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Diagnosis of Secondary Diabetes Mellitus in a Patient with Heart Failure Followed in a Context of Limited Resources in the Cardiology Department of the International Clinic for Advanced Medicine in Kivu in Goma, North Kivu in Goma, Democratic Republic of Congo: A Case Report

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Abstract

This case describes the diagnosis of secondary diabetes mellitus in a patient with chronic heart failure, followed in Bunia since 2022, province of Ituri in the Democratic Republic of Congo, transferred to the Clinique International de Médecine Avancée au Kivu (CIMAK) in eastern Democratic Republic of Congo (DRC). The patient is a 32-year-old nurse born into a non-diabetic sibling group of 5 children, all of whom are still alive. He was transferred to CIMAK from BUNIA for the first time in 2022, diagnosed with heart failure with reduced ejection fraction, with blood sugar levels within the norms, treated as

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an outpatient, stabilized and then returned to BUNIA with an appointment that was not kept due to a lack of resources, especially air transport. The patient was transferred back to CIMAK on September 23, 2024 with 48-hour anuria, congestive signs, NYHA IV dyspnea, and blood pressure 127/83 mmHg, heart rate 112 bpm, oxygen saturation 84% at free air. The patient had prominent and turgid jugular veins; his cardiopulmonary examination was marked by regular tachycardia, protodiastolic gallop, pluriorificial systolic murmur and pulmonary crepitations. His abdomen showed a stasis liver, and his lower limbs were edematous. The workup requested: NT-ProBNP came back elevated at 6535.81 pg/L due to lack of BNP, fasting plasma glucose elevated at 220 mg/dL from 400 mg/dL in Bunia since 48 hours, glycated hemoglobin (HbA1c) 8.97%. We believe that diabetes mellitus secondary to heart failure is caused by several mechanisms, notably insulin resistance and pancreatic hypoperfusion. It is crucial to disseminate this diagnosis in order to draw the attention of clinicians in the DRC to patient education and the systematic search for secondary diabetes in heart failure patients, thereby improving the poor prognosis associated with its occurrence in heart failure patients in our resource-limited environment.

Keywords

Secondary Diabetes and Heart Failure, Limited Resources, Diagnosis, Democratic Republic of Congo

1. Introduction

The relationship between diabetes mellitus and heart failure is a frequent two-way street: diabetic patients have a high risk of developing heart failure; on the other hand, those suffering from heart failure also have an increased risk of developing diabetes mellitus [1] [2]. Heart failure is the leading major cardiovascular complication of the diabetic patient, with a high prevalence (22%) and rising incidence rates [2]-[5].

Diabetes mellitus in patients with heart failure is common, as illustrated by large cohorts. The synergy of heart failure and diabetes mellitus is associated with high mortality, compared with patients suffering from heart failure not associated with diabetes mellitus or diabetic patients without heart failure [6]-[8].

Diabetes mellitus may develop in patients with heart failure through the following mechanisms: pancreatic hypoperfusion linked to the collapse of cardiac output [9] [10]; insulin resistance linked to chronic inflammation, endothelial dysfunction, oxidative stress, altered hepatic glucose metabolisms, risk factors such as obesity, dyslipidemia and sedentary lifestyle [11] [12]; negative effects of certain drugs used to treat heart failure on glycemic control and increased future risk of diabetes [13] [14]; neurohormonal dysfunction in heart failure, characterized by stimulation of the sympathetic nervous system, resulting in chronic hyperglyce-

mia through the action of catecholamines and the renin-angiotensin-aldosterone system, leading to resistance to insulin action and worsening hypoperfusion of the pancreas [14].

Systematic research and prevention of heart failure complications must be a major preoccupation for clinicians, in order to reduce the poor prognosis associated with the onset of diabetes mellitus, the complexity of treating heart failure associated with diabetes mellitus, and the health fragility associated with this synergy in terms of physical, rehospitalization, social, professional, economic and high mortality [2] [14] [15].

The treatment of secondary diabetes mellitus is not only very narrow in terms of the drugs to be used, but also leads to the worsening of heart failure, for example via hydrosodic retention with the insulin commonly used in our environment, the absence of recommendations on the level of glycemic control in the diabetic heart failure patient in the world and the appearance of complications in this case renal failure [1] [16].

In the Democratic Republic of Congo, the diagnosis of secondary diabetes mellitus in patients with heart failure is a rarity, yet timely diagnosis and treatment reduce mortality among affected patients in our resource-constrained environment.

The aim of this case report is to improve the management of heart failure by systematically investigating secondary diabetes mellitus in patients with heart failure, especially chronic heart failure.

