

Maternal and Perinatal Prognosis of Gestational Diabetes at the Maternity of the University Hospital Center of Porto-Novo in Southern Benin

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Abstract

Objective: To evaluate factors related to the maternal and perinatal prognosis of gestational diabetes.

Patients and Methods: It was a prospective case-control study carried out from February 1st, 2015 to July 31st, 2017 at the maternity of the University Hospital Center (CHU) of Porto-Novo in Southern Benin. We screened gestational diabetes in all pregnant women admitted to antenatal care with a gestational age between 24 and 28 Weeks of Amenorrhea (WA), and who agreed to participate in the study.

Results: There was a high correlation between the delivery route and gestational diabetes, with a higher caesarean section rate [OR 2.51 95% CI (1.55-4.67)]. The maternal prognosis was more severe for women with diabetes than it was for women without diabetes. Maternal morbidity was marked by pre-eclampsia [OR 2.90 CI 95% (1.74-4.84)], urinary tract infection [OR 2.86 CI 95% (1.49-5.48)], fetal and pelvic disproportion [OR 2.67 CI 95% (1.55-4.67)] and immediate postpartum hemorrhage [OR 2.93 CI 95% (1.41-6, 07)]. Perinatal prognosis was also more severe with diabetic women than it was for non-diabetic women. Perinatal morbidity was marked by stillbirth [OR 2.77 CI 95% (1.11-6.92)], fetal asphyxia [OR 2.54 CI 95% (1.44-4.50)], immediate neonatal distress [OR 2.64 CI 95% (1.35-5.16)], secondary neonatal distress [OR 5.85 CI 95% (2.57-13.29)], macrosomia [OR 6.16 CI 95% (3.29-11.50)] and neonatal hypoglycemia [OR 5.12 CI 95% (1.57-16.76)]. The neonatal lethality rate was 5-times higher with diabetic women [OR 5.12 CI 95% (1.57-16.76)].

Conclusion: This study confirmed that gestational diabetes increases the risks of a pregnancy for the mother, the fetus, and the newborn.

Keywords: Gestational diabetes; Maternal prognosis; Fetal prognosis; Neonatal prognosis; Mortality

Objective

To evaluate factors related to the maternal and perinatal prognosis of gestational diabetes.

Patients and Methods

We conducted a prospective case-control study at the maternity of the University Hospital center of Porto-Novo in southern Benin. The study was conducted over a period of thirty (30) months, from February 1st, 2015 to July 31st, 2017. The sampling was systematic with extensive recruitment of pregnant patients. Only Pregnant women seen in prenatal consultation between the 24th and the 28th week of amenorrhea were included in the study. Excluded from the study were all pregnant women with a renal vascular profile (diabetes, hypertension, and nephropathy) that erupted before or at the beginning of their pregnancy as well as those with other intercurrent illnesses such as HIV or AIDS, hepatitis and malaria.

Screening was done according to the World Health Organization (WHO) test which consisted of an induced hyperglycemia test conducted two hours after oral intake of 75 g of glucose. Were considered having "Gestational diabetes" those patients whose test results were greater than or equal to 1.40 g/L (defined as "case"). The "Control sample" was made of pregnant women with blood glucose <1.40 g/L. Obstetrical records were used for monitoring and observing

Introduction

Gestational Diabetes (GD) is a glucose tolerance disorder leading to hyperglycemia of variable severity. It starts or is diagnosed for the first time during pregnancy, regardless of the treatment required and the postpartum course [1,2]. It is the most commonly observed endocrine disorder during pregnancy, making it a high-risk pregnancy with maternal, fetal, and neonatal complications [3-6]. It is a public health problem in Africa in general and particularly in Benin.

Globally, the prevalence of gestational diabetes varies between 3% and 15% [7-9] with disparities from one continent to another. In Africa, the few studies carried out have reported a prevalence of gestational diabetes that ranges from 5% to 17% [10-12]. According to various studies carried out in Cotonou in the southern Benin, the prevalence of gestational diabetes has doubled in less than 30 years: 3.2% in 1988 [13], 4.4% in 1998 [14] and 6.5% in 2013 [15]. The purpose of this study is to contribute to the reduction of maternal and perinatal morbidity and mortality related to gestational diabetes.

the outcome of pregnancies. The variables studied were: socio-demographic profile of pregnant women, obstetrical history, prognosis of childbirth, maternal prognosis (pre-partum, per partum and immediate postpartum maternal complications) and perinatal prognosis. The chi-square test was used for the comparison of the results and the difference was supposed to be significant for a p-value lower than or equal to 0.05.

Results

Out of a total of 967 pregnant women screened, we diagnosed 73 cases of gestational diabetes, representing a prevalence rate of 7.5%.

The remaining 894 pregnant women whose results were negative were put in the control sample.

