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RESEARCH ARTICLE

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Risk Factors Associated with the Onset of Diabetes Mellitus in Patients with A History of Gestational Diabetes at The University Hospital of Kinshasa

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is a disorder of glucose tolerance occurring or first diagnosed during pregnancy, whatever the treatment required and its evolution after delivery. Its prevalence varies between 5 and 17% depending on the setting. 15 to 60% of those who develop gestational diabetes progress to type 2 diabetes, and are therefore at major risk of developing type 2 diabetes, hence the importance of identifying the risk factors associated with this conversion, so that preventive measures can be taken.

Objectives: This study aims to identify the risk factors associated with the onset of type 2 diabetes in women with a history of gestational diabetes at the University Hospital of Kinshasa.

Methods: This study will be a retrospective cohort conducted at the University Hospital of Kinshasa among women with a history of gestational diabetes from January 2013 to December 2023. Women with a history of gestational diabetes will be recruited from the delivery room registers at University Hospital of Kinshasa. Their data will be collected in their files, and they will be contacted for type 2 diabetes screening. Delivery and breastfeeding data 6 weeks after delivery, anthropometric data, physical activity, diet and rhythm will be analysed.

Conclusion: At the end of this study, the rate and time of conversion of gestational diabetes to type 2 diabetes, as well as the factors associated with this outbreak, will be known in our setting, providing us with variables on which we can act to reduce the progression of gestational diabetes to diabetes mellitus.

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Introduction

Pregnancy known as a diabetogenic state may be the time of gestational diabetes onset, defined as carbohydrate intolerance of variable degree first discovered or diagnosed during pregnancy [1,2].

Gestational diabetes affects 8% of pregnancies, with an incidence ranging from 2% to 14%, depending on the population studied and the diagnostic criteria [1,2]. During pregnancy, there are adaptations in carbohydrate metabolism that ensure the needs of the rapidly growing fetus are met, while maintaining adequate maternal nutrition. Early in pregnancy, insulin secretion and sensitivity increase to facilitate maternal fat and glycogen storage. In the second half of pregnancy, progressive insulin resistance sets in, with the secretion of various placental hormones acting as insulin antagonists, resulting in a state of peripheral insulin resistance with a consequent increase in maternal blood glucose levels, an increase in the synthesis of free fatty acids and amino acids, the purpose of which is to ensure a sustained energy supply for the fetus during postprandial periods [1,3]. However, women with pre-existing metabolic disorders, such as pre-gestational insulin resistance and chronic beta-cell dysfunction with relatively abnormal insulin secretion, are unable to positively regulate insulin secretion and develop the clinical picture of gestational diabetes [1], which is associated with the fetal risk of macrosomia, fetal distress, fetal death in utero and maternal risk of infection, dystocia, vasculo-renal syndromes, caesarean section and post-partum haemorrhage, and later on, the onset of type II diabetes in both mother and child [2,4,5].

Its evolution is generally marked by a return to normal blood glucose levels after birth, although some women progress to type II diabetes. Gestational diabetes therefore represents a real opportunity to identify women at risk of developing type II diabetes, and the American Diabetes Association (ADA) recommends post-partum blood glucose monitoring for up to

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12 weeks [1,6]. But despite the scale of the risk associated with gestational diabetes, attendance at postpartum blood glucose testing remains sub-optimal, as has been reported in several studies in Europe, the USA and Canada [6].

Several studies worldwide have demonstrated that conversion rates from gestational diabetes to type II diabetes vary between 2. 6 -70% in post-partum periods ranging from 6 weeks to 28 years [1,7], and that factors such as pre-gravidic weight, gravidic weight gain, BMI > 30kg/m2, history of macrosomia, family history of diabetes, hyperglycemic states, insulin treatment and sedentary lifestyle were considered predictive of the onset of type II diabetes in women with a history of gestational diabetes [1,4,5,8]. Given that these factors vary according to setting, dietary conditions and quality, physical activity and genetics [1,9,10], we felt it appropriate to conduct a study on the conversion rate of gestational diabetes and associated factors in our environment.

The aim is to identify variables that can be acted upon to prevent type II diabetes mellitus in women with gestational diabetes.

Several authors in the D.R of Congo carried out studies on gestational diabetes without really addressing the aspect of its conversion to type II diabetes [11-13].

Objective

To determine the conversion rate of gestational diabetes to type II diabetes and to investigate factors associated with this conversion in patients with a history of gestational diabetes.

Rationale for the Study

To achieve this objective, our study will be conducted at the University Hospital of Kinshasa.

Our study population will consist of all women with a history of gestational diabetes during the period from January 2013 to January 2024.

In children, OCD symptoms can overlap significantly with other disorders, such as generalized anxiety disorder (GAD), attention-deficit/hyperactivity disorder (ADHD), and autism spectrum disorder (ASD). This overlap often leads to delayed diagnosis or misdiagnosis. For example, repetitive behaviors in ASD may resemble compulsions, but they lack the anxiety-driven nature characteristic of OCD [1]. Tools such as the Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS) help clinicians assess the severity of symptoms and differentiate between diagnoses [8].

