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Maternal Impact of Incidentally Diagnosed Gestational Diabetes at the Time of Delivery in a Level III Maternity Hospital in Dakar, Senegal

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Abstract

Background: Gestational diabetes mellitus (GDM) is a common pregnancy complication associated with increased maternal and perinatal morbidity. In low-resource settings, inadequate screening may lead to late or fortuitous diagnosis, sometimes occurring during labor without prior management. **Objective:** To assess the maternal impact of gestational diabetes fortuitously diagnosed in the delivery room among women with or without classical risk factors defined by the International Association of Diabetes and Pregnancy Study Groups (IADPSG). **Methods:** A retrospective descriptive and analytical study was conducted from 2018 to 2023 at the Pikine National Hospital Center, a level III maternity unit in Dakar, Senegal. Included were women not previously known to be diabetic who delivered in the department and had a fasting plasma glucose ≥ 0.92 g/L, with or without classical GDM risk factors, and without prior management. Sociodemographic data, risk factors, maternal complications during pregnancy and delivery, and mode of delivery were analyzed. Statistical analysis was performed using STATA 12, with $p < 0.05$ considered significant. **Results:** Eighty percent of women had at least one classical IADPSG risk factor. The presence of at least one risk factor significantly increased the likelihood of maternal complications (OR = 14.39; p = 0.01), without a significant effect on fetal complications. Hypertensive disorders were the most frequent maternal complications (14.45%). Most pregnancies reached term. The cesarean section rate was 41% and was significantly associated with the number of risk factors, maternal glycemic level, and fetal macrosomia. No cases of postpartum hemorrhage or maternal death were recorded. **Conclusion:** Fortuitously diagnosed gestational diabetes at delivery is associated with significant maternal morbidity, particularly in women with classical risk factors. Early and systematic screening of GDM, including in women without apparent risk factors, is essential to improve maternal outcomes.

Keywords

Gestational Diabetes Mellitus, Fortuitous Diagnosis, Maternal Morbidity, Risk Factors, Cesarean Section, Senegal

1. Introduction

Gestational diabetes mellitus (GDM) is defined by the World Health Organization (WHO) as a disorder of glucose tolerance resulting in hyperglycemia of variable severity, with onset or first recognition during pregnancy, regardless of the treatment required and its postpartum evolution [1]. The prevalence of GDM varies widely worldwide, ranging from 1% to 14% [2]. In Senegal, it has been reported to be as high as 34.3% [3].

Several risk factors have been implicated in the occurrence of GDM. Advanced maternal age (≥35 years), body mass index (BMI) ≥ 25 kg/m^2, a first-degree family history of type 2 diabetes, and a personal history of GDM or fetal macrosomia are considered the main risk factors identified by the International Association of Diabetes and Pregnancy Study Groups (IADPSG). However, not all cases can be anticipated, as it is acknowledged that approximately one-third of women who develop GDM do not present any identifiable risk factors [4].

Gestational diabetes mellitus is associated with potentially severe maternal and fetal complications. Maternal complications may be metabolic, infectious, vascular, renal, or psychological. Fetal prognosis is mainly threatened by congenital malformations, macrosomia, prematurity, and intrauterine fetal death. Newborns are also exposed to metabolic and cardiorespiratory complications, as well as increased perinatal mortality.

The objective of this study was to determine the maternal outcome of gestational diabetes fortuitously diagnosed during labor, without prior management, in women with or without classical risk factors as defined by the IADPSG.

2. Patients and Methods

Data collection was carried out between 2018 and 2023 at the Pikine National Hospital Center, located in the suburban area of Dakar, Senegal.

2.1. Inclusion Criteria

Pregnant women meeting the following criteria were included:

- no prior diagnosis of diabetes mellitus,
- delivery in our department, with or without GDM risk factors,
- fasting plasma glucose ≥ 0.92 g/L during the first trimester,
- with or without an oral glucose tolerance test (OGTT),
- and no prior management for gestational diabetes.

2.2. Exclusion Criteria

Women with known diabetes mellitus, those with a fasting plasma glucose ≤ 0.92

g/L in the first trimester who experienced a miscarriage, and those with incomplete or unusable medical records were excluded.

2.3. Study Parameters

Collected and analyzed variables included sociodemographic and clinical characteristics, personal and family medical history, the presence or absence of classical GDM risk factors according to the IADPSG, obstetric follow-up data, labor and delivery outcomes, neonatal characteristics (Apgar score and birth weight), and associated maternal and perinatal complications tells que. The complications investigated were cesarean section, hypertensive complications and eclampsia, perineal tears and episiotomy, chorioamnionitis, polyhydramnios, fetopelvic disproportion in mothers and macrosomia, malpresentation, low birth weight, fetal death, and the Apgar score at five minutes.

