GLYCEMIA AND HbA1c WITH PATIENTS INFECTED BY SARS CoV-2 IN A BIOCHEMICAL LABORATORY IN 2020

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Summary

Coronavirus disease 2019 is a viral zoonosis caused by the Severe Acute Respiratory Syndrome Coronavirus-2 strain of coronavirus. The aim of this study is to determine the glycaemic disturbances in patients infected with SARS CoV-2. This is a retrospective and descriptive study conducted at the Paraclinical Service of Training and Researches in Biochemistry at the University Hospital Center of Joseph Ravoahangy Andrianavalona, Antananarivo from January 1st to June 30th 2021. The data were collected from the laboratory analysis request forms. All test requests belonging to coronavirus-infected patients mentioned in the clinical information and involving a simultaneous fasting blood glucose and HbA1c test were included. Our study included 52 patients of whom 53.87% were male and 46.15% female. The average age was 58 years. The average blood glucose value was 10.78 mmol/l, that of HbA1c was 4.9%. The average blood glucose value was significantly higher with men than with women. The highest average blood glucose level (12.96 mmol/l) was found between the age group 35-45 years. The average HbA1c in the 35-45 age group was the highest but still within the normal range. Hyperglycaemia is frequently observed during SARS-CoV-2 infection in diabetics and non-diabetics by several mechanisms.

Keywords : *Antananarivo, Biochemistry, Glycemia, HbA1c, SRAS CoV-2*

Introduction

Coronavirus disease 2019, referred to by the World Health Organization (WHO) as COVID-19, is a viral zoonosis caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) strain of coronavirus [1,2].

Coronavirus 2019 (COVID-19) is an emerging infectious disease that was first reported in Wuhan, China, and subsequently spread worldwide [3].

Hyperglycaemia has been associated with in-hospital complications in SARS cov-2 infected patients with and without diabetes [4,5].

The aim of this study is to determine the glycaemic disturbances in patients infected with SARS CoV-2.

Materials and methods

This is a retrospective and descriptive study conducted at the Paraclinical Service of Training and Researches (UPFR) in Biochemistry at the University Hospital Center of Joseph Ravoahangy Andrianavalona (UHC-JRA), from January 1st to June 30th 2021. The data were collected from the laboratory analysis request forms. All test requests belonging to coronavirus-infected patients mentioned in the clinical information and involving a simultaneous fasting blood glucose and HbA1c test were included. Any test request forms that were incompletely filled out and/or without specific clinical information were excluded. Gender, age, fasting blood glucose and HbA1c results were studied.

Blood samples were taken on a grey tube with sodium fluoride and potassium oxalate for fasting blood glucose and on an EDTA (ethylene diamine tetraacetic acid) tube for HbA1c. The Mindray BS300® from Shenzhen

Mindray Bio-medical Electronics Co is used to measure blood glucose and HbA1c. For blood glucose, a colorimetric enzymatic end-point method with glucose oxidase was used. The turbidimetric method for HbA1c (Cromatest, Barcelona, Spain).

The reference values for blood glucose and HbA1c at the UPFR Biochemistry of the University Hospital (UHC-JRA) are shown in Table I.

Table I- The reference values for blood glucose and HbA1c at the UPFR Biochemistry of the University Hospital

Parameters	Reference values
Glycemia (mmol/l)	4,20-6,40
HbA1c (%)	<6,5

Hyperglycaemia is defined as blood glucose > 7.80 mmol/L (140 mg/dL) in 2 or more determinations [6].

Student's T-test was used to compare the observed results. The difference between two averages was considered significant when p <0.05. The results were evaluated using Microsoft Office Excel 2007 and Epi info 7.0.

Results

Our study included 52 patients of whom 53.87% were male and 46.15% female. The average age was 58 years with extremes of 25 to 75 years.