2. Case Presentation

On September 23, 2024, at the Clinique International de Médecine Avancée au Kivu (CIMAK) in Goma, North Kivu, Democratic Republic of Congo (DRC), we received a 32-year-old patient with chronic heart failure and reduced ejection fraction, diagnosed in 2022 at CIMAK, transferred from Bunia, capital of Ituri province in the east of the DRC, for better management of 48-hour anuria unresponsive to intravenous furosemide 80mg, associated with pulmonary and peripheral congestive signs, occurring in a context of more than 6 months' downtime related to recovery and the cost of medication for him, his heart failure treatment started at CIMAK on August 9, 2022, consisting of Nebivolol 5 mg daily PO, Aldactone 25 mg daily PO, losartan 50 mg daily PO and dapagliflozin 10 mg daily PO, the lack of positive response to the treatment with furosemide 80 mg daily, carvedilol 6.25 mg daily and Aldactone 25 mg daily initiated in Bunia, and a notion of taking medicinal plants to treat oedema without success were the reasons for his transfer to Goma.

His clinical symptoms and signs on admission to CIMAK included NYHA IV dyspnea, anuria, cough, physical asthenia, hepatica and edema of the lower limbs.

He is a single nurse born into a non-diabetic, non-hypertensive sibling of 5 children. He is not known to be hypertensive or diabetic, does not smoke or drink alcohol, and his cardiovascular risk factors are male and black.

His physical examination was marked by normal blood pressure at 127/83 millimeters of mercury (mmHg), elevated heart rate at 100 to 112 beats per minute (bpm), polypnea at 28 cycles per minute (Cpm), normal temperature at 36.4 degrees Celsius (˚C), height 1.7 meters (m), weight 88 kilograms (Kgs). The patient was lucid, coherent and asthenic, with normo-colored palpebral conjunctiva and anicteric bulbar. Jugular veins were prominent and turgid.

The cardiopulmonary examination was marked by a peak shock perceived at the seventh intercostal space outside the midclavicular line, a pluriorificial systolic murmur more marked at the fifth-sixth mitral focus radiating to the left shoulder and back. A galloprotodiastolic murmur, and pulmonary crepitations at the two inferior borders of the two pulmonary fields.

His abdomen was softly bloated, expandable with tender hepatomegaly with a frothy lower border and hepatojugular reflux.

His lower limbs were oedematous, with the bucket reaching down to his thighs.

His vascular examination was normal, and the catheter in place did not return urine.

After the following examinations: transthoracic cardiac Doppler echography: HFrEF/dilated cardiomyopathy of probably primitive or ischemic origin (global hypokinesia of the walls with anteroseptal akinesia) with left ventricular ejection fraction at 26.04% according to Simpson, creatinineemia at 4.5 mg/dL, urea 180.62 mg/dL, Hemonglobin 14.9 g/dL, sodium 133.8 mmol/L, NT-ProBNP came back high at 6535.81 pg/L due to lack of BNP, glycated hemoglobin (HbA1c) 8.97%, fasting blood glucose 220 mg/dL coming from 400mg/dL in Bunia one day before his arrival at CIMAK, uric acid 12.36 mg/dL, the diagnosis of secondary diabetes mellitus was confirmed; type 2 cardio-renal syndrome aggravated by the use of unsafe medicinal plants, complicated by anuria, hypervolaemia, uraemic syndrome and hyperkalaemia; chronic heart failure with reduced ejection fraction due to dilated cardiomyopathy of primary or ischaemic origin; hyperuricaemia and false hyponatremia due to hypervolaemia.

We had treated the patient urgently with Lasix 240 mg with an electric syringe pump at a rate of 1 cc to 2 cc per hour depending on blood pressure level, dapagliflozin 10 mg per day, Lovenox 0.6 ml per day subcutaneously, carvedilol 6.25 mg started in Bunia was continued and Coversyl 2.5 mg per day, Diamicron 1 × 120 mg per day per os, Zyloric 200 mg per day per os.

The 24-hour evolution was marked by hypotension to 84/40 mmHg, diuresis to 600 ml, agitation, reduction of plasma creatinine to 2.5 mg/dL, and urea to 197 mg/dL from 180.62 mg/dL. The diagnoses of worsening cardio-renal syndrome and cardiogenic shock due to drug overload were retained, prompting the administration of dobutamine associated with noradrenaline and hemodiafiltration under vasoactive amines, a urinary infection based on dysuria and procalcitonin: 2.32 ng/mL, treated with ceftriaxone 2 × 1 g/d iv. The patient had benefited from two sessions of hemodiafiltration over two days, which led to an improvement in diuresis of 4500 ml in 24 h.

After two sessions of hemodiafiltration, we gradually weaned the patient off dobutamine and norepinephrine, with blood pressure ranging from 104/68 to 118/72 mmHg and oxygen saturation at 98% free air, by introducing Digoxin 0.25 mg daily, Torasemide 100 mg daily, Coralan 5 mg daily, Dapagliflozin 10 mg daily then stopped following urinary tract infection, Lovenox 0.6 ml daily subcutaneously.