Data were extracted from delivery records, entered into an Excel database, and analyzed using STATA version 12.

3. Results

In our cohort, 80% of pregnant women had at least one IADPSG risk factor for gestational diabetes. Half of the patients (50.84%) had a single risk factor, 24.77% had two risk factors, and only 4.32% had three cumulative risk factors.

The presence of at least one IADPSG risk factor increased the likelihood of maternal complications by 14.39 times (OR = 14.39; p = 0.01), without a significant influence on the occurrence of fetal complications.

3.1. Pregnancy-Related Complications

Among the 107 patients without any recorded risk factor, 6 women (5.61%) developed gestational hypertension, one patient (0.93%) developed preeclampsia, and none developed eclampsia. No cases of polyhydramnios were observed. Premature rupture of membranes occurred in 10 patients (9.35%), and placental abruption was recorded in 2 cases (1.87%) (Figure 1).

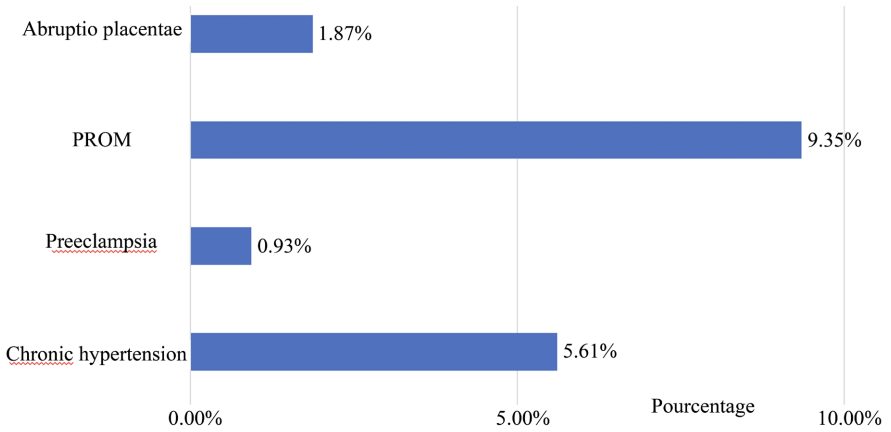

Figure 1. Distribution of the main pregnancy-related complications among women without any gestational diabetes risk factors. PROM: premature rupture of membranes.

Among the 426 women with at least one risk factor, nearly 70% experienced no pregnancy-related complications. However, 58 women (13.62%) developed premature rupture of membranes, and 34 (8%) presented with gestational hypertension. Other complications are illustrated in Figure 2 below.

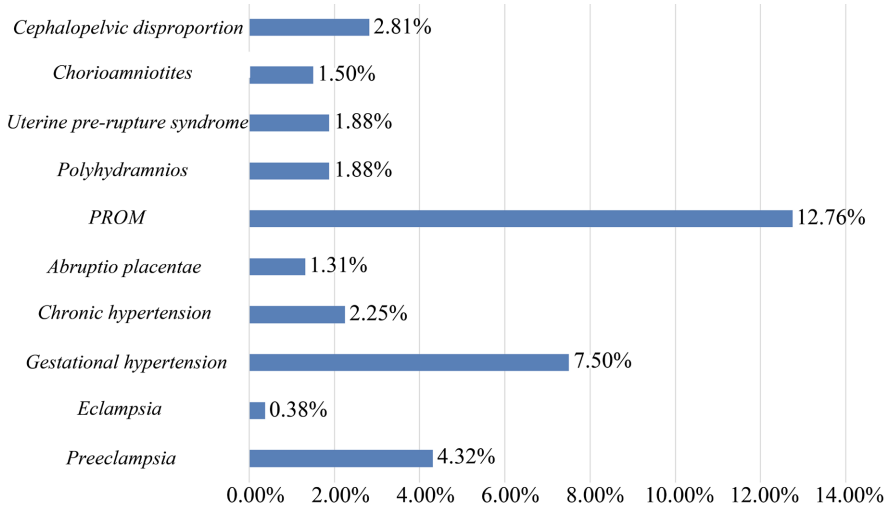

Figure 2. Distribution of the main pregnancy-related complications among women with at least one gestational diabetes risk factor.

