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Gestational diabetes in Cameroon: analytical study of the glycemic profile and pregnancy outcomes at the Laquintinie Hospital in Douala

Diabète gestationnel au Cameroun: étude analytique du profil glycémique et des issues de grossesse à l'Hôpital Laquintinie de Douala

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Article original

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RESUME

Introduction: The direct effects of a disruption in the regulation of carbohydrate metabolism during the first trimester of pregnancy remain poorly understood, hence the main objective of this study, to seek an association between the glycemic profile of the pregnant woman in the first trimester of pregnancy and the outcome of childbirth.
Methodology: We carried out an analytical cross-sectional study concerning two groups of pregnant women with a prospective recruitment method at the maternity ward of Laquintinie Hospital over a period of 06 months. We were interested in any childbirth from the term of 28 weeks of amenorrhea, in whom fasting blood sugar had been measured before 16 weeks of amenorrhea. The variables were collected in the delivery room using a structured and pre-tested survey form. Statistical analyzes were performed with a statistical significance threshold set at a P value < 0.05.
Results: Out of a total of 142 pregnant women included in our study, 32.0% of pregnant women had a fasting blood glucose (FBG) ≥ 0.92 g/L (group 1). There was a significant association between fasting blood sugar ≥ 0.92 g/l in the first trimester and premature delivery (OR: 2.99; p=.002); the birth of macrosome newborns (OR: 3.64; p=0.017); cesarean section (OR: 2.18; p=0.009), hospitalization of newborns (OR: 2.98; p=0.002).
Conclusion: Abnormal blood sugar levels in the first trimester are associated with a risk of complications during delivery

ABSTRACT

Introduction : Les effets directs d'une perturbation de la régulation du métabolisme glucidique pendant le premier trimestre de grossesse demeurent mal connus d'où l'objectif principal de cette étude, de rechercher une association entre le profil glycémique de la gestante au premier trimestre de grossesse et l'issue de l'accouchement.
Méthodologie : Nous avons réalisé une étude transversale analytique concernant deux groupes de gestantes avec un mode de recrutement prospectif à la maternité de l'Hôpital Laquintinie sur une période de 06 mois. Nous nous sommes intéressés à toute accouchée à partir du terme de 28 semaines d'aménorhhée, chez qui une glycémie à jeun avait été mesurée avant 16 semaines d'aménorrhée. Les variables ont été collectées en salle d'accouchement à partir une fiche d'enquête structurée et pré testée. Les analyses statistiques ont été effectuées avec un seuil de signification statistique fixé pour une P value < 0,05.
Résultats : Sur un total de 142 gestantes incluses dans notre étude, 32,0% de gestantes avaient une glycémie à jeun (GAJ) ≥ 0,92 g/L (groupe 1). Il y'avait une association significative entre une glycémie à jeun ≥ 0,92 g/l au premier trimestre et l'accouchement prématuré (OR : 2,99 ; p=002) ; la naissance de nouveau-nés macrosomes (OR : 3,64; p=0,017) ; la césarienne (OR : 2,18 ;p=0,009), l'hospitalisation des nouveau-nés (OR : 2,98; p=0,002).
Conclusion : Une glycémie anormale au premier trimestre est associée à un risque de survenue de complications à l'accouchement.

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Introduction

Pregnancy exposes the pregnant woman, as well as her product of conception, to various health risks such as gestational diabetes. It is a glucose tolerance disorder of varying severity, beginning or diagnosed for the first-time during pregnancy and regardless of its evolution postpartum [1-5]. Systematic screening is controversial given the lack of solid data to define the glycemic threshold beyond which treatment is necessary [6,7,8]. The first trimester represents the phase of insulin sensitivity with a tendency to hypoglycemia, yet in many pregnant women, we note an increase in the latter with values above the threshold. This threshold currently does not create agreement between schools and learned societies [9]. Indeed, after the HAPO (hyperglycemia and Adverse Pregnancy Outcomes) study demonstrated incontrovertibly that there is a significant continuity between maternal glycemic levels and the occurrence of maternal-fetal complications but without an obvious threshold [12,13] , several other studies followed, notably that of the IADPSG (International Association of Diabetes in Pregnancy Study Group) which in 2010 proposed targeted screening for gestational diabetes with a threshold ≥ 0.92g/l, thus allowing early and adequate loading [14].