Study Method

Sample Size

Our study will be a cross-sectional, analytic study, and the minimum sample size will be calculated according to the SCWARTW formula, which is n =

n= ((Z)^2 p.q)/((d)^2)

n = sample size

Z = coefficient at 95% confidence level (= 1.96)

P = estimate of the proportion of the parameter studied (Gestational diabetes) in the population = 4.2% (11)

q = complement of q = 1 - p = 1 - 0.42 = 0.58

d = degree of precision = 0.05

n= ((1.96)^2 x 0.42 x 0.58)/((0.05)^2)

n = 374

Patient Selection

Inclusion criteria

- To have presented gestational diabetes during the period from January 2013 to January 2024
- Agree to participate in the study

Exclusion criteria

- Absence of at least 75% of the data sought for the study
- Patients lost to follow-up.

Data Collection Procedures

Women with a history of gestational diabetes will be selected from the registers of the delivery rooms of the University Hospital of Kinshasa, their various data and contact details will be collected from medical records, patients will be contacted by telephone to obtain consent to participate in a survey and receive screening for type II diabetes, patients will be categorized into two groups, those who have developed type II diabetes and those who have not.

Study Variables

- Sociodemographic variables: woman's age; marital status; municipality of residence.
- Clinical variables: medical history (diabetes mellitus); parity; BMI at 20 weeks at the latest; gestational weight gain; mode of delivery; treatment received for gestational diabetes; type and quantity of food consumed with consumption schedule; type and rhythm of physical activity; fasting blood glucose from the 6th postpartum week.
- Neonatal variables: gender; neonatal weight; fetal outcome.

Operational Definitions

Parity will be the number of pregnancies having reached at least 28 weeks

Gestational weight gain will be the difference between the woman's body weight at the beginning of pregnancy and that at the end of gestation. Body mass index (BMI) will be defined as body weight in kilograms/height in meters squared by the 20th week of gestation. Treatment received will be either dietary, oral antidiabetic or insulin therapy.

Physical activity will be assessed according to metabolic equivalents (METs¬ in short). Women with an activity generating less than 6 METs per week will be considered non-active, and those with more than 6 METs will be considered active.

- Type 2 diabetes: The diagnostic criteria will be fasting blood glucose > 126 mg/dl or random blood glucose ≥ 200 mg/ [4,6].
- Gestational diabetes: Diagnostic criteria: either fasting blood glucose ≥ 92 mg/dl or the presence of at least two disturbed values on an orally induced hyperglycemia test with the following references: H1 ≥ 180 mg/dl; H2 ≥ 155mg/ dl; H3 ≥ 140mg/dl [4].

Statistical Results of the Study

After validation, the data will be processed using Ms Excel 2016 software.

Descriptive statistics will be expressed as means ± standard deviation, and proportions as percentages. The Student's t test will be used to compare means, and the Pearson's chi-square test to compare proportions. Logistic regression will be used to identify factors associated with the conversion of gestational diabetes to type II diabetes, and odds ratios will be calculated to determine the strength of association between risk factors and the development of type II diabetes. The threshold of statistical significance will be $p < 0.05$ will be used as the only statistical significance.

Ethical Considerations

This study was presented to the gynaecology-obstetrics staff of University Hospital of Kinshasa for validation, and will then be presented to the ethics committee of the University of Kinshasa's Public Health School for approval. Information will be collected in strict confidence.

Expected Results of the Study

Four important results are expected at the end of this study:
The rate of conversion of gestational diabetes to type II diabetes;
Time to conversion;
Factors associated with conversion;
The strength of association of each of these factors.

Discussion

In the literature, the rate of conversion of gestational diabetes to type II diabetes ranged from 2% to 70% [6]. Himali. H et al found a conversion rate of 63% over a 10-year study period.

While Yukari k et al. found a conversion rate of 10.5% for a study duration of 5 years [14]. These differences in conversion rates may be explained by differences in study duration, setting, treatment, physical activity and diet. Several risk factors associated with the conversion of gestational diabetes to type II diabetes have been studied to determine the strength of association, including maternal age, physical activity, insulin treatment, diet and fasting blood glucose at the time of gestational diabetes discovery. Data on the association between maternal age and the onset of type 2 diabetes are contradictory, as Rayanagoudar et al. found in their study that age > 30 years was not significantly associated with the onset of type 2 diabetes, whereas Himali H et al. in a retrospective cohort found an association [1,15].

Yukari et al. in their study found that women who had fasting blood glucose > 94 mg/dl at the time of diagnosis of gestational diabetes had 5 to 7 times greater risk of developing diabetes mellitus than others [14]. Oldfield et al. found that women who received insulin were 2 times more likely to develop diabetes than those who did not [16]. Oldfield and Yuhong Xu found that insulin treatment during pregnancy was associated with the onset of diabetes mellitus in Caucasian women but not in Asian women, which may be explained by genetic differences between populations [16,17]. W bao et al. found, in a prospective cohort, that increased physical activity reduced the risk of developing type 2 diabetes after gestational diabetes [8].

Study Highlights

This study will be the first in our setting to analyze the risk factors associated with the onset of diabetes mellitus in women with a history of gestational diabetes, and therefore represents a contribution to the fight against diabetes mellitus, as it will provide us with variables on which we can act to prevent diabetes mellitus.

Study Limitatioin

The uni-centric nature of our study means that it cannot reflect the national trend in our country.

Conclusion

Women with a history of gestational diabetes are at considerable risk of developing diabetes mellitus in the 5 years following childbirth. The scale of this risk calls for a multiplication of efforts to identify all the risk factors that can be acted upon to slow or halt the progression to diabetes mellitus.

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