3.2. Delivery Outcomes

- **Maternal Outcomes**

Among women without any risk factors, the majority (78.5%) delivered vaginally, while 23 women (21.5%) underwent cesarean section. During vaginal delivery, 36 women (33.64%) required an episiotomy, and 7 patients (6.54%) experienced first-degree perineal tears. Uterine pre-rupture syndrome and chorioamnionitis were each observed in 2.8% of cases.

Table 1. Maternal delivery outcomes according to risk factor status.

Maternal outcomes	R = 0 (n = 107)	%	R ≥ 1 (n = 426)	%
Cesarean section	23	21.5	194	45.5
Vaginal delivery	84	78.5	232	54.5
Episiotomy	36	33.6	87	20.4
Perineal tear	7	6.5	28	6.5
Uterine pre-rupture syndrome	3	2.8	7	1.6
Chorioamnionitis	3	2.8	5	1.2

Among women with at least one risk factor, 194 patients (45.54%) delivered by cesarean section, while 232 (54.46%) had a vaginal delivery. During vaginal delivery, 28 women (6.47%) sustained first-degree perineal tears, and 87 (20.42%) underwent episiotomy. Uterine pre-rupture syndrome was observed in 1.64% of

cases, and chorioamnionitis in 1.17%. Table 1 presents maternal outcomes at delivery, taking into account the various risk factors noted.

The number of risk factors present was found to significantly influence the mode of delivery (p = 0.00).

4. Discussion

4.1. Risk Factors for Gestational Diabetes Mellitus in Our Cohort Classical IADPSG Risk Factors

Our study population was characterized by a high prevalence of classical risk factors for gestational diabetes mellitus (GDM): 80% of pregnant women had at least one classical GDM risk factor, with a mean of 1.42 risk factors per woman. In contrast, Ngoné's study reported that 75% of women had at least one risk factor, with a mean of 2 ± 1.9 risk factors per woman [5].

We observed that maternal glycemic levels between 1.00 and 1.16 g/L and between 1.17 and 1.26 g/L were significantly associated with the number of risk factors present (p = 0.006). Moreover, the presence of at least one IADPSG-defined risk factor increased the likelihood of maternal complications by 14.39 times (OR = 14.39; p = 0.01), without exerting a significant influence on fetal and/or neonatal complications.

4.2. Maternal Age

In our study, the mean maternal age was 29 years. This was lower than that reported in Dakar-based studies by Ngoné (32.8 ± 6.2 years) [6], Hayriat (33.93 years) [7], and Jules (30.27 years) [8]. However, our findings were comparable to those reported by Landon *et al.* (29.2 years) [9] and the French DIAGEST study (28.8 years) [10].

The age threshold retained by the IADPSG and the CNOGF as a risk factor for GDM is 35 years. In our cohort, 21% of women met this criterion, compared with 26.92% reported by Jules [8].

4.3. Overweight and Obesity

The mean body mass index (BMI) of our cohort was 28.23 kg/m^2, higher than that reported in the ACHOIS study (26.8 kg/m^2) [11], lower than that reported by Landon *et al.* (30.1 kg/m^2) [9], and comparable to that reported by Jules (28.41 kg/m^2) [8].

Overweight was observed in 76% of women in our study population. A significant association was found between BMI and maternal fasting glucose levels between 0.92 and 1.00 g/L (p = 0.024). However, a case-control study conducted by Ngoné in 2016 did not identify a significant association between overweight and GDM [6].

4.4. Family History of Diabetes

A family history of diabetes was reported in 12.6% of women in our study. This

prevalence was markedly lower than that reported by Ngoné (40.9%) [6] and Jules (46.16%) [8], but higher than that reported by Mamabolo *et al.* in South Africa (8.7%) [12] and Seyoum *et al.* in Ethiopia (0.6%) [13]. In our cohort, this history was more frequently paternal (50.6%), contrary to the findings of Jules [8]. Nevertheless, the presence or absence of a family history of diabetes did not significantly influence maternal glycemic levels.

4.5. Personal History of GDM

A personal history of gestational diabetes was less frequent in our cohort (1.2%) compared with that reported by Jules (15.38%) [8]. This rate is far below the recurrence rates described in the literature (30% - 40%, depending on the country) [14], which may be explained by underdiagnosis of GDM during previous pregnancies in our setting.

4.6. Personal History of Fetal Macrosomia

Only 1.5% of women in our cohort had a history of fetal macrosomia, compared with 19.23% in the study by Jules [8]. A personal history of fetal macrosomia was significantly associated with higher maternal glycemic levels ($p = 0.017$).