The prevalence of first trimester hyperglycemia worldwide varies depending on the strategy used [12]. Thus, in 2015 in California in the United States of America, the prevalence of hyperglycemia in the first trimester of pregnancy was 9.4% (IADPSG 2010/WHO 2013 criteria) and 5. 3% (O'Sullivan and Mahan criteria) [11], while in Europe (WHO 2013 criteria), in France it was 10.6% in 2019 [14], in Italy by 48.5% in 2016 [15]. In Asia, more particularly in China, it was 11.4% in 2013 (WHO 2013 criteria) [16]; of 27.31% in Australia 2016 with the same criteria, [17]. In Israel it was 11.9% in 2013 (WHO 2013 criteria) [18]. In Africa, a study carried out in Senegal, Leye D. et al. [11] found that only 3.12% women were screened during the first trimester of pregnancy. In Cameroon in 2018, for Egbe et al. no pregnant woman had been tested during the first trimester of pregnancy [10]. These results demonstrate the paucity of data concerning hyperglycemia during the first trimester of pregnancy in Africa and in Cameroon in particular. Hence the justification for the present study, in order to determine the outcome of childbirth in pregnant women who presented a particular glycemic profile in the first trimester of pregnancy at the Laquintinie Hospital in Douala (LHD).

Methodology

We conducted a cross-sectional analytical study with a prospective recruitment method at LHD over a period of 9 months from December 1, 2019 to August 14, 2020 and recruitment over a period of 6 months from December 1, 2019 to May 31, 2020 on the LHD pregnant women. Were included, any pregnant woman with a pregnancy of at least 28 weeks of amenorrhea admitted to the labor room at LHD, with a single pregnancy, having completed at least one prenatal consultation before 16 weeks of pregnancy with blood sugar measurement whatever what the result was, consenting and agreeing to participate in the study. Excluded were any pregnant woman with a surgical pelvis, known type 1 or 2 diabetic, pregnant women having already benefited from at least two cesarean sections, multiple pregnancies, pregnant women under hyperglycemia-inducing treatment (cortico-therapy, neuroleptics, ARV) and hypoglycemia (antidepressants, anti-arrhythmias, hypo-lipidemics, hypotensives). Our sample is consecutive; we recruited all pregnant women admitted to the labor room of LHD received were interviewed and examined after explaining the purpose of our study and obtaining their consent, clinical, socio-demographic data and anthropometric parameters were collected upon their admission to the delivery room. Glycemic profile of the first trimester were collected from the pregnant women's pregnancy monitoring booklet. Data concerning obstetric and clinical profiles as well as the outcome of delivery were collected during and after labor in the delivery room and/or after leaving the operating room. Information concerning the study variables was recorded on a structured and pre-tested survey sheet; they

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focused on the description of socio-demographic characteristics, clinical and obstetric profiles, as well as the outcome of the delivery. The statistical analysis consisted of recording the data collected using an input mask designed using Cs Pro 7.3 software and analysis using statistical software: SPSS 25.

Results

Out of a total of 225 pregnant women, we retained 142 pregnant women, 24 had not consented to participate in the study; 40 multiple pregnancies, 8 known diabetic pregnant women and 11 scarred uteri were excluded.

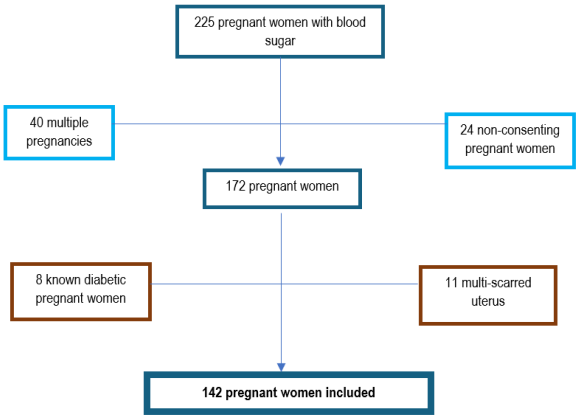

Figure 1: *flow chart presenting the inclusion of pregnant women in the study*

The study sample included 142 women whose ages ranged from under 18 to over 30. The pregnant women were equally distributed between the marital statuses of married and single (50%), more than half of them had an educational level corresponding to secondary school (57.0%). Nearly 74% of our sample had no known sporting activity and nearly 33% were obese before their pregnancy. More than half of the pregnant women were from the West region (59.8%). Our series was mainly represented by first-time mothers (34.5%) and multi-pregnant women were mainly represented with 27.4%.

