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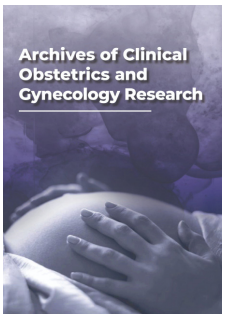

Association Between Diabetes and Pregnancy: 81 Cases Collected at the Maternity Hospital of the Social Hygiene Institute of Dakar

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Abstract

Patients and Methods: This was a retrospective, descriptive and analytical study carried out over a 3-year period (January 1, 2019, and December 31, 2021), focusing on the management of the association between diabetes and pregnancy in the maternity ward of the Social Hygiene Institute Hospital of Dakar. Data was collected and analyzed using Google Forms software.

Results: We identified 81 cases of association between diabetes and pregnancy among the 6003 deliveries, a frequency of 1.3%. The epidemiologic profile of the patients was that of a woman with an average age of 35 years (31 years for type 1 diabetics and 36 years for type 2 diabetics), poor (40.7%), married (97.5%), with a secondary education (32.1%), with a domestic activity (28.4%) and with a socioeconomic level considered average (65.4%). In our series, type 2 diabetes was predominant (69.1%). Slightly more than half of the patients (54.3%) had received regular diabetic follow-up. The Cesarean section was the most common mode of delivery (72.2%). In our series, 41 patients (50.6%) had complications. During pregnancy these were dominated by pre-eclampsia (16%), followed by glycemic imbalance (14.7%). Perinatal complications were dominated by prematurity (16%), low birth weight (LBW) (16%) and fetal macrosomia (12.3%). Perinatal mortality was recorded in 151.5 live births. Risk factors for maternal complications were age over 35 years (p=0.0001), type 1 diabetes (p=0.003), poor follow-up (p=0.003), and low socioeconomic level (p=0.0001). Risk factors for perinatal complications were maternal age less than 25 years (p=0.0001) and cesarean delivery (p=0.005).

Conclusions: Pregnancy in diabetic women is associated with an unfavorable maternal-fetal prognosis. Pregnancy must be planned and monitored accordingly.

Background

In recent decades, diabetes has become a major concern for health authorities worldwide, particularly in developing countries. According to the IDF (International Diabetes Federation), it now affects half a billion people worldwide, and one adult in two is unaware of his or her diabetes status [1]. Diabetes affects women more than men. Its prevalence in the female population was 10.2% in 2021 (17.7 million more cases than in men) [2]. Its association with pregnancy is therefore relatively common. Over the last decade, its frequency has varied between 0.07% and 3.6% [3]. This association constitutes an exchange of bad practices responsible for numerous maternal and perinatal complications. We therefore proposed to conduct this study, the general aim of which was to evaluate the management of the association between diabetes and pregnancy.

Methodology

We conducted a retrospective, descriptive and analytical study of the management of diabetes and pregnancy in the maternity ward of the Social Hygiene Institute Hospital of Dakar between 1 January 2019 and 31 December 2021. Our study population consisted of pregnant women and parturient admitted to the department during the study period. We included all patients managed in the department during the study period for a pregnancy associated with diabetes. These were patients with known diabetes and patients whose diabetes was discovered during pregnancy. In the case of the latter, the diagnosis was based on a GAJ ≥1.26 g/l in the 1st trimester. Data were collected from patients' medical records and hospital registers. They were recorded on a computerized form containing the following items: socio-demographic characteristics of patients, clinical and paraclinical data on admission, pregnancy outcome and maternal and perinatal prognosis. Data were analyzed using Excel and Google Forms. Qualitative variables were described in terms of numbers and percentages, and quantitative variables in terms of averages with standard deviations and extremes. The Fisher test was used to compare proportions and the difference was

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statistically significant when the P-value was less than 0.05. The retrospective nature of our work explains the difficulties encountered in retrieving patient data and in exploiting certain variables not documented in the observations. For example, we were unable to determine the delay in patient management. Patients' glycaemic control during pregnancy could not be assessed due to insufficient data on blood glucose levels.

