. Thus, the choice was made on CRP-us, with a view to screening and assessing cardiovascular risk. Numerous recent studies have demonstrated the value of us CRP over conventional CRP in predicting cardiovascular complications in diabetics [6]. In this context, the aim of this study was to demonstrate the benefit of CRP-us in type 2 diabetics.

Methods

This was a case-control study carried out at the Center Hospitalier Universitaire de Brazzaville from October to December 2020. This study included any subject aged 35 or over, formed into two groups. The first group consists of type 2 diabetic patients without a history of hepatic diseases presenting a risk (or risks) of vascular, ischemic, inflammatory, cognitive diseases, dyslipidemia and a metabolic syndrome or any other cardiovascular risk factor. The second group consisted of apparently healthy subjects who were our controls. These were separated into two subgroups: a first of the rarely sporting subjects in apparent good health (an intermediate risk population) and a second made up of active sports subjects (professional football players) in apparent good health. Patients with a history of liver disease, flu-like illness or a temperature above 37°C were not included in the study. Recruitment was random, resulting in a sample of 63 patients: 33 T2DM patients (group I: n = 9 consists of patients with at least one microvascular complication. Group II: n = 24 consists of patients without vascular complications of diabetes and 30 controls (group III: n = 15 is composed of subjects at intermediate risk and group IV: n = 15 active athletes). Data were collected using a questionnaire by direct interview between patients diabetic and the investigator in a room guaranteeing confidentiality. The test consisted in taking 5 ml of whole blood by venipuncture at the fold of the elbow. The blood sample, collected in the dry tube, was centrifuged at 3000 revolutions for 5 minutes to obtain serum. This was intended for the determination of the biochemical parameters (triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol, transaminases and creatinine). For each patient, we studied socio-demographic and clinical variables (age, sex, duration of diabetes, BMI and existence of vascular complications). The laboratory parameters studied were

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Table 1: Socio-demographic and clinical characteristics of diabetic patients in group I (without vascular complications), group II (with vascular complications) and controls (group III: patients at intermediate risk, group IV: active athletes).

Variable	Case		Control		P
	Group I (n=9)	Group II (n=24)	Group III (n=15)	Group IV (n=15)	
Age (years)	61±5	54±11.9	41±7.8	38±2.8	<0.001
Age of diabetes (years)	3±3.7	5±5.2	-	-	<0.001
BMI (kg/m^2)	24±4.6	27±6.4	30±5.9	24±1.4	0.01

Table 2: Biological data of diabetic patients in group I (without vascular complications), group II (with vascular complications) and controls (group III: patients at intermediate risk, group IV: active athletes).

Variable	Case		Control		P
	Group I (n=9)	Group II (n=24)	Group III (n=15)	Group IV (n=15)	
Fasting blood sugar (g/l)	2.3±0.6	2.7±0.9	1.3±0.1	1.1±0.1	<0.001
HbA1c (%)	8.6±1.8	9.9±2.7	6.1±0.5	5.1±0.3	<0.001
Creatinine (g/l)	10±2.3	10.6±4	11.9±2.5	13.2±1.2	0.01
CT (g/l)	1.9±0.4	1.7±0.5	2.1±0.4	1.8±0.1	0.05
C-HDL (g/l)	0.4±0.1	0.4±0.1	0.4±0.1	0.6±0.1	<0.001
C-LDL (g/l)	1.0±0.3	0.9±0.4	1.4±0.3	0.9±0.1	0.01
TG (g/l)	1.0±0.2	1.1±0.4	1.6±0.7	0.8±0.1	0.004
CRP-us (mg/l)	6.8±6.3	7.8±6.3	3.1±3	0.5±0.2	<0.001
IA : CT/C-HDL	4.95±2.61	5.34±3.67	5.55±2.45	2.68±0.18	0.001

CRP-us, creatinine, HbA1C and lipid profile.

Statistical analysis

Statistical analysis was performed by R Studio software Version 1.4.1106. We applied the test of Kruskal-Wallis for the comparison of the means between the diabetic patients of groups I, II and the controls. Correlations were made on the one hand between CRP-us and socio-demographic parameters and on the other hand between CRPus and other biological parameters by the Spearman test. The significance level was set at a p value <0.05.

Results

The socio-demographic and clinical characteristics of the diabetic population studied as well as that of the controls are shown in Table 1.

The biological data of the diabetic subjects and of the controls are shown in Table 2. The comparison of the means of the concentrations of the biological parameters between the controls and the diabetic subjects showed a significant difference.

The control group consisted of 33 non-diabetic subjects aged 35 to 55 years. The 30 diabetic patients included, aged 35 to 72, were divided into two groups: group I included 9 patients who had developed at least one microvascular complication (retinopathy, neuropathy). Group II consists of 24 diabetic patients (Figure 1).

The comparison of the means between the different groups (I, II, III, IV) and the different parameters are shown in Figure 2.

Figure 3 shows the absence of correlations between CRP-us and the various parameters studied.