In total, 6.1% of our pregnant women had either a first-degree family history of diabetes or both (arterial hypertension and diabetes). More than half of the pregnant women (78.9%) had received all prophylaxis during follow-up. An oral load of 75 grams of glucose between the 24th and 28th week of amenorrhea was not achieved in 97.7% of pregnant women. Regarding pregnancy monitoring, 92.9% had at least four prenatal consultations. In total, 54 (38%) pregnant women had a FBS ≥ 0.92 g/l during the first trimester of pregnancy. The majority glycemic range was 0.92-1.02 g/l i.e. 51.8%. In total, 88 (61.9%) pregnant women had a FBS at the start of pregnancy less than 0.92g/l. In our series, we found that 38.46% of pregnant women in group 1 had given birth before term (OR: 2.99[(95% CI: 1.36 – 6.54; p=0.002]).

Table I: *distribution according to socio-demographic characteristics and family history*

Variables	Number (n)	Percentage (%)
Age (years)		
≤ 18	2	1,56
[18 ; 25]	20	15,63
[25 ; 30]	36	28,13
>30	70	54,69
Ethnic origin		
West	85	59,58
Littoral	25	16,92
North-West	12	8,45
South	7	4,93
Centre	7	4,93
Far-north	3	2,11
South-West	2	1,40
North	2	1,40
East	0	0,00
Adamawa	0	0,00
Weekly physical activity		
None	104	73,24
1 time	2	1,41
2 times	30	21,13
3 times	6	4,23
>3 times	0	0,00
Body mass index before pregnancy(n=142)		
<18,5	1	0,70
[18,5-24,9]	40	28,16
[25,0-29,9]	41	28,90
≥30,0	46	32,46
Unknown	14	9,86
Marital Status		
Single	81	50,70
Married	81	50,70
Divorced	0	0,00
Widow	0	0,00
Level of education		

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Non scolarised	1	0,70
Primary	2	1,41
Secondary	81	57,04
Higher education	58	40,85
Family history (N = 15), (1st degree)		
Diabetes	9	3,34
Hypertension	2	1,40
Diabetes and hypertension	4	2,81

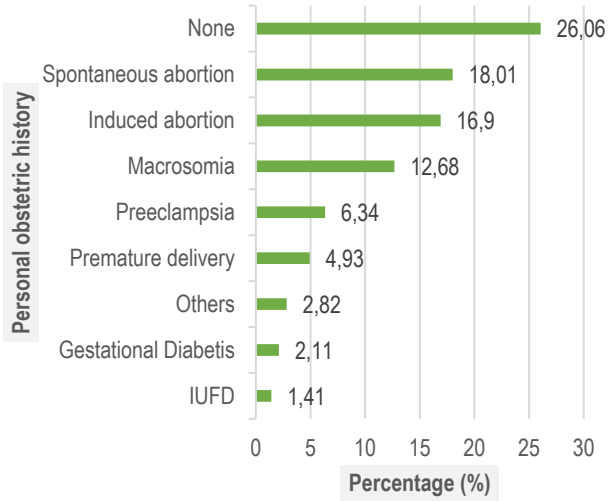

Figure 2: *distribution according to personal obstetric history*

Table II: *distribution according to prophylaxis not administered, performance of an oral hyperglycemia test between the 24th and 28th weeks and pregnancy monitoring*

Variables	Number (n)	Percentage (%)
prophylaxis not administered (N=142)		
None	101	78,91
Anti-tetanic toxoid	8	6,25
Malaria Prophylaxis	0	0,00
Iron	0	0,00
Folic acid	17	13,28
Calcium	23	17,97
performance of an oral hyperglycemia test between the 24th and 28th weeks		
Not done	85	97,70
Number of antenatal consultations (N=142)		
[1-2]	0	0,00
[2-4]	10	7,04
>4	132	92,96