The average blood glucose value was 10.78 mmol/l, that of HbA1c was 4.9%. The average blood glucose value was significantly higher with men than with women with a p value of 0.03. No statistically significant difference in HbA1c was observed between the two genders. The highest average blood glucose level (12.96 mmol/l) was found between the age group 35-45 years (figure 1). The average HbA1c levels were normal in all age groups. The average HbA1c in the 35-45 age group was the highest but still within the normal range (figure 2)

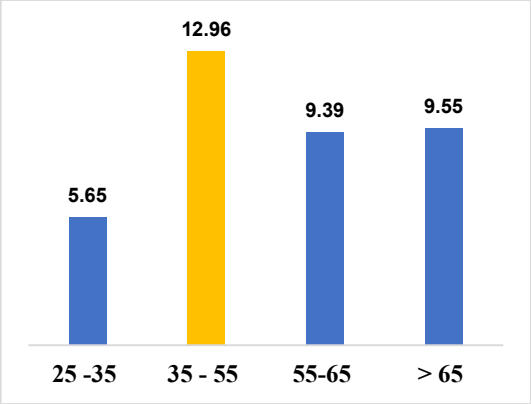

Figure 1- Variation of average blood glucose level by age

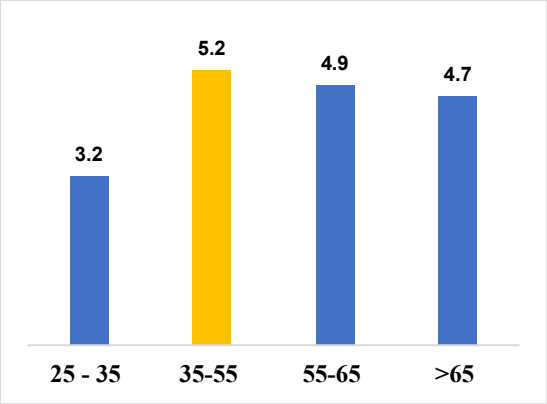

Figure 2- Variation in average HbA1c by age

Discussion

This male predominance has been found in several studies with varying proportions: Omer Ayten et al (64.40%) [7], Huang et al (73.0%) [8], Wang et al (54.3%) [9], Zhang et al (50.7%) [10]. This male predominance was confirmed by a study reporting that circulating CEA2 levels are higher with men than with women [11]. SARAS-CoV-2 uses angiotensin converting enzyme 2 as a functional coronavirus receptor to enter the host cell [12,13]. Furthermore, the X chromosome contains a high density of immune-related genes; therefore, women generally develop stronger innate and adaptive immune responses than men [11,14]. The average age in our study was 58 years. The average ages found in some studies were almost similar to ours: Omer Ayten et al (56.9 years) [6], Chen N et al (55.5 years) [15] and Bouzid G et al (60.0 years) [16]. Another study by Gao Y et al. reported a lower average age in their study at 44 years [17].

The average blood glucose level in our study was 10.78 mmol/l. Of our 52 patients, 43.90% had hyperglycaemia whose diabetes status could not be investigated. In the study by Wen Zhang et al, the average blood glucose level in diabetics was 9.91 mmol/l and 5.54 mmol/l in non-diabetics. Of these diabetic patients, 71.58% suffered from hyperglycaemia and 13.03% in non-diabetics [18]. Several hypotheses have been put forward to explain this hyperglycaemia during SARS-CoV-2 infection: firstly, pancreatic beta cells may be highly permissive to SARS-CoV-2 infection [19] as ACE2 is also expressed on pancreatic islet cells. Thus, the possibility of acute pancreatic β-cell injury via angiotensin 2 converting enzyme. Secondly, glucocorticoids could also cause hyperglycaemia by inducing insulin resistance and beta cell dysfunction [20]. Thirdly, the massive release of cytokines and glucocorticoids during overwhelming viral infection [21] induced the stimulation of gluconeogenesis and an increase in insulin resistance [22, 23], which could also contribute to this rise in blood glucose.

In our study, patients had a high average blood glucose level while the average HbA1c was normal. This result may indicate that patients are predisposed to fluctuating blood glucose levels when exposed to a virus [18].

The parallel increase in HbA1c and blood glucose in the 35-55 age group (figure 1 and 2) could be explained by the fact that HbA1c is influenced by blood glucose levels in the last 4 months, but blood glucose levels in the previous 30 days are responsible for 50% of its value. [24].

Conclusion

Hyperglycaemia is frequently observed during SARS-CoV-2 infection in diabetics and non-diabetics by several mechanisms. Glycaemic disturbances have been found more frequently with men than with women.

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