Discussion

One of the factors favoring the onset of type 2 diabetes is the Body Mass Index (BMI) greater than 30kg/m^2, the limit characterizing obesity. In our study, it was higher in intermediate risk patients characterized by a sedentary lifestyle. Indeed, the literature reports that people with T2DM are overweight or obese [7]. In fact, the American Heart Association (AHA) in 1998 defined obesity as a major risk factor for cardiovascular disease [8]. In contrast, patients with vascular complications were not obese. This data is explained by the fact that this category of patients benefits from a good therapeutic follow-up. In addition, a predominance of male patients was observed. Our results diverge from other studies [9] which showed that the prevalence of diabetes was higher in women. Intermediate risk patients had prediabetes, which is correlated with glycated hemoglobin.

With the exception of intermediate-risk patients, cholesterolemia was normal. HDL cholesterolemia was essentially at the limit of the protective value, as for active athletes, HDL cholesterolemia was more

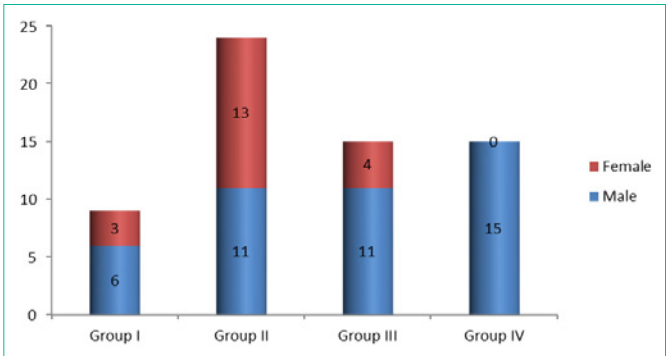

Figure 1: Proportion of diabetic subjects in group I (with microvascular complication), group II (without complication) and controls (Group III: patients at intermediate risk and group IV: active athletes) according to sex.

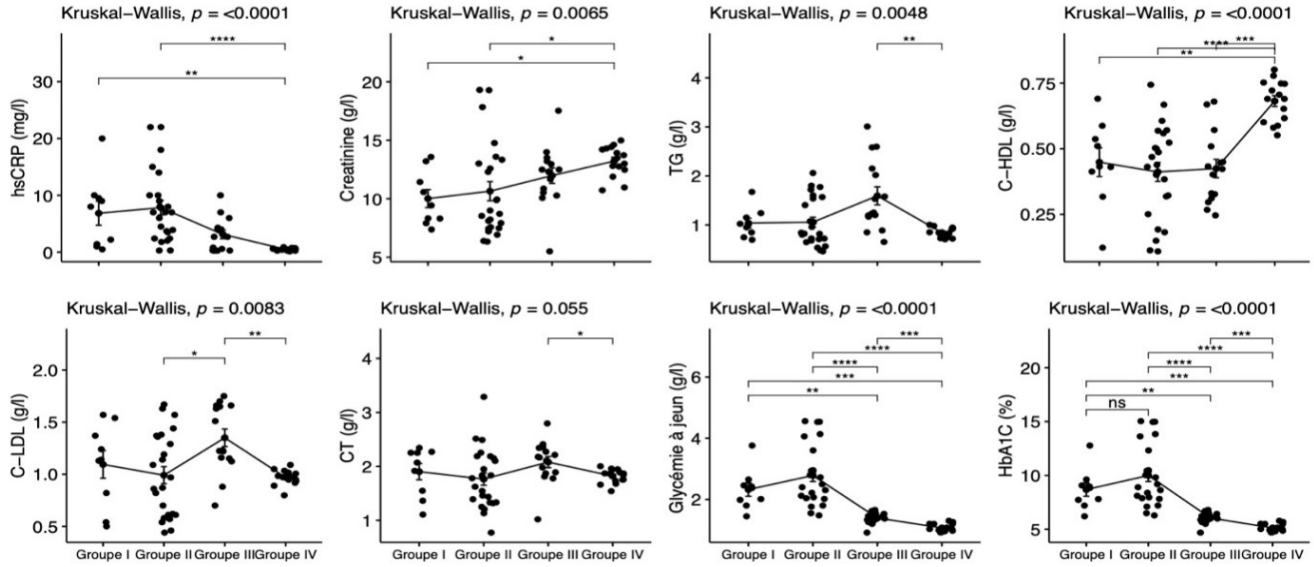

Figure 2: Comparison of the means between the different groups (I, II, III, IV) and the various parameters.