Table III: *distribution according to the glycemic profile of pregnant women in group 1 and group 2*

Variables	Number (n)	Percentage (%)
Group 1		
[0,92-1,02]	28	51,85
[1,02-1,12]	14	25,93
[1,12-1,22]	4	7,41
[1,22-1,32]	3	5,56
>1,32	5	9,26
Total	**54**	**38,03**
Group 2		
<0,52	0	0,00
[0,52-0,62]	6	6,81
[0,62-0,72]	19	21,59
[0,72-0,82]	37	42,05
[0,82-0,92]	26	29,54
Total	**88**	**61,97**

Table IV: *distribution according to the term of pregnancy in the 2 groups*

Term (WA)	Group 1 N =54 (%)	Group 2 N =88 (%)	OR ($CI_{95\%}$)	P-value
[28-37]	**10 (38,46)**	**16 (61,54)**	***2,99 (1,36 – 6,54)***	***0,00232***
[37-41]	40 (37,38)	67 (62,2)	Ref.	Ref.
>41	4 (44,44)	5 (55,56)	0,75 (0,19 – 2,94)	0,34096

**WA: Weeks of amenorrhea. *Ref: Reference*

Discussion

The most represented pregnant women were aged at least 30 years, i.e. 50.7%, with an average age of 30.21 ± 6.20 years. These figures are close to those found Msollo et al., Most et al., Bianchi et al. [3, 23, 25,], and may be related to the fact that this age would correspond to the peak of procreation. Activity practiced regularly before pregnancy but also during pregnancy appears to be a real protective factor against gestational diabetes, leading, as in type 2 diabetes, to an improvement in carbohydrate metabolism by improving insulin sensitivity [7]. During our study, we found that 73.2% of pregnant women did not practice any weekly physical activity. This rate is significantly higher than that found by Mapira et al. [8]. More than half of our pregnant women (67.9%) had a BMI

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before pregnancy ≥ 25.0 kg/m2, similar to El-Ghabir et al. [27]. These results were different from those reported by Imoh et al [6]. This variability could be attributable to ethnic or even interindividual differences.

In our series, multigestation were mainly represented with 27.4%. These rates are close to those found by Leye et al [11], and unlike those reported by El-Gharib et al. [27]. The influence of sociocultural considerations could explain the variability between these results. In a literature review, Galtier et al. [1] quantified the level of risk of occurrence of GDM in the event of a history of type 2 diabetes in first-degree relatives. The odds ratio varies from 1.58 to 3.03 depending on the study. Analysis of our results showed that 6.1% of our pregnant women had a first-degree family history of diabetes. This ratio contrasted with those found by Imoh et al [6], Moumhil, Mapira et al. [8,12] and probably in relation to ethnicity and socio-environmental context. History of spontaneous abortions accounted for 18.3%; followed by induced abortions 16.9%; macrosomia 12.6%. 2.1% of pregnant women had a personal history of GDM and 1.4% of IUFD. A trend close to that of Lahlou [9], unlike Moumhil, Imoh et al. [6,12]. In our series, 23.9% of pregnant women had a history of cesarean section and cephalopelvic disproportion was the majority indication (26.4%).

Of a total of 142 pregnant women included in our study, 54 (32.0%) had a FBS ≥ 0.92 g/L (group 1) compared to 88 (61.9%) having a FBS < 0.92 g/L (group2). The majority glycemic range in the general population was 0.72-0.82 g/l with a rate equal to 26.0%. The average glycemic value was 0.87 ± 0.18 g/L. This trend is close to those Clarke et al. [14] and Bashir et al. [15] but different from that of Hong et al. [16] who found an average of 1.18 ± 0.42 g/l. In pregnant women in group 1, the average glycemic value was 1.05 ± 0.14 g/l. Gupta et al. [17] and Boriboonhirunsarn et al. [18] reported respective means of 1.82 ± 0.31g/l and 0.91 ± 0.24g/l. In 2019, Bashir et al. [27] found an average of 0.95±0.12g/l; Hong et al. [16] reported a mean fasting blood glucose level of 1.18 ± 0.42g/l. In pregnant women in group 2, the average fasting blood sugar level was 0.76 ± 0.09 g/l. Barahona et al. [19] found respective means of 0.84 ± 18.8 g/l; 0.88 ± 0.28 g/l. For Clarke et al. [14] the average value of fasting blood sugar at the start of pregnancy was 0.88±0.10g. The great variability and divergence between these results could be justified on the one hand by the existence of a multitude of fasting blood sugar screening tests, but also by the significant variability between the sociodemographic characteristics of pregnant women, particularly ethnicity, age, body mass index, weight gain, habits.

