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Gestational Diabetes : A Cross-Section of Factors and Complications in Mothers and Newborns in Southern Morocco

Ibrahimi Halima[1]
Ibn to Fail University Laboratory Biology and Health, Kenitra Morocco

Aslaou Fatima[2]
Research Team on Health and Nutrition of Mother and Child, Faculty of Medicine and Pharmacy, Mohammed V University in Rabat

Chbabe Milouda[3]
Institut Supérieur Des Sciences de La Santé, Casablanca-Settat

Abstract:- By way of introduction, the prevalence of gestational diabetes varies between 1% and 14%, in Morocco, a single study conducted in Dakhla in southern Morocco in 2019, estimates that the prevalence of GD is 7.7% in accordance with the recommendations of the American Diabetes Association, hence the need to explore the epidemiological profile in southern Morocco.

➢ ***Methodology:-***

A cross-sectional descriptive analytical correlational epidemiological survey of 202 pregnant women during the period 2021-2022, conducted at the Dakhla regional hospital centre, which attempts to describe the individual, biological and gynecological-obstetric risk factors in pregnant women with gestational diabetes. As well as maternal and neonatal complications. The study also analyses the effect of hospital performance on the management of parturients.

➢ ***Results:-***

The prevalence of GD is high in the age group [35,41] and over 42 years, mainly among illiterate. Several risk factors have been identified for GD : age, high preconceptional BMI, low level of education, polycystic syndrome, history of urinary infection, positive vaginal swab for Streptococcus B, and complications for mothers and newborns revolving around Dystocic delivery, macrosomia and hypoglycaemia in newborns. There is also retinopathy in premature babies due to candida albicans and early bacterial infection due to GSB in full-term newborns.

I. INTRODUCTION

According to estimates by the national diabetes federation, the prevalence of gestational diabetes remains unknown in certain regions of Morocco, in this case the region of Dakhla. Worldwide, it varies between 1% and 14% depending on the population studied (International Diabetes Federation, 2013). The International Diabetes Federation counts 21 million live births, or 1 in 6 (16.8%), to women with some form of gestational diabetes, of which 2.5% of cases can be attributed to clinical diabetes during pregnancy. The remaining 14.3% (one in seven pregnancies) can be attributed to gestational diabetes mellitus, a condition that occurs as a result of hormonal changes in pregnancy (International Federation of Gynecology and Obstetrics,2018). On the recommandation of the French-speaking virtual university, a caesarean section is recommended if the estimated foetal weight on ultrasound is greater than 4250g for women with GD, and prophylactically if macrosomia occurs above 4750g (French-speaking virtual medical university, 2014). In 2014, the WHO started that there was no correlation between the reduction in maternal and neonatal mortality and the caesarean section rate, ranging from 10% to 30%, and that no effect was observed according to the analysis, which was carried out using a longitudinal approach, based on national data taking into account socio-economic development (World Health Organisation, 2014). In OECD countries, the caesarean section rate was estimated at 20.8% in France in 2010, 32.6% in the United States and around 50% in Brazil, i.e. one woman in two is caesarean sectioned (Ray, 2015). The main risk factors are : overweight, age, ethnic origin, first-degree family history, obstetric history of DG or macrosomia, ovarian syndrome.

➢ *Objective*

To study the factors that expose women to gestational diabetes and that hinder the effectiveness of interventions based on healthy eating, physical exercise and diet.

- *Type of Study*

This is a descriptive and correlational study based on the association of nutritional, physical and hereditary factors and exposure to gestational diabetes.

- *Study Participants*

Pregnant women of any body mass index (BMI) category (cases and controls with BMI ranging from 18 to 30 kg/m²) were studied to investigate the risks and complications associated with weight in pregnancy ; thus the study

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recruiting women with BMI<29 and BMI≥30 respectively were considered to be of mixed risk; and the study recruiting overweight or obese women (BMI ≥25 to <30 kg/m² and BMI ≥30 kg/m² respectively) were considered to be of high risk).

Secondary endpoints for the mother included average weight gain, low weight gain (as defined by trial participants), preterm birth, premature rupture of membranes before labour, preeclampsia or eclampsia, hypertension (not predefined), induction of labour, caesarean section, postpartum complications. (Post-partum haemorrhage, wound infection, endometritis, antibiotic treatment, perineal trauma, thromboembolic disease, maternal death), results of behaviour modification (diet, physical activity) and post-partum maternal weight retention. For infants, secondary outcome measures included birth weight (not predefined), macrosomia (birth weight >4,000g or greater than the 90th percentile for gestational age and sex), complications related to macrosomia (hypoglycaemia ; hyperbilirubinaemia ; birth trauma, including paralysis). Other complications. Shoulder fracture and dystocia ; respiratory distress syndrome) and the child's weight.

