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Prevalence and Risk Factors of Gestational Diabetes Mellitus in Likasi, in The Democratic Republic of The Congo: A Preliminary Study

Hénoch Kabala Tshasuma*, Chamy Lubamba Cham, Joseph Bulanda Nsambi, Charles Wembonyama Mpoy

Abstract

Objective: To determine the prevalence and identify risk factors for gestational diabetes mellitus (GDM) in Likasi City in the Democratic Republic of the Congo.

Materials and Methods: A cross-sectional study of 203 pregnant women was conducted in Likasi. The diagnosis of GDM was made by oral glucose tolerance test (OGTT), using the CyanSmart automaton, and the criteria of the International Association of Diabetes and Pregnancy Study Group (IADPSG) were used. The Chi-square test and the calculation of the odds ratio and 95% confidence interval were used with the significance level set at $p<0.05$.

Results: The median age of pregnant women was 28 years (interquartile range: 23-33) and the median parity of 3 (interquartile range: 1-5). The majority of them were housewives. The prevalence of GDM was 17.24% (95% CI: 12.31%-23.14%). History of preterm birth (adjusted OR=5.24 [1.40-19.66]) was the only risk factor significantly associated with GDM.

Conclusion: Our study shows that GDM is indeed a public health problem in Likasi City. The history of prematurity is independently associated with GDM.

Keywords: Gestational diabetes mellitus, Prevalence, Risk factor, Likasi

Introduction

Gestational diabetes mellitus (GDM) is a condition characterized by varying degrees of carbohydrate intolerance, leading to elevated blood sugar levels, that develops or is first detected during pregnancy, regardless of its progression after childbirth [1]. GDM poses a significant public health challenge both nationally and globally. Its prevalence varies significantly across different regions: 9.2% in the United States of America in 2010 [2], 23% in Belgium in 2012 [3], and 17.8% in Canada in 2017 [4]. In Africa, the prevalence of GDM was reported as 8.5% in Morocco in 2014 [5], 13% in Arusha (Tanzania) in 2019 [6], and 33.1% in Dakar (Senegal) in 2017 [7]. In the Democratic Republic of the Congo (DRC), the prevalence ranged from 11.3% in 2014 to 44% in 2015 in Bukavu [8,9], and from 3.9% to 5.2% in Kinshasa in 2009 [10]. Various modifiable risk factors for GDM have been identified, including maternal age, family history of type 2 diabetes, polycystic ovary syndrome, previous history of GDM (with recurrence rates ranging from 30% to 84%), fetal macrosomia, and intrauterine fetal demise (IUFD) [11,12]. Obesity and weight gain during the first trimester of pregnancy have also been identified as modifiable risk factors [13,14]. The objective of this study was to determine the prevalence and to identify risk factors of GDM in Likasi city, in the DRC.

Affiliation:

Department of Gynecology and Obstetrics, Faculty of Medicine, University of Lubumbashi, Lubumbashi, Democratic Republic of Congo

***Corresponding author:**
Hénoch Kabala Tshasuma, Department of Gynecology and Obstetrics, Faculty of Medicine, University of Lubumbashi, Lubumbashi, Democratic Republic of Congo

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Materials and Methods

This was a multicenter cross-sectional study carried out in Likasi, in five health facilities (namely SNCC Hospital, Shekinah Medical Center, ASVIE, La Consolation, and Likasi University Hospital). From April 1, 2021 to March 31, 2022, the sera of 203 pregnant women were collected between the 24th and 28th weeks of amenorrhoea using Naegele's formula, in cryotubes, at "Time Zero" (fasting), "Time One" (one hour after ingestion of 75g of sugar), and "Time Two" (two hours after the same ingestion). The analysis was performed with the CyanSmart Spectrophotometer and the International Association of Diabetes and Pregnancy Study Group (IADPSG) criteria were applied for the diagnosis of GDM.

In addition to blood samples, epidemiological data concerning maternal age, marital status, occupation, medical history (diabetes mellitus in the first degree), obstetric history (prematurity, macrosomia, congenital malformations, stillbirth, parity, etc.) were collected using a pre-established card. Ethical standards have been respected. We have obtained approval from the ethics committee of the University of Lubumbashi (UNILU/CEM/127/2022).To determine the GDM's risk factors, a multivariate analysis was conducted. Significant variables ($p<0.20$) in univariate analysis were introduced into the multivariate model. A $p<0.05$ value was statistically significant. The odds ratio was presented with a 95% confidence interval (95% CI).

Results

We collected a total of 203 pregnant women. The median age was 28 years (interquartile range: 23-33) and the median parity was 3 (interquartile range: 1-5). The majority of them were housewives (68.97%) and married (98.52%). We found 35 cases of GDM out of a total of 203 pregnant, giving a prevalence of GDM of 17.24% [95% CI: 12.31-23.14%].

In bivariate analysis (Table 1), only the history of prematurity and the history of macrosomia were the determinants of GDM. After multivariate analysis (Table 2), maternal age, parity, history of diabetes mellitus in the first degree, and history of macrosomia were not significantly associated with GDM. In contrast, history of preterm birth (adjusted OR=5.24 [1.40-19.66]) was the only independent factor associated with the occurrence of GDM.