Results

Descriptive results

Frequency of diabetes associated with pregnancy

During our study, we recorded 81 cases of diabetes associated with pregnancy among 6003 pregnancies, i.e. a frequency of 1.3%. There were 25 cases of type 1 diabetes (30.9%) and 56 cases of type 2 diabetes (69.1%). The average age of the patients was 35, with extremes of 21 and 43. The 36-40 age group was the most represented (37%). More than half of the pregnant women were educated (55.5%). The socio-economic level was most often considered to be average (65.4%) or low (26%). The average gestational age was 4, with extremes of 1 and 9. Paucigravida (32.1%) and multigesta (44.4%) were the most represented, with an average parity of 3.4. Paucigravida (40.7%) and multiparas (33.3%) were the most represented.

Clinical Data

In our series, most patients were evacuated (53%). The reason for evacuation was dominated by a lack of space in the referring facilities (30.8%). In the case of patients who consulted on their own (47%), the most frequent reason for consultation was abdomino-pelvic pain (21%).

Past history

In terms of previous history, 24 patients (29.6%) had a pathological obstetric history. These were mainly cases of foetal macrosomia (29.6%) or abortion (28.4%) (Table 1).

Table 1. *Obstetric history of patients managed for diabetes and pregnancy between 1 January 2019 and 31 December 2021 at the SHI.*

History obstétrical	Number	Frequency (%)
No	34	41,9
Macrosomia	24	29,6
Abortion	23	28,4
Gestational diabetes	13	16
Prematurity	4	4,9
Retention of dead egg	3	3,7
Fetal death in utero	3	3,7
Neonatal death	3	3,7
Other	8	9,8

From a medical point of view, 11 patients (13.6%) had chronic hypertension and 58 (71.6%) had a family history of diabetes (45.7%) or hypertension (23.5%).

Pregnancy follow-up

Diabetis follow-up: In our series, type 2 diabetes predominated (69.1%). Diabetes was diagnosed before pregnancy in 55 patients (67.9%). For these patients, the diabetes had been present for an average of 5 years. Only 26 patients (32.1%) were diagnosed during pregnancy. In all cases, the diagnosis was made during the fi rst trimester of pregnancy. The screening method used was most often fasting blood glucose (88.8%). Oral induced hyperglycaemia was used in 4 patients (4.9%). Diabetes monitoring was carried out in 59 patients (72.8%). Of these, 44 (54.3%) had regular follow-up and 27.2% had no follow-up.

Obstetrical follow-up: In our series, 74 patients (91.3%) had received antenatal care. Most of them were attended by a midwife (47.3%), 46% by an obstetrician-gynaecologist, and in 5 cases (6.7%) the provider's qualifications were not specified. They had undergone an average of 3 ANC with extremes of 1 and 8. The mean gestational age on admission was 34 SA and 4 days, with extremes of 5 and 43 SA. We recorded 73 singleton pregnancies (90%) and 4 twin pregnancies (5%). Of these, 74 (91.3%) were progressive. The general examination revealed 8 cases of obesity (9.8%) and 20 cases of hypertension (24.6%).

In our series, the average uterine height was 33.8 cm, with extremes of 23 and 42 cm. It was excessive in 13 patients (16%). Uterine contractions were present in 33 patients (40.7%). On auscultation, the foetal heart rate was mostly normal (64.2%). On vaginal examination, the membranes were intact in 50 patients (61.7%) and presentation was most often cephalic (71.6%). Clinical pelvimetry was normal in most patients (83.9%).

Paraclinical data

Biological tests revealed 7 cases (8.6%) of moderate anaemia (8-10.9 g/dl), 2 cases (2.4%) of 24-hour proteinuria of less than 2 grams and positive albuminuria on urine dipstick in 12 patients (14.8%). Among the patients, 42 (51.8%) had undergone obstetric ultrasound in the 3rd trimester. This revealed 28 foetal anomalies (66.7%). These were dominated by fetal macrosomia (19.1%), amniotic fluid volume anomalies (14.2%) and fetal morphological anomalies (11.9%) (Table 2).