Characteristics of the sample

Socio-demographic profile of the pregnant women: The mean age of pregnant women in the study was 28.47 ± 5.71 years old (33 ± 4.19 years vs. 28 ± 5.66 years) with extremes of 16 and 44 years. The occupation, education, and marital status of pregnant women were not considered to be relevant factors regarding the "gestational diabetes" (Table 1).

Obstetrical record of pregnant women: The mean number of pregnancies our patients had was 2.90 1.48 pregnancies (1-8) for an average parity of 2.00 1.53 deliveries (0-7). Most of the pregnant women had had a relatively low number of pregnancies and deliveries (Table 2).

| Variables | Total (967) | Cases (73) | Control (894) | p-value |
|-----------------------------|-------------|------------|---------------|---------|
| | n (%) | n (%) | n (%) | |
| Occupation | | | | |
| Sales woman | 383 (39.6) | 26 (35.6) | 357 (40.0) | 0.289 |
| Housewife | 204 (21.1) | 12 (16.5) | 192 (21.5) | |
| Public worker | 160 (16.6) | 16 (21.9) | 144 (16.1) | |
| Craftswomen | 130 (13.4) | 9 (12.3) | 121 (13.5) | |
| Students | 90 (9.3) | 10 (13.7) | 80 (8.9) | |
| Education level | | | | |
| No schooling/Primary school | 450 (46.5) | 30 (41.1) | 420 (47) | 0.172 |
| Secondary school | 296 (30.6) | 20 (27.4) | 276 (30.9) | |
| High school | 221 (22.9) | 23 (31.5) | 198 (22.1) | |

Table 1: Distribution of "Case" and "Control Sample" by occupation, level of education and marital status.

| Variables | Total (967) | Cases (73) | Controls (894) | p-value |
|--|-------------|------------|----------------|---------|
| | | n (%) | n (%) | |
| Pregnancy | | | | |
| 1 st Pregnancy | 147 | 6 (8.2) | 141 (15.8) | 0.212 |
| 2 nd or 3 rd Pregnancy | 474 | 37 (50.7) | 437 (48.9) | |
| 4 th or more pregnancy | 346 | 30 (41.1) | 316 (35.3) | |
| Parity | | | | |
| Nulliparous (0) | 174 | 8 (10.9) | 166 (18.6) | 0.11 |
| Primigravida (1) | 253 | 17 (23.3) | 236 (26.4) | |
| Gravida (2-3) | 399 | 37 (50.7) | 362 (40.5) | |
| Multigravida (4 or more) | 141 | 11 (15.1) | 130 (14.5) | |
| History of caesarean | 133 | 13 (17.8) | 120 (13.4) | 0.295 |

Table 2: Distribution of the patients classified in "Case" and "Control sample" gestures according to their obstetrical history.

Prognosis: Before turning to the prognostic component of the study, it should be noted that all pregnant women diagnosed with diabetes benefited from dietary and lifestyle measures and in 10 out of 73 cases from insulin therapy. The follow-up of diabetic patients was conducted both by obstetricians and diabetologists.

Prognosis of the delivery: There was no significant difference regarding the gestational age at delivery. However, induced delivery was more frequent with pregnant women with gestational diabetes [OR 2.35 CI 96% (1.38-3.65)]. The delivery route was correlated with

gestational diabetes with a higher caesarean section rate [OR 2.51 95% CI (1.55-4.67)].

Caesarean section indications were dominated by fetopelvic disproportion [OR 2.67 CI 95% (1.55-4.67)] and fetal asphyxia [OR 2.54 CI 95% (1.44-4, 50)] (Table 3).

Perinatal complications: The maternal prognosis was more severe with patients with diabetes than it was with patients without diabetes (Table 4).

| Variables | Cases (73) | Control (894) | OR (CI 95%) | p-value |
|-----------------------------------|------------|---------------|------------------|---------|
| | n (%) | n (%) | | |
| Delivery Term (WA) | | | | |
| <37 | 3 (4.1) | 63 (7.1) | 0.54 (0.17-1.77) | 0.3029 |
| 37-41 | 60 (82.2) | 761 (85.1) | 0.81 (0.43-1.51) | 0.5012 |
| >41 | 10 (13.7) | 70 (7.8) | 1.87 (0.92-3.80) | 0.0801 |
| Labor stimuli | | | | |
| Induced | 33 (45.2) | 240 (26.8) | 2.25 (1.38-3.65) | 0.0008 |
| Spontaneous | 40 (54.8) | 654 (73.2) | 0.44 (0.27-0.72) | - |
| Method of Delivery | | | | |
| Caesarean | 41 (56.1) | 302 (33.8) | 2.51 (1.55-4.07) | 0.0001 |
| Vaginal | 32 (43.8) | 592 (66.2) | - | - |
| Signs leading to C-section | | | | |
| Cephalopelvic disproportion | 20 (27.4) | 110 (12.3) | 2.67 (1.55-4.67) | 0.0003 |
| Fetal asphyxia | 18 (24.6) | 102 (11.4) | 2.54 (1.44-4.50) | 0.0009 |
| Uterus with 2 scars | 10 (13.7) | 56 (6.3) | 2.37 (1.16-4.88) | 0.0154 |
| Severe pre-eclampsia | 16 (21.9) | 77 (8.6) | 2.98 (1.63-5.44) | 0.0002 |