II. RESULTS

- *Main Finding*

Among the various factors highlighted as being associated with exposure to gestational diabetes, low level of education, co-morbidity with arterial hypertension and overweight, given that obesity is still perceived as a sign of good health. Compared with the present study, socio-educational factors were found to be significantly associated with the onset of gestational diabetes. The results show that, in relation to the level of education, the prevalence of GD ranges from 0.05 in women aged under 25 to 0.29 in women aged over 42 in the illiterate group. With regard to co-morbidity with hypertension, the prevalence of gestational diabetes was twice as high among university-educated women as among illiterate women (0.12 to 0.24) in women aged over 42, while in women under 25 the prevalence of GD was higher among university-educated women. Regarding overweight, young university women under 25 were less exposed to GD (P=0.0012) compared with illiterate women (P=0.039). Similarly, illiterate women aged over 42 were more exposed than university women to GD, (P<0.0041) compared with (P<0.005).

- *Logistic Regression*

The dependent variable gestational diabetes is a qualitative binary variable (0 =no, 1=yes), hence the choice of binary logistic regression for univariate analysis of the association between GD and certain factors. In univariate analysis using binary logistic regression, age, low socioeconomic level, BMI, passive smoking, history of polykinetic syndrome and type 2 diabetes, history of urinary tract infection, history of urinary tract infection, physical activity less than 160 min/d, multiparity, hypertension and albuminuria were statically associated with GD in the population studied. Age : an increase of one year in age increases the risk of having GD by a statically significant 6.22-fold (P<0.003). History of polycystic fibrosis syndrome: parturients with a history of polycystic fibrosis syndrome have a 13-fold increased risk of gestational diabetes (p<0.001). BMI greater than 30: a BMI greater than 30 increases the risk of exposure to gestational diabetes by a statically significant 4-fold (p<0.001).

- *Factor Analysis : Principal Component Analysis*

Principal component analysis, usually referred to as PCA, is a multidimensional statistical method that allows us to summarise a set of data by identifying their repetition dimensions. In addition, the aim of PCA is to account for as much of the total variance as possible using as few variables as possible. The principal components, which are uncorrelated, are therefore treated as a new set of variables, reducing a large number of variables to a small number of dimensions. In order to carry out principal component analysis, it is first necessary to check that certain basic assumptions are respected. In this respect, two tests are a prerequisite for using this analysis: the Kaiser-Mayer-Olkin (KMO) test, which must have a value of at least 0.70 in order to establish that the distribution of values is relevant (correlation of statements), and the sphericity test (Bartlett), which analyses the normality of statements and must be significant at the 0.05 level. It should also be added that one of the main conditions is the presence of a minimum ratio of five observations per variable. Given that there are different indices to show the proximity between variables (inverse distance, correlations, similarity index), it is important to take into account the fact that there is no single index for all variables. As in many computerised statistical procedures, the SSA (Smallest Space Analysis) technique is adopted in order to remove values that lie in an area not predicted by the model.