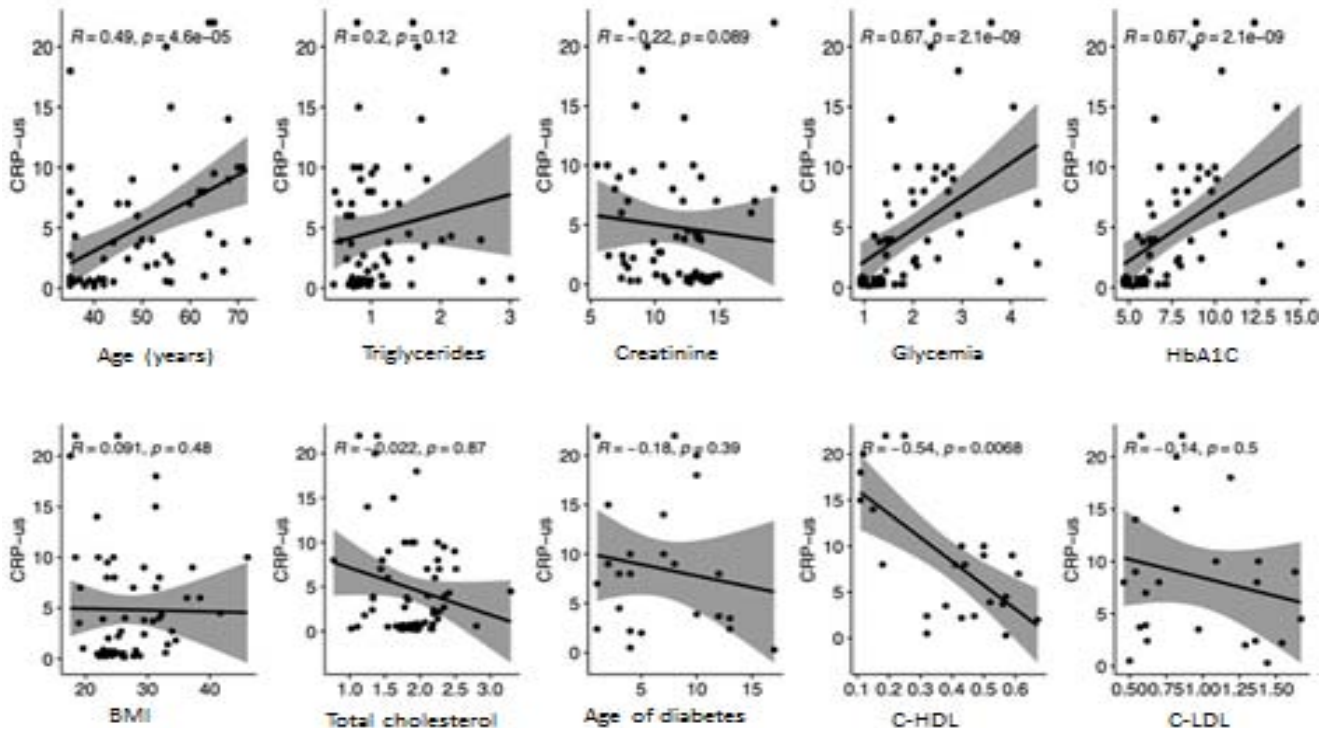

Figure 3: Spearman correlations obtained between CRP-us and the different parameters.

or less protective. Trygliceridemia was normal except in intermediate risk patients

Regarding CRPus, only active athletes had values at the limit of normalcy without presenting any vascular risk, which is justified by an index of non-pathological atherogenicity. Indeed, these patients benefit from regular physical activity, the impact of which has been proven in several studies [10]. Our standard deviations were highly significant for glycemia, glycated hemoglobin, HDL cholesterol, CRPus and atherogenicity index.

Our study demonstrated a significant correlation between CRPus and glycaemia on the one hand and between CRPus and glycated hemoglobin on the other hand [6].

Study Limit

The non-prospective nature of the study and the small size of the study population were the limitation of the present study. The

age adjustment by the statistical comparison was not corrected for the comparisons. However, the identification of a biomarker for monitoring diabetes is an essential element in the control of the glycemic homeostat.

Conclusion

This study reported that us CRP concentrations were increased in diabetic patients and in the intermediate risk control population. The latter, vulnerable, in a situation of prediabetes with CRPus in the pathological window, should be the subject of biomedical assistance. No correlation was found with biomarkers of cardiovascular risk, however, this was found to be significant for the diagnostic and monitoring marker of diabetes. CRPus therefore appears to be an early biomarker of cardiovascular risk both in diabetics and in the general population. This should be part of the follow-up biomarkers, in order to improve the management of diabetes.

Declaration

Knowledge on the subject: One of the markers identifying the inflammatory and infectious profile is classical CRP.

Scientific contribution of this study: The introduction of CRPus is an area of predictive biology in the assessment of cardiovascular risk in diabetics.

Authors' contribution: Principal editors: Fylla Onanga Koumou, Etienne Mokondjimobé; Critical readers: Benjamin Longo Mbenza, Aliocha Nkodila, Germain Monabeka, Etienne Mokondjimobé, Rod Ibara-Okabande, Nestor Andzouana; Biological analyzes: Rod Ibara-Okanbande, Jeanne Gambomi Kibah, Monde Ikia, Barnes Yoyo

Data processing: Yvon Mbouamboua; Supervision: Benjamin Longo Mbenza, Etienne Mokondjimobé.

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