Table 3: Distribution of "Case" and "Control" according to prognostic factors of childbirth [(OR: Odds Ratio; CI: Confidence Interval of 95%).

| Variables | Cases (73) | Controls (894) | OR (IC 95%) | p-value |
|---------------------------------|------------|----------------|------------------|---------|
| | n (%) | n (%) | | |
| Maternal complications | | | | |
| Preeclampsia | 26 (35.6) | 143 (16.0) | 2.90 (1.74-4.84) | <0.0001 |
| Urinary infection | 13 (17.1) | 63 (7.0) | 2.86 (1.49-5.48) | 0.001 |
| Cephalopelvic disproportion | 20 (27.4) | 110 (12.3) | 2.67 (1.55-4.67) | 0.0003 |
| Postpartum hemorrhage immediate | 10 (13.7) | 46 (5.1) | 2.93 (1.41-6.07) | 0.0026 |
| Puerperal infection | 7 (9.6) | 77 (8.6) | 1.12 (0.50-2.54) | 0.7759 |
| Maternal death | 0 | 0 | - | - |
| Perinatal complications | | | | |
| Stillborn | 6 (8.2) | 28 (3.1) | 2.77 (1.11-6.92) | 0.0233 |
| Fetal asphyxia | 18 (24.6) | 102 (11.4) | 2.54 (1.44-4.50) | 0.0009 |

| | | | | |
|-----------------------------|-----------|----------|-------------------|---------|
| Immediate neonatal distress | 12 (16.4) | 62 (6.9) | 2.64 (1.35-5.16) | 0.0033 |
| Secondary neonatal distress | 9 (12.3) | 21 (2.3) | 5.85 (2.57-13.29) | <0.0001 |
| Macrosomia (\geq 4000 g) | 17 (23.3) | 42 (4.7) | 6.16 (3.29-11.50) | <0.0001 |
| Neonatal hypoglycemia | 20 (27.4) | 73 (8.1) | 4.24 (2.41-7.48) | <0.0001 |
| Early neonatal death | 4 (5.5) | 10 (1.1) | 5.12 (1.57-16.76) | 0.0027 |

Table 4: Distribution of "Case" and "control" pregnant patients according to their recorded maternal and perinatal complications [(OR=Odds Ratio; CI=Confidence Interval of 95%).

Maternal morbidity was marked by pre-eclampsia [OR 2.90 CI 95% (1.74-4.84)], urinary tract infection [OR 2.86 CI 95% (1.49-5.48)], fetopelvic disproportion [OR 2.67 CI 95% (1.55-4.67)] and immediate postpartum hemorrhage [OR 2.93 CI 95% (1.41-6, 07)]. However, no case of maternal death was recorded.

Perinatal prognosis was also more severe with diabetic patients than it was with non-diabetic patients. Perinatal morbidity was marked by stillbirth [OR 2.77 CI 95% (1.11-6.92)], fetal asphyxia [OR 2.54 CI 95% (1.44-4.50)], immediate neonatal distress [OR 2.64 CI 95% (1.35-5.16)], secondary neonatal distress [OR 5.85 CI 95% (2.57-13.29)], macrosomia [OR 6.16 CI 95% (3.29-11.50)] and neonatal hypoglycemia [OR 5.12 CI 95% (1.57-16.76)]. The neonatal lethality rate was 5-fold higher with diabetic women [OR 5.12 CI 95% (1.57-16.76)].

Discussion

Prevalence of gestational diabetes

Gestational diabetes is a common pathology at the University Hospital Center of Porto-Novo with a prevalence of 7.5%. According to various studies carried out in Cotonou in the southern Benin, the prevalence of gestational diabetes has doubled in less than 30 years: 3.2% in 1988 [13], 4.4% in 1998 [14] and 6.5% in 2013 [15]. Globally, the prevalence of gestational diabetes varies between 3% and 15% [7-9] with disparities from one continent to another. In Africa, the few studies carried out have reported a prevalence of gestational diabetes that ranges from 5 to 17% [10-12]. In the United States, this prevalence doubled from 1.5% between 1989-1990 to 4.2% between 2001-2004 [16]. In France, the prevalence of gestational diabetes varies from 2 to 6% [17,18].