Table 2. *Ultrasound findings in patients managed for diabetes and pregnancy between 1 January 2019 and 31 December 2021 at the SHI (N=42).*

Ultrasound results	Number	Frequency (%)
Morphology		
Normal	37	88,1
Abnormal	5	11,9
Weight estimate		
Normal	19	42,2
IUGR	4	9,5
Macrosomia	8	19,1
Unspecified	11	26,2
Amniotic fluid		
Normal	36	85,8
Hydramnios	3	7,1
Oligohydramnios	3	7,1
Placental implantation		
Normal	41	97,6
Prævia	1	2,4
Fetal presentation		
Vertex	34	81
Seat	3	7,1
Oblique	1	2,4
Unspecified	4	9,5
Heart rate		
Normal	27	64,3
Tachycardia	6	14,3
Unspecified	9	21,4

Therapeutic data

Obstetrical treatment

During pregnancy: During pregnancy, 30 patients (37%) received specific treatment. These included lung maturation (12.3%), anti-hypertensive treatment (7.4%), antibiotic therapy (7.4%), tocolysis (6.1%) or treatment with magnesium sulphate (3.7%).

Delivery method: In terms of mode of delivery, 72 patients (88.8%) had given birth. The caesarean section rate was 72.2%. These were often emergency caesareans (75%). The indications were dominated by poor glycaemic control (38.5%) (Table III). We recorded 20 vaginal deliveries (27.8%), including one with instrumental vacuum extraction (5%).

Diabetes treatment

During pregnancy : In our series, diabetic treatment was recorded for 59 patients (72.8%). Of these, 11 were on a diabetic diet alone (13.6%) and 48 were on subcutaneous insulin (59.2%). The daily doses of insulin administered in International Units (IU) were ≤ 20 IU in 31.2%, between 21-35 IU in 39.6% and > 35 IU in 18.8%. The type of insulin therapy was specified in only 10.4% of cases.

During childbirth and in the post-partum period: Blood glucose monitoring during delivery was carried out in 33 patients (40.7%). During the post-partum period, a reduction in insulin dose was observed in 21 patients (26%), while it was not specified in the others.

Prognosis

Maternal prognosis: In our series, 41 patients (50.6%) had experienced complications. These were dominated during pregnancy by glycemic imbalance (14.7%). These included one case of ketoacidosis (1.2%), 3 cases of hypoglycemia (3.7%) and 8 cases of pure hyperglycemia (9.8%). We also recorded 13 cases of pre-eclampsia (16%). Complications during delivery were dominated by traumatic injuries, including 4 perineal tears and one uterine rupture (1.23%). In the post-partum period, we noted 3 cases of PPH (3.7%) and 10 cases of glycemic imbalance, including one case of ketoacidosis (1.2%) and 3 cases of hypoglycemia (3.7%) (Table 4). No maternal deaths were recorded.

Perinatal prognosis

The Apgar score at 5 minutes was normal in 95.6% of newborns. We also recorded 3 cases of neonatal asphyxia (4.4%). Birth weight was specified in 67 newborns (88.1%). The average was 2968.4 g, with extremes of 1200 and 4400 g. Most newborns had a normal birth weight (73.1%).

Perinatals complications

Perinatal complications were dominated by prematurity (16%), low weight for gestational age (LGA) (16%), foetal macrosomia (12.3%) and foetal death in utero (9.8%). We also recorded 6 cases (7.4%) of neonatal respiratory distress, 3 cases of neonatal hypoglycaemia (3.7%) and 3 cases of hydramnios (3.7%). Intra-uterine growth retardation and non-reassuring foetal condition were respectively (6.1%) and (8.6%). Finally, 4 cases of foetal malformation (4.9%) (polydactyly, microcephaly, cardiac malformation associated with pulmonary agenesis and a polymalformative syndrome) and 2 early neonatal deaths were observed.

As regards admission to neonatology, 11 newborns were hospitalised. The main reason for admission was respiratory distress (54.5%). Following hospitalisation, the majority of newborns were alive and well (95.3%). We recorded 66 live births, 5 fresh stillbirths, 3 macerated stillbirths and two early neonatal deaths, giving an estimated perinatal mortality of 151.5‰ live births.