On September 30, 2024, the patient was discharged from the intensive care unit to the cardiac hospitalization room. A check-up was performed: An electrocardiogram showed left ventricular hypertrophy, bi-atrial dilatation, incomplete left bundle-brachial block, and first-degree atrioventricular block. Plasma creatinine 1.32 mg/dL, urea 48 mg/dL, blood glucose 110 mg/dL, potassium 4.07 mg/dL, Uric acid 4.30 mg/dL, he was weaned off vasoactive amines, we had stopped Zyloric 200 mg, then continued with Torasemide 100 mg 1/2 daily, Coralan 7.5 mg daily, Dapagliflozin 10 mg daily to be resumed after controlling the urinary tract infection, Digoxin 0.25 mg daily, Diamicron 60 mg morning and evening after glycemic control, Aldactone 25 mg 1/2 tablet daily and Candesartan 8 mg daily, Lovenox 0.6 ml daily in sc.

On 2 October 2024, he was discharged from the hospital with his current treatment Lovenox, replaced by Aspirin junior 100 mg daily.

3. Discussion

This case of diabetes mellitus in a patient with advanced chronic heart failure was diagnosed in a context of limited resources, and is of interest in drawing clinicians' attention to the frequent occurrence of diabetes mellitus in patients with heart failure, although it is a rarity in Congolese literature. Despite poverty and the inadequacy of mutual health insurance schemes in the DRC in particular, and in Africa in general, diabetes mellitus must always be borne in mind when monitoring heart failure patients, in order to reduce the poor prognosis associated with its late onset and treatment.

Heart failure is associated with a poor prognosis, while heart failure that progresses to diabetes mellitus remains a challenge for cardiologists and diabetologists, not only because of the limitations of the drugs needed to treat this synergy, but also because of the high mortality rate compared with heart failure not associated with diabetes mellitus [17] [18].

The mortality rate of acute heart failure patients with diabetes mellitus was 26%, compared with 12% of heart failure patients without diabetes; in addition, diabetes multiplies the risk of death in heart failure patients by 1.62 (OR = 1.82, 95% CI: 1.15, p-value 0.001) [18]. The factors contributing to this mortality are related to the difficulty of determining the exact limits of glycemic control in heart failure patients with diabetes mellitus; the involvement of their medications in glycemic imbalance; the aggravation of heart failure by fluid retention; and the frequent occurrence of renal failure [19] [20].

In this case, we believe that the favorable evolution would be linked to its timely

diagnosis, its young age, hemodiafiltration, and the right choice of drugs, destabilizing less the treatment of this conjunction (heart failure and diabetes mellitus) whose specific drugs are incriminated in the bidirectional relationship of diabetes and heart failure.

The mechanisms most incriminated in the onset of diabetes mellitus in our heart failure patient would be insulin resistance, which is the main mechanism of onset of diabetes mellitus in the heart failure patient in over 60% of cases, and the rare black [21]-[23].

This study is limited by a logistical problem: we can't say exactly what mechanism led to the onset of diabetes mellitus in our heart failure patient, as insulin resistance was not measured.

4. Conclusions

Although the onset of diabetes mellitus in heart failure patients is common, with a reputation for poor prognosis in the West; in the DRC, the diagnosis of diabetes mellitus secondary to heart failure is not only rare in our literature, but also a topical issue, and crucial for improving the survival of chronic heart failure patients in our resource-limited environment.

This improvement in the poor prognosis of heart failure patients with secondary diabetes mellitus requires the prevention of secondary diabetes mellitus, focused on combating the causes of insulin resistance, reduced left ventricular systolic ejection fraction, and early diagnosis.

5. Key Clinical Message

The relationship between diabetes mellitus and heart failure is a well-known two-way street. Heart failure is the most common complication of diabetes mellitus, while secondary diabetes mellitus is common in heart failure patients, but is rarely diagnosed in our Congolese environment. The onset of diabetes mellitus in heart failure patients is associated with reduced survival.

This health fragility is explained by the difficulty of choosing the right drugs to treat secondary diabetes and heart failure, as drugs for both are equally incriminated in their bidirectional relationship; the frequent occurrence of renal failure. In addition, the absence of recommendations on the level of glycemic control for all diabetic populations worldwide suffering from heart failure and the precarious conditions of intensive care, which lack resources in the Democratic Republic of Congo.

This is a case study of the diagnosis of secondary diabetes mellitus in a patient with chronic heart failure and its treatment in a Congolese hospital.

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Data Availability Declaration

The datasets used and/or analyzed for this study are available on request from the corresponding author.

Declaration of Ethics

This is a case study and therefore did not require ethics committee approval.

Consent

The patient has given informed consent to the publication of this case report.

Conflicts of Interest

No competing interests.

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