Once considered a rare disease in Africa, the frequency of diabetes and more particularly of gestational diabetes is growing in African countries [10-12]. This is a disturbing situation that raises questions, especially in West Africa where the technical platform for adequate intake is often lacking.

Prognosis

Therapeutically, all pregnant women with diabetes benefited from dietary and lifestyle measures and in 10 out of 73 cases, representing 13.7% of cases, they benefited from insulin therapy. In the literature the use of insulin therapy is low [17,19]. However, insulin therapy remains a second alternative whenever the glycemic equilibrium is not obtained by dietary and lifestyle measures [20,21].

Maternal prognosis

In litterature [1,22,23], A, It is noted that the diagnosis of gestational diabetes makes it possible to identify a population at risk of preeclampsia and caesarean section. These risks would be correlated with the severity of hyperglycemia at the time of diagnosis and persist despite the implementation of a treatment compared to a non-diabetic population. In the majority of cohort studies, there is a significant increase in caesarean section rates for gestational diabetes, whether treated or untreated, as compared to control groups. Treatment of gestational diabetes does not seem to influence the risk of caesarean section [1].

In our study, gestational diabetes was significantly associated with preeclampsia [OR 2.90 CI 95% (1.74-4.84)] and caesarean section [OR 2.51 CI 95% (1.55-4.67)] and the main indications for caesarean section were severe pre-eclampsia [OR 2.98 CI 95% (1.63-5.44)] and fetopelvic disproportion [OR 2.67 CI 95% (1.55-4.67)]. If the risk of pre-eclampsia is positively and linearly correlated with the severity of hyperglycemia at the time of diagnosis, it would also be related to the glycemic balance obtained after the beginning of the treatment [1]. However, there is insufficient evidence to indicate whether preeclampsia is more severe whenever gestational diabetes is detected. The treatment of gestational diabetes could reduce the risk of pre-eclampsia as compared to where there is no treatment, without increasing the risk of cesarean section and postpartum hemorrhage [1].

Immediate postpartum hemorrhage [OR 2.93 CI 95% (1.41-6.07)] was more detected with diabetic women in our study. In the literature, macrosomia, labor induction, caesarean section and pre-eclampsia are risk factors for immediate postpartum hemorrhage regardless of gestational diabetes [1]. In other words, gestational diabetes would not be directly associated with immediate postpartum hemorrhage. Many studies have shown that patients with gestational diabetes are also at high risk of developing urinary tract infection [1,4,6,18,24], the infection often being related to hyperglycemia. This was confirmed in our sample with a significantly higher rate of UTI in diabetic women [OR 2.86 CI 95% (1.49-5.48)].

Perinatal prognosis

In literature [1], there is a significant but modest relationship between the risk of premature birth and increased blood glucose. Gestational diabetes may increase the risk of spontaneous prematurity. However, the data are insufficient to explain this risk and to consider preventive measures. In our study, we found no significant association between gestational diabetes and prematurity ($p=0.3029$). However, gestational diabetes is correlated with perinatal complications such as stillbirth [OR 2.77 CI 95% (1.11-6.92)], fetal asphyxia [OR 2.54 CI 95%

(1.44-4.50)], immediate neonatal distress [OR 2.64 CI 95% (1.35-5.16)], secondary neonatal distress [OR 5.85 CI 95% (2.57-13.29)], macrosomia [OR 6.16 95% CI (3.29-11.50)] and neonatal hypoglycemia [OR 5.12 CI 95% (1.57-16.76)]. These results are consistent with most of the literature data [3,5,18,22,25,26]. According to several studies [27]. This complication, especially macrosomia, is reported to be related to high levels of maternal blood glucose, an idea not shared by other authors who have shown that despite good glycemic control during pregnancy, macrosomia remains high [25-29].

Nonetheless, according to the French National College of Gynecologists and Obstetricians (CNGOF), perinatal complications are rare and are usually increased in cases of type II unrecognized [18]. In our study, stillbirth rates [OR 2.77 CI 95% (1.11-6.92)] and neonatal lethality were significantly higher with diabetic women [OR 5.12 CI 95% (1.57 to 16.76)]. Perinatal mortality is mainly due to induced prematurity in pre-eclampsia [27].

Ethical Considerations

We requested and obtained the authorization from the hospital' officials and from the obstetrics and gynecology department' officials before starting the study. After an interview with each patient, during which details on our study were provided, we obtained an oral consent (or a parental agreement for pregnant women under 18) before the inclusion of each pregnant woman. The anonymity of the pregnant women and the confidentiality of the data have been respected.

Conclusion

This study confirmed that gestational diabetes makes pregnancy a high-risk pregnancy with more maternal, fetal, and neonatal complications. These diabetic patients should be given special attention by obstetricians during pregnancy, childbirth and postpartum. The limitations of this study are that "Controls" were not matched to "Cases" when they were identified. However, the results generated by the study are consistent with data from the scientific literature.

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