Post-natal monitoring data

In our series, Postnatal consultations (PNC) 1 was performed in 70 patients (86.4%). Following this, 35 patients (43.2%) had opted for family planning, the methods of which are summarised in the table below (Table V). PNC 2 was performed by 63 patients (77.7%) and PNC 3 was performed by 48 patients (59.2%). No abnormalities were noted during PNC 2 or PNC 3.

Table 4. *Maternal complications in patients managed for diabetes and pregnancy between January, 1, 2019 and December,31, 2021 at the IHS.*

Maternal complication	Number	Frequency (%)
No	40	49.4
During pregnancy		
Pure hyperglycaemia	8	9.8
Hypoglycaemia	3	3.7
Ketoacidosis	1	1.2
Preeclampsia	13	16
Abortion	7	8.6
Urinary tract infection	1	1.2
HRP	2	2.4
During childbirth		
Perineal tear	4	4.9
Vaginal tear	1	1.2
Uterine rupture	1	1.2
In the post-partum period		
Pure hyperglycaemia	6	7.4
Hypoglycaemia	3	3.7
Ketoacidosis	1	1.2
Post-partum haemorrhage	3	3.7
Genital infection	1	1.2

Table 5. *Postnatal consultations for patients managed for diabetes and pregnancy between 1 January 2019 and 31 December 2021 at the IHS (N=81).*

Post-natal follow-up	Number	Frequency (%)
PNC1		
Done	70	86,4
Not done	11	13,6
Method of contraception prescribed at PNC1		
IUD	14	17,3
Implant (Jadelle)	13	16
LST	4	5
Microprogestogen pills	3	3,7
Injectable	1	1,2
No family planning	46	56,8
PNC2		
Done	63	77,8
Not done	18	22,2
PNC3		
Done	48	59,3
Not done	33	40,7

Analytical results

Risk factors for maternal and perinatal complications

Factors associated with the risk of maternal complications: In our series, maternal complications were more frequent in patients with type 1 diabetes (56%) than in those with type 2 diabetes (46.4%), with a statistically significant relationship (p=0.003). Maternal complications were more prevalent at the extremes of age, with 66.7% of patients under 25 years and 60% of those over 36 years showing a statistically significant relationship (p=0.0001); and also in patients with a low socio-economic level (57.1%) compared with those with an average socio-economic level (45.3%), the relationship was statistically significant (p=0.0001). This statistically significant relationship was also observed in patients who had received no diabetic follow-up (59.1%) compared with those who had regular follow-up (45.8%), with a p=0.003.

Factors associated with the risk of perinatal complications

Type of diabetes: In our series, the risk of perinatal complications was higher in the newborns of mothers with type 2 diabetes (64.3%), although there was no statistically significant relationship (p=0.84). The same observation was made for level of education (p=0.95), socio-economic level (p=0.87), diabetic follow-up (p=0.61), diabetic treatment modalities (p=0.37), insulin doses (p=0.94), obstetrical follow-up (p=0.3) and the qualification of the prenatal care provider (p=0.75). However, in terms of age, the younger the mother, the more frequent the perinatal complications. In fact, 83.3% of newborns born to mothers aged under 25 had complications, whereas this rate was only 50% in mothers aged over 40. This relationship is statistically significant (p=0.0001). For the route of delivery in our study, the rate of perinatal complications was higher for vaginal deliveries (75%) than for caesarean sections (55.8%), with a statistically significant association (p=0.005).

Factors associated with the choice of delivery route: These were age and parity. The higher the maternal age, the higher the frequency of caesarean section. It was 50% for patients under 25, 70% for those aged between 26 and 30 and 84% for those aged between 36 and 40. There was a statistically significant association (p=0.006). In our study, we noted that the frequency of caesarean section decreased with parity. Indeed, with the exception of primiparous women (50%), the lowest rates were observed in multiparous women (60%). There was a statistically significant link (p=0.0001).