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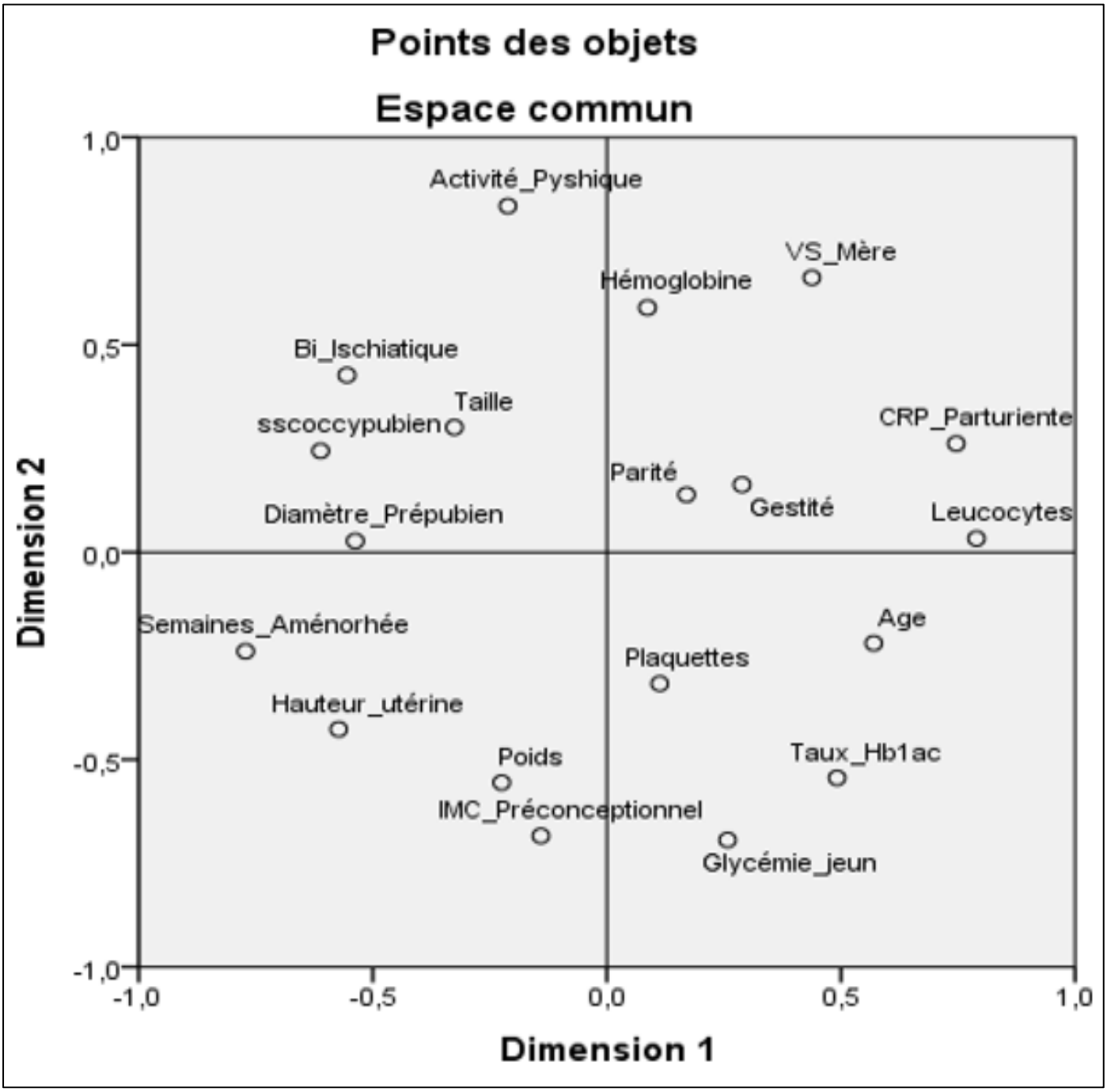

Fig 1 The Structure of Gestational Diabetes Factors in Parturients

This method provides a graphical representation of the data structure, reducing its multi-dimensionality as much as possible so as to obtain a two-dimensional space. The final structural analysis shows the division of the two-dimensional space into 4 distinct sectors.

The antroprometric variable, preconception body mass index, was strongly correlated with weight (R>0.8), whereas the correlation with the biological marker (infection indicator), mainly temperature, was negative, as was the sedimentation rate (R : -.143*).

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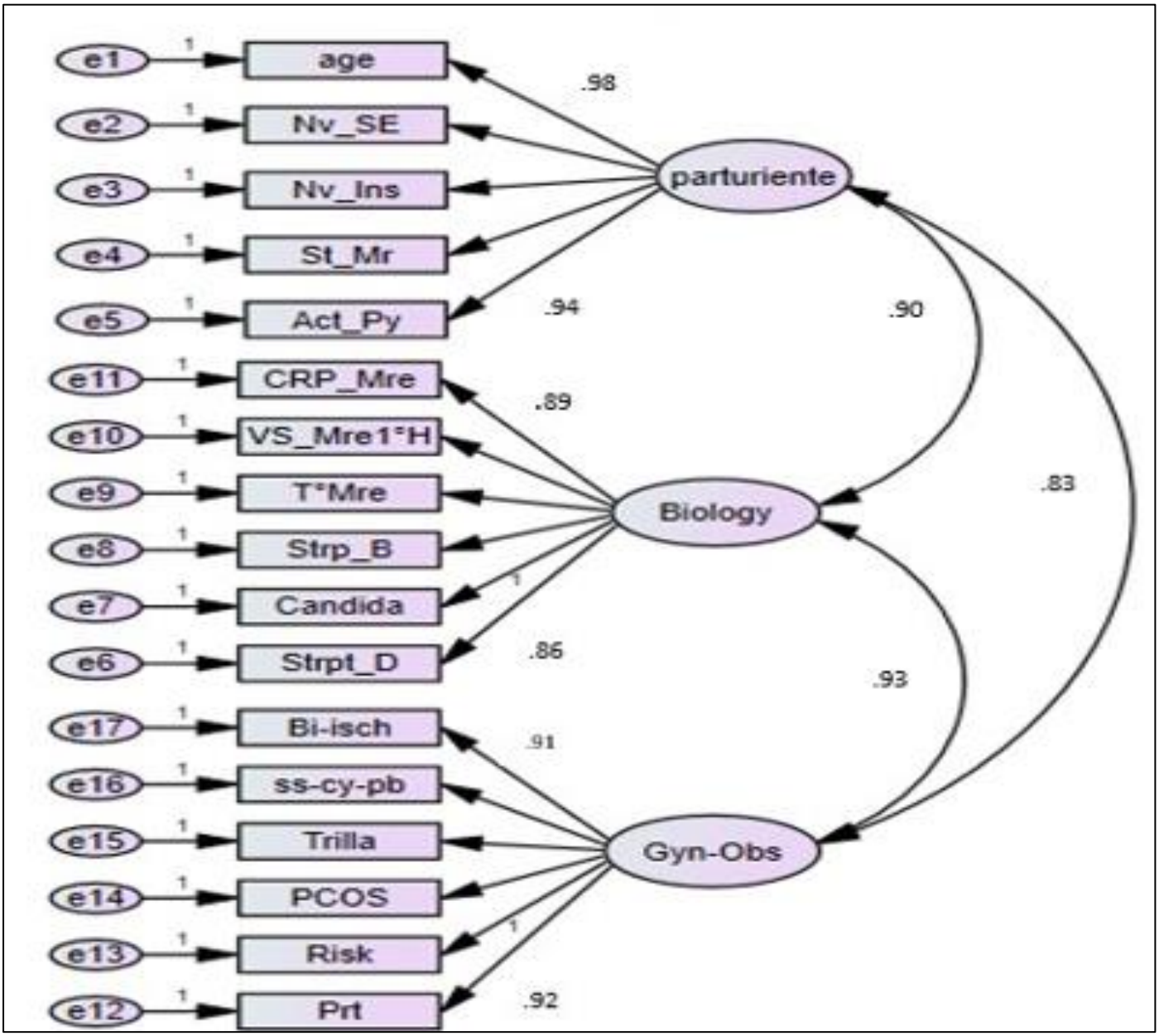

