

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

Kerekou A, Ogoudjobi OM*, Lokossou MSHS, Hounkpatin B, Tandjiekpon E, Aboubakar M, Denakpo JL, Lokossou A, Takpara I and Perrin RX

Faculty of Health Sciences, University of Abomey-Calavi, Cotonou, Benin

*Corresponding author: Ogoudjobi O Mathieu, Assistant Professor, Faculty of Health Sciences, University of Abomey-Calavi, Cotonou, Benin, Tel: 0022997563303; E-mail: mogoudjobi2014@gmail.com

Received date: October 28, 2018; Accepted date: November 12, 2018; Published date: December 15, 2018

Copyright: ©2018 Kerekou A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

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 preeclampsia 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.

References

1. Beucher G, Viaris de Lesegno B, Dreyfus M (2010) *J Gynecol Obstet Biol Reprod* 39: S171S188.
2. Haute Autorité de Santé (HAS) (2005) Synthesis report concerning screening and diagnosis of gestational mellitus diabetes. Professional recommendations, HAS France Juillet.
3. Hedderson MM, Weiss NS, Sacks DA, Pettitt DJ, Selby JV, et al. (2006) Pregnancy weight gain and risk of neonatal complications: Macrosomia, hypoglycemia, and hyperbilirubinemia. *Obstet Gynecol* 108: 1153-1161.
4. HAPO study cooperative research group (2008) Hyperglycemia and adverse pregnancy outcomes. *N Engl J Med* 358: 1991-2002.
5. Metzger BE, Persson B, Lowe LP, Dyer AR, Cruickshank JK, et al. (2010) Hyperglycemia and adverse pregnancy outcome study: neonatal glycemia. *Pediatrics* 126: e1545-e1552.
6. Metzger BE (2010) Hyperglycemia and adverse pregnancy outcome (HAPO) study: preeclampsia. *Am J Obstet Gynecol* 202: 255e1-255e7.
7. American College of Obstetricians and Gynecologists (2003) Clinical management guidelines for obstetrician-gynecologists. *Obstet Gynecol* 102: 417-427.
8. Wang P, Lu MC, Yu CW, Wang LC, Yan YH (2013) Influence of food intake on the predictive value of the gestational diabetes mellitus screening test: *Obstet Gynecol* 121: 750-758.
9. Russo LM, Nobles C, Ertel KA, Taber LC, Whitcomb BW (2015) Physical activity interventions in pregnancy and risk of gestational diabetes mellitus: A systematic review and meta-analysis. *Obstet Gynecol* 125: 576-582.
10. Sobngwi E, Sobngwi J, Limen S, Nguewa JL, Mbanya JC (2010) International association of diabetes and pregnancy study groups. Recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care* 33: 676-682.
11. Motala A, Ramaiya K (2010) Diabetes: the silent pandemic and its impact in sub-Saharan Africa. *Novo Nordisk. Diabetes Laedership Forum Africa* pp: 1-48.
12. Bensalem S, Lakehal A, Roula D (2014) Gestational diabetes in Constantine area, Algeria: A prospective study. *Medicine of Metabolic Diseases* 8: 216-220.
13. Honliasso AK, Monteiro B (1988) Diabetes and pregnancy: preliminary study of 7 cases in the maternity hospitals of Cotonou CNHU and Cotonou urban district I. *Libraries of the University of Abomey-Calavi* P: 145.
14. Vodouhe MV, Alassani A, Obossou AAA, Dovonou AC, Bio Batta NY, et al. (2016) Prévalence et facteurs associés au diabète gestationnel à Parakou en 2015. *Journal de la Société de Biologie Clinique du Bénin* pp: 59-64.
15. Monteiro B, Gninafon M, Amoussou KJ (1991) Contribution to the epidemiological study of adult diabetes mellitus. *Afr Black Medicine* 38: 5
16. Castillo WC, Bogges K, Stürmer T, Brookhart MA, Benjamin DK, et al. (2014) Trends in glyburide compared with insulin use for gestational diabetes treatment in the United States, 2000-2011: *Obstet Gynecol* 123: 1177-1184.
17. Touzet S, Rocher L, Drevard E, Poncet B, Colin C, et al. (2002) Observational study of gestational diabetes screening practices from a cohort of 701 women. *J Gynecol Obstet Biol Reprod* 31: 248-255.
18. Collège National des Gynécologues et Obstétriciens Français (2005) Complications maternelles du diabète gestationnel. *J Gynécologie Obstétrique Biol Reprod* 34: 513.
19. Hiéronimus S, Cupelli C, Réville M, Bongain A, Fénelich P (2004) Pregnancy and type 2 diabetes: which fetal prognosis? *Gynecol Obstet Fertil* 32: 23-27.
20. Ach MT, Hasni Y, Abdelkarim AB, Maaroufi A, Kacem M, et al. (2017) Dietary study in patients followed for gestational diabetes. *Ann Endocrinol* 78: 434.
21. Barka I, Rejeb O, Melki A, Yazidi M, Chaker F, et al. (2016) Maternal factors predicting the use of insulin in gestational diabetes. *Ann Endocrinol* 77: 511.
22. Atraki S, El Aziz S, Bensbaa S, Chadli A (2017) Maternal-fetal complications of diabetic pregnancy in 293 cases. *Ann Endocrinol* 78: 415.
23. Regnault N (2017) A different maternal-fetal prognosis according to the date of diagnosis of gestational diabetes: data from 788,494 women who gave birth in France in 2013. *Diabetes Metab* 43: A10.
24. Damoune I, El Ouahabi H, Ajdi F (2014) P51 Risk Factors for Gestational Diabetes in 100 Cases. *Diabetes Metab* 40: A42.
25. Evars I, Valk H, Mol B, Braak E, Visser G (2002) Macrosomia despite good glycaemic control in Type I diabetic pregnancy; results of a nationwide study in The Netherlands. *Diabetologia* 45: 1484-1489.
26. Braak EWMT, Evers IM, Willem Erkelens D, Visser GHA (2002) Maternal hypoglycemia during pregnancy in type 1 diabetes: maternal and fetal consequences. *Diabetes Metab Res Rev* 18: 96-105.
27. Djirolo F, Houinato D, Gbary A, Akoha R, Djigbénoude O, et al. (2012) Prevalence of diabetes mellitus in the adult population in Cotonou, Benin.
28. Jardim O, Sobral E, Branco EC, Marta E, Carvalheiro M, et al. (1997) Delivery in diabetic pregnancy. *Ann Ist Super Sanita* 33: 329332.
29. Gunton JE, McElduff A, Sulway M, Stiel J, Kelso I, et al. (2000) Outcome of pregnancies complicated by pre-gestational diabetes mellitus. *Aust N Z J Obstet Gynaecol* 40: 38-43.