Discussion

Épidémiology

AThe association of diabetes and pregnancy represented 1.3% of deliveries at the IHS maternity hospital. This frequency is assessed differently by different authors. Over the last decade, it has varied from 0.07% to 3.6% [3]. Lorenzini [4] in France and Eshetu [5] in Ethiopia found rates similar to ours, at 1.35% and 1.3% of deliveries respectively. However, a lower rate of around 0.26% was observed by Drabo [6] in Mali. These observed differences could be related to the specificities of the study population, the patient selection criteria and the referral centre status of certain maternity units which receive the majority of cases of high-risk pregnancies from satellite facilities. In our study, we only included cases of pregestational diabetes. The epidemiological profile of the patients was that of a woman aged on average 35 years (31 years for type 1 diabetics and 36 years for type 2 diabetics), poor (40.7%), married (97.5%), with a secondary level of education (32.1%), exercising a domestic activity (28.4%) and with a socio-economic level judged to be average (65.4%). This profile does not differ from those found in the literature [7, 8]. In his series, Ndong [8] found an average age comparable to that of our patients, around 32.8 years (29.5 years in type 1 diabetics and 36.6 years in type 2 diabetics). In 1991, Cissé [7] reported an overall mean age of 31 years (28 years in type 1 diabetics and 33 years in type 2 diabetics). This mean age is closer to the usual period of onset of T1DM, which was, however, the least frequent clinical form in our series (27.1%). Guira [9] in Ouagadougou (Burkina Faso) had found in his study an average parity of 2 with 40.3% pauciparous and 28.4% multiparous. This could be explained by the fact that pregnancy has to be planned and the number of pregnancies is usually limited to two in diabetic women. The rate of multiparous women noted in our series (33.3%) shows that efforts still need to be made in terms of contraception among diabetic women. The education levels and socio-economic status of our patients reflect those of the general population in Senegal. According to the ANSD, the secondary school enrolment rate for girls was 34.7% in 2019 [10]. There are several possible explanations for these findings. It is well documented in the literature that socio-economic level and education are determining factors in the onset and progression of diabetes [11]. In 2017, the CDC [12] (Center for Disease Control and prevention) found that the prevalence of diabetes was inversely associated with patients' level of education in the United States, with a lower rate observed for university graduates. Bijlsma-Rutte [13] found that HbA1c levels were higher in patients with low socio-economic status.

Clinical data

Risk factors

In our series, the interview revealed obstetrical history dominated by macrosomia (29.6%), abortion (28.4%) and gestational diabetes (16%). These rates were slightly higher than those reported by Drabo [6] in Bamako (Mali) with 25.7% fetal macrosomia, 23% abortion and 21.6% gestational diabetes. A family history of diabetes concerned 45.7% of our patients, slightly more than in the series by Gandaho [14] where it concerned 39.1% of patients. Along with delivery of a macrosomic foetus and a history of gestational diabetes, it is a known risk factor for T2DM [15].

Type of diabetes

In our series, we recorded 69.1% of T2DM cases, i.e. more than double the number of T1DM cases, which represented 30.9% of the study population. The same observation was made in Senegal by Ndong [8], who reported 23% type 1 diabetes and 43% type 2 diabetes in pregnant women. In Morocco, Lahlou [16] reported 77.2% T2DM and 22.8% T1DM. In Niger, Sani [17] reported 82.2% T2DM. This further confirms the downward trend in the age of onset of T2DM reported in the literature. The rural exodus, rapid urbanisation, changing lifestyles and the resurgence of obesity and sedentary lifestyles could explain this new phenomenon. In European series, however, the trend is the opposite. Large-scale studies conducted in Spain and Sweden on more than one million pregnant women found frequencies of 73.9% and 55.8% respectively for T1DM [18, 19]. However, in recent years there has been an increase in the prevalence of type 2 diabetes. In Sweden, this was estimated at 11% compared with 33.2% for T1DM between 1998 and 2012 [18].