Fig 2 Final model for Confirmatory Analysis of Gestational Diabetes Factors

Maternal weight is proportionally correlated with external pelvic measurements. The bi-ischiatic diameter of the inferior strait is strongly correlated with the diameter of the superior strait (Sub.coccy. sspubic). As for the correlation of the bi-ischiatic diameter with the maternal weight, it is of moderate intensity (R<0.5). Similarly, between the Trilla pre-pubic diameter and the bi-ischiatic diameter (R=,420).

In relation to the anthropometric variable maternal weight, and the correlation with the biological markers of gestational diabetes (Hb1Ac, fasting glycaemia), the correlation was two-sided with moderate intensity (0.2<R<0.5). The correlation with body mass index was very strong (R>0.8). In addition, the correlation between maternal weight and uterine height was moderate. Conversely, the correlation between weight and temperature was negative.

III. DISCUSSION

The objectives of the study were to describe the factors and complications of gestational diabetes in pregnant women with gestational diabetes and in their newborns. The factors included (1) those related to the characteristics of pregnant women, (2) biological factors and (3) gynaeco-obstetric factors. In terms of complications, a distinction is made between those of the mother and those of the newborn.

- *No-Modifiable Risk Factor*

The results of the present study show that the average age of pregnant women is 30±6, 70% of whom have GD. In relation to the two age groups, the prevalence of GD ranged from 0.05 in women aged under 25 years to 0.13 in women aged over 42 years, which is perfectly in line with the authors' analysis of the effect of age on exposure to gestational diabetes. Several studies have identified gestational.

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➢ *Modifiable Risk Factor*

Several studies have identified gestational diabetes in women aged 30 and over, while few studies have justified the significant association of age as a risk factor (Masson, 2009). In addition, the low level of education, particularly for illiterate women, has been shown in the study to increase the prevalence of gestational diabetes in illiterate women across all education levels (P<0.05 in illiterate women versus <0.003 in university graduates).

Similarly for body mass index, subjects with a high BMI who consume nutrients with a high glycaemic index suffer greatly from gestational diabetes. Other studies establish a significant link between women with a BMI >30kg/m^2 and exposure to gestational diabetes (Maxwell et al., 2019). In this study, preconceptional BMI in pregnant women showed that 34.7% were overweight and 18% were obese, all classes combined. Compared with this study, women with a body mass index above 30 had a statically significant (p<0.001) 4-fold increased risk of exposure to gestational diabetes. However, gestational diabetes is also explained by ethnic, genetic and lifestyle variations, which may be subject to different epidemiological screening and diagnostic methods. As a result, it is not legitimate to assert stricto sensu that the high exposure to gestational diabetes is due to obesity.

➢ *Biological Factors*

- *Temperature*

The results of this study showed a negative correlation between uterine height and temperature (R:-.158). temperature decreases with the age of pregnancy. In fact, at the start of pregnancy, temperature rises under the effect of progesterone. Throughout pregnancy, the temperature is regulated, with a tendency towards hypothermia at the end of pregnancy. This is consistent with the