We found a statistically significant association between a FBS in the first trimester ≥ 0.92 g/l and premature delivery (p=0.002), like Bashir et al. [15] as well as Immanuel J. et al. [20]. On the other hand, Geurtsen et al., like Cosson et al [21,22], did not find a significant difference. These differences may be related to the management of pregnant women with high FBS during screening at the start of pregnancy in certain studies. Blood pressure constitutes the main element in the definition of hypertensive diseases in pregnancy. In our series, there was no significant association between high FBS in the first trimester of pregnancy and the occurrence of hypertensive disorders. These results are consistent with those reported by Clarke, Most et al. [14,23]. Unlike Immanuel et al who reported a significant link in their actions [20]. This could be explained by sampling; in fact, some studies included more pregnant women with a personal and family history of hypertension).

In our study, an association was noted between a FBS ≥ 0.92 g/l at the start of pregnancy and stationary labor (p=0.020). However, we did not find any attention on the subject in the literature. Our findings on the mode of delivery were superimposable to those of Riskin-Mashiah, Bashir, Most et al. [15,23,24], and supported the idea of a significant association between a high FBS at the start of pregnancy and the risk of occurrence of delivery by cesarean section (p = 0.009), with the major indication being a suspicion of macrosomia either in scarred uterus, borderline pelvis or malformed presentations. Our results, however, contrasted with those reported by Bianchi,

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Boriboonhirunsarn et al. [18, 25]. The difference between these data could be explained by the fact that the indication for cesarean section is also affected by the therapeutic attitude (monitoring the progress of labor, obstetric maneuvers). Just like Most et al. [23], no link was found during our study between a FBS ≥ 0.92 g/l during the first trimester of pregnancy and trauma to the genital tract. Unlike Clarke et al. who reported a significant association with the occurrence of obstetric trauma in pregnant women with a high FBS in the first trimester of pregnancy [14]. The therapeutic attitude could justify the dissimilarity between these results (monitoring the progress of labor, obstetric maneuvers).

The definition of neonatal asphyxia proposed by the WHO is that of a failure to establish or initiate normal breathing at birth. Its diagnosis is based on several criteria including a clinical criterion, that of cardiorespiratory and neurological depression (defined by an Apgar score less than 7 at the fifth minute of life) [26]. During our research, we found no association between a FBS in the first trimester of pregnancy ≥ 0.92 g/l and an Apgar score < 7 at delivery (at the first and fifth minute). These results supported by the reports of Bianchi, Gupta et al. [17, 25] were nevertheless contradictory to those found by Barahona et al. [19]. Sampling could explain the variability between these different results (inclusion of twin pregnancies in the Barahona study). This variability could be related to the fact that care for pregnant women was initiated as soon as hyperglycemia was diagnosed in certain studies.

Conclusion

At the end of our study, it emerged that majority of pregnant women had FBS above normal. We found a statistically significant association between an elevated FBS in the first trimester and premature delivery.

Contribution of the study to science
Our study lifts the veil on gestational diabetes in our environment and calls for greater consideration for early diagnosis in the first trimester in order to anticipate, through quality monitoring, the various complications reported by our research work.

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Conflict of interest: All authors declare no conflict of interest in this research.

Contribution of the authors
Essome supervised the study and wrote the manuscript. Obo'o Okalia collected the data. Tocki provided the English translation as well as the formatting of the manuscript. Moustapha; Boten; Mangala; Tchounzou; Ngalame; Ngaha; Ndolo; Ofakem; Mounchikpou; Mwandje; Ekono; read and corrected the manuscript. Nana and Foumane supervised the study. All authors read and validated the final version of the study.

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