Follow-up

Diabetic follow-up was considered regular in 44 patients (54.3%). Maïga [20] found a rate comparable to ours, in the order of 58% of women with regular diabetic follow-up, whereas Dao [21] found a follow-up rate of 45.6%, lower than that recorded here. These low follow-up rates noted in African series testify to the extent of the difficulties encountered in the management of the association of diabetes and pregnancy and justify the need to improve the availability of qualified human resources in diabetology and health structures. Also, the low socio-economic level of our patients, the lack of awareness and the often late diagnosis could explain this irregular follow-up. On the other hand, the prenatal follow-up rate was higher (91.3%). This was carried out by an obstetrician-gynaecologist in 46% of cases. In the series by Sqalli [22] and Mouth [23] in Morocco, patients followed by an obstetrician-gynaecologist represented 26.7% and 34% of their respective samples. These rates are lower than the one we recorded. In our series, 55.6% of patients had undergone at least 4 ANC. This rate is higher than that recorded by Hayriat [24] who reported 40.5% of patients having undergone 4 or more ANC, and also that reported in the study by Ndong [8] where 86.9% of patients had less than 5 ANC. Overall, the results we found for antenatal and diabetic follow-up do not comply with current recommendations for the management of diabetes and pregnancy. In fact, monitoring should be carried out by an obstetrician-gynaecologist in collaboration with a diabetologist, at the frequency of a monthly antenatal consultation and a fortnightly diabetological consultation in the absence of complications [25].

Therapeutic information

Diabetic treatment

In our series, 59.2% of patients were on subcutaneous insulin and 13.6% were on a diabetic diet alone. None of the patients were on ADO. Our results are comparable to those observed by Gandaho [14] in Morocco, with 49.2% of patients on insulin, 33.3% on OADs and 11.1% on diet alone. However, in the series by Pandey [26] in India, 84.6% of patients were on insulin and 7.7% on OADs. In practice, we do not use OADs in the management of diabetes and pregnancy due to the lack of reliable data on their safety. Insulin is therefore the reference molecule in the management of diabetes during pregnancy, due to its greater hypoglycaemic power and safety [27]. The high proportions of patients treated with insulin observed in the various series may be explained by the high incidence of T1DM in our regions. They also reflect all the difficulties encountered by patients in implementing an antidiabetic regimen, which is often insufficient on its own to achieve glycaemic control.

Obstetrical treatment

The caesarean section rate observed in our study was 72.2%. This rate is comparable to that recorded by Bayoumi [28] in Qatar, which was 69.1%. It is slightly lower than those reported by Capobianco [29] in Italy and Opara [30] in Nigeria, which were 87.9% and 77.7% respectively. In Saudi Arabia, a lower caesarean section rate of 51.1% was found by Al Nemri [31]. These high caesarean section rates observed in the association of diabetes and pregnancy are thought to be due to the need to terminate the pregnancy once the foetus has reached maturity, usually around 36 weeks' gestation, in order to avoid foetal death in utero, which is a major concern. In fact, it is most often a case of ill-adapted treatment at the end of pregnancy. In our series, the mode of delivery was significantly related to the patient's age (p=0.006) and parity (p=0.0001). Caesarean section was more frequent in women aged between 36 and 40 and nulliparous women. Taye [32] made a similar observation for this age group and Eshetu [33] found an association between caesarean section and primiparity. This could be explained by the fact that high maternal age (> 35 years) is a risk factor for obstetric complications, which may sometimes require caesarean section [34].

Pronosis

Maternal

Maternal complications were dominated by pre-eclampsia (16%) and abortion (8.6%) during pregnancy, perineal and vaginal tears (6.1%) during delivery and metabolic complications in the post-partum period (12.3%). In Sweden, Stogianni [35] in Kronoberg reported a rate of 21% of pre-eclampsia, slightly higher than ours in pregnant women with diabetes. High maternal age, black race and the presence of associated cardiovascular risk factors may also explain the frequency of preeclampsia in our patients. Abortion was noted in 8.6% of cases. This rate is comparable to that recorded in the general population, which is approximately 10% [36]. As regards metabolic complications, we found a rate of 7.4% of hypoglycaemia and 2.4% of ketoacidosis. In the series by Sani [17], hypoglycaemia was more frequent and was found in 22.2% of cases. However, the proportion of ketoacidosis that he recorded (2.2%) was comparable to that which we found. These metabolic complications are most often explained by poor compliance with treatment or failure to adapt diabetic treatment secondary to irregular monitoring. In our series, complications were more frequent in patients aged over 35 (p=0.0001), with type 1 diabetes (p=0.003), poorly monitored (p=0.003) and with a low socio-economic level (p=0.0001). These findings do not differ from those reported in the literature [11, 34].