Table 1: Bivariate analysis of risk factors for gestational diabetes

Variables	Gestational diabetes			p-value
	No, *n(%)*	Yes, *n(%)*	Total, *N(%)*	
Educational level				0.975
Primary	33 (19.64)	7 (20.00)	40 (20.20)	
Secondary	90 (53.57)	19 (54.29)	109 (53.70)	
Higher	44 (26.19)	9 (25.71)	53 (26.11)	
Profession				0.545
Farmer	9 (5.36)	0 (0.00)	9 (4.43)	
Saleswoman	18 (10.72)	7 (20.00)	25 (12.32)	
Civil servant	25 (14.88)	4 (11.43)	29 (14.29)	
Housewife	114 (67.86)	24 (68.57)	138 (68.97)	
Maternal age				0.0751
<20 years	5 (2.98)	1 (2.86)	6 (2.96)	
20 – 34 years	130 (77.38)	25 (71.43)	155 (76.35)	
≥ 35 years	33 (19.64)	9 (25.71)	42 (20.69)	
Parity				0.0545
0	46 (27.38)	5 (14.29)	51 (25.12)	
1 - 4	87 (51.79)	21 (60.00)	108 (53.20)	
≥ 5	35 (20.83)	9 (25.71)	44 (21.68)	
History of prematurity				0.001
No	160 (95.24)	27 (77.14)	187 (92.12)	
Yes	8 (4.76)	8 (22.86)	16 (7.88)	
History of macrosomia				0.022
No	146 (86.90)	25 (71.43)	171 (84.24)	
Yes	22 (13.1)	10 (28.57)	32 (15.76)	

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History of hormonal contraception				0.121
No	129 (76.79)	31 (88.57)	160 (78.82)	
Yes	39 (23.21)	4 (11.43)	43 (21.18)	
Family history of diabetes in first degree				0.059
No	146 (86.9)	26 (74.29)	172 (84.73)	
Yes	22 (13.1)	9 (25.71)	31 (15.27)	

Table 2: Multivariate analysis of risk factors for the occurrence of gestational diabetes

Variable	Adjusted OR [95% CI]	p-value
Age		
<20 years	1	
20-34 years	0.26 [0.03-2.68]	0.259
≥35 years	0.22 [0.02-2.85]	0.247
Parity		
0	1	
1 - 4	0.83 [0.24-2.83]	0.763
5	0.72 [0.16-3.33]	0.675
History of prematurity		
No	1	
Yes	5.24 [1.40-19.66]	0.014
History of macrosomia		
No	1	
Yes	2.07 [0.68-6.33]	0.203
History of 1st degree diabetes		
No	1	
Yes	2.33 [0.80-6.75]	0.12

Discussion

The findings obtained from this study regarding the occurrence and risk factors of GDM in five healthcare facilities in Likasi city (DRC) have the potential to enhance understanding of the epidemiology and management of GDM. The study revealed a GDM prevalence of 17.4% (95% CI: 12.31% - 23.14%). Our results closely align with similar rates reported in Guinea (16.3%) and Canada (17.8%) [4]. In comparison, the prevalence observed in Tanzania (13%) [6] and China (14.8%) [15] was lower, while higher rates were found in Bukavu (DRC) (44.0%) [9] and Dakar in Senegal (33.1%) [7]. These variations may be attributed to factors such as ethnicities, obesity rates, and the prevalence of type 2 diabetes [16]. However, it is worth noting that the use of the IADPSG criteria has led to an increasing trend in GDM prevalence across multiple studies due to its heightened sensitivity and lower diagnostic threshold associated with GDM complications [17].

The association between a history of prematurity and gestational diabetes mellitus (GDM) was found to be significant in our study (adjusted odds ratio [OR]=5.24 [1.40-19.66]), which supports the findings of Lowe and Mustafa [18,19]. Conversely, some authors have not identified a history of prematurity as an independent risk factor for GDM [16,20]. Our results can be explained by the fact that prematurity is a common complication of GDM [21]. The median age of pregnant women in our study was 28 years, and we did not observe an association between maternal age and GDM. This finding aligns with the recommendations of the NICE (National Institute for Health and Clinical Excellence) and the CNGOF (French National Council of Obstetrician Gynecologists), which consider maternal age over 35 years as a risk factor for GDM [16]. Additionally, we found no association between parity and GDM, consistent with Kisindja et al.'s findings in the eastern DRC [22]. However, several authors have reported an association between parity and GDM [7,10,23,24]. The lower rate of large multiparous women in our study (21.68%) may explain this discrepancy. Our study also revealed that a history of macrosomia was not significantly associated with GDM (OR=2.07 [0.68-6.33]) (p=0.203), which is consistent with the findings of Ping Li et al. [25]. Although a history of macrosomia is a known risk factor for GDM [10,22], it is important to note that macrosomia can have multiple causes unrelated to GDM [26]. Lejeune et al. [27] demonstrated that 87% of macrosomic babies were born to women who had a normal result on the GDM screening test proposed by the WHO.

Conclusion

Our study shows that GDM is a real public health problem in the city of Likasi (17.24%). The history of prematurity is independently associated with the GDM. Maternal age, parity, history of 1st degree diabetes and macrosomia could directly or indirectly constitute risk factors for GDM; this would need to be confirmed or refuted by further studies. The detection of GDM requires urgent hygiene-dietary measures and insulin therapy if the therapeutic target is not reached.

Conflict of interest: None

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