4.7. Maternal Morbidity Associated with GDM during Pregnancy

- **Hypertensive Disorders**

Hypertensive disorders are frequently reported maternal complications associated with GDM [15], and may also be influenced by other factors such as maternal age, pregestational BMI, a history of hypertension, and multiparity. In a case-control study by Suhonen, 19.8% of women with GDM developed hypertension, compared with 6.1% in the control group [16].

In our study, hypertensive complications were observed in 14.45% of cases, a lower rate than that reported by Hayriat (17.82%) [17]. Maternal glycemic level significantly influenced the occurrence of hypertensive complications, whereas maternal age, BMI, and parity were not associated with this outcome. Women with hypertensive disorders had significantly higher mean glycemic levels (1.0555 g/L) compared with those without such complications (1.003 g/L). A maternal glycemic level below 1 g/L reduced the risk of complications by 8.7-fold.

- **Polyhydramnios**

According to the literature, polyhydramnios occurs in approximately 20% of women with GDM and is more frequent among older and multiparous women. An Algerian study by Bensalem *et al.* reported a higher frequency of polyhydramnios in diabetic women, all of whom were multiparous [18]. Capula *et al.*, in an Italian study involving 2448 women, demonstrated an association between GDM and polyhydramnios even after adjustment for age, parity, and pregestational BMI [19].

In our study, polyhydramnios was observed in only 1.88% of women, a rate substantially lower than that reported in the literature. The occurrence of polyhy-

dramnios was not associated with maternal glycemic levels (p = 0.967) or fetal macrosomia (p = 0.561).

4.8. Maternal Morbidity Associated with GDM during Delivery

- **Gestational Age at Delivery**

In our population, the majority of pregnancies (88%) reached term between 37 and 41 weeks of gestation. The mean gestational age at delivery was 39 weeks and 2 days. These findings are comparable to those reported by Bensalem *et al.* (38.5 ± 0.5 weeks) [18] and Ngoné (38.1 ± 2.3 weeks) [6].

Post-term pregnancy was observed in 9% of cases, while only 3% delivered near term, compared with 15% reported by Ngoné [6] and 9.3% in the French DIAGEST study [19].

- **Cesarean Section Rate**

The literature consistently reports a significant association between GDM and increased cesarean section rates [20]. Cesarean delivery is often performed to improve maternal and fetal outcomes by preventing late pregnancy complications. Reported cesarean section rates range from 20% to 30% [21].

In our study, 41% of women underwent cesarean delivery. This rate was lower than that reported by Ngoné (51.3%) [6] but higher than that reported by Langer in the United States (24%) [15]. In Hayriat's study conducted at Abass Ndao Hospital in Dakar, the cesarean rate among known diabetic women reached 63.1% [17]. In our cohort, only 17.05% of cesarean deliveries were scheduled, compared with 76.57% reported by Hayriat [17].

Notably, 90% of women who underwent cesarean section had at least one classical risk factor, and 30.8% had a scarred uterus. Elevated cesarean section rates should not be attributed solely to the presence of GDM. However, Capula *et al.* [19] demonstrated a significant association between GDM and cesarean delivery even after adjustment for age, parity, and BMI.

We identified a significant association between maternal glycemic levels between 0.92 and 1.00 g/L and the mode of delivery (p = 0.047). The number of risk factors present (p = 0.00) and the presence of fetal macrosomia (p = 0.01) also significantly influenced the mode of delivery. Women carrying a macrosomic fetus were 1.44 times more likely to undergo cesarean section. Mean maternal glycemic levels were higher among women who underwent cesarean delivery (1.0212 g/L) compared with those who delivered vaginally (1.0013 g/L).

- **Obstetric Trauma**

Among women who delivered vaginally, 50% experienced obstetric trauma: 39% underwent episiotomy and 11% sustained perineal tears. The rate of perineal tears was comparable to that reported by Ngoné (10%) [6]. No significant association was found between fetal macrosomia and the occurrence of perineal tears (p = 0.125).

Episiotomy was significantly associated with the number of maternal risk factors and the presence of fetal macrosomia (p = 0.000), but not with maternal gly-

cemic levels. Women who underwent episiotomy had a mean glycemic level of 1.004 g/L. In contrast, perineal tears were not influenced by the number of risk factors ($p = 0.307$) or fetal macrosomia ($p = 0.125$). A maternal glycemic level ≥ 1.27 g/L significantly increased the risk of perineal tears ($p = 0.045$).

No cases of postpartum hemorrhage were recorded in our study.

5. Conclusion

Fortuitously diagnosed gestational diabetes at delivery is associated with significant maternal morbidity, particularly in women with classical risk factors. Early and systematic screening of GDM, including in women without apparent risk factors, is essential to improve maternal outcomes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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