Perinatal

Perinatal complications were dominated by macrosomia (12.3%), neonatal respiratory distress (7.4%), in-utero foetal death (9.8%), prematurity (16%) and foetal malformations (4.9%). Capobianco [29] in Italy found a rate comparable to ours of around 12.1%. Higher rates of macrosomia were reported by Kheir [37] in Sudan (28%) and Murphy [38] in England (36.2%). Macrosomia is one of the most frequent complications of maternal diabetes, essentially due to foetal hyperinsulinism secondary to maternal hyperglycaemia. Macrosomia could therefore be avoided by good glycaemic control during pregnancy. Our rate of foetal malformations was in line with the literature, which estimates their frequency at 5 to 10% of pregnancies in diabetic women, three times higher than in the general population [39, 40]. Planning pregnancy during a period of euglycaemia, stopping or replacing potentially teratogenic drugs and supplementing with folic acid during the preconception phase could help reduce the risk of foetal malformations. The prematurity rate we recorded was close to that reported by Almhanna [41] in Iraq, which was 18%. In Niger, Sani [17] reported a higher rate of around 20.6%. This is most often due to prematurity induced by the need to terminate the pregnancy for maternal or foetal reasons. Our rate of neonatal respiratory distress is close to that reported by Eshetu [5], which was 9.2%. Capobianco [29] in Italy and Opara [30] in Nigeria found higher rates of 29.3% and 34% of births respectively. This high incidence of

neonatal respiratory distress in newborns born to diabetic mothers could be explained by the frequency of prematurity, which exposes them to the risk of hyaline membrane disease, and also by the frequency of caesarean delivery, which is more often associated with a delay in resorption of the pulmonary fluid responsible for neonatal respiratory distress. Perinatal complications were more frequent in women aged under 25 (p=0.0001) and those who had given birth by caesarean section (p=0.005). In the literature, age over 35 years is more likely to be associated with the risk of developing complications during pregnancy [34]. However, in Singapore, Kang [42] found a link between maternal age less than or equal to 21 years and the risk of developing certain complications such as prematurity, congenital malformations and foetal death in utero. The higher incidence of perinatal complications in women who had a caesarean delivery is certainly due to the high proportion of caesareans performed as emergencies, most often for severe pathologies exposing the foetus to perinatal complications. Fetal death in utero occurred in 9.8% of pregnancies. This rate was similar to that reported by Gandaho [14] and much higher than that recorded by Boulot [43], which was 3.4%. This could be explained by the different inclusion criteria in the different studies. Indeed, in most series, recruitment concerned cases of pregestational and gestational diabetes, whereas our study concerned pregestational diabetes, which is associated with a less favourable perinatal prognosis. MFIU is also a frequent complication of diabetes, especially in patients on insulin, because of the risk of foetal hypoglycaemia due to hyperinsulinism or iatrogenic maternal hypoglycaemia In our series, the perinatal mortality rate was estimated at 151.5‰ live births which is five times higher than that reported by Macintosh in England which was 31.8‰ live births. It is also significantly higher than the stillbirth rate in the general population, which was estimated in 2018 at 37‰ live births [44]. This justifies in this association closer monitoring both clinical and paraclinical and termination of the pregnancy as soon as foetal maturity is reached usually around 36 SA. Early, multidisciplinary neonatal management in collaboration with neonatal paediatricians would also help to reduce this stillbirth rate.

Conclusion

The association of diabetes and pregnancy is a high-risk condition for both mother and foetus. It is responsible for high maternal and perinatal morbidity and mortality, justifying the need for public awareness campaigns and rigorous, multidisciplinary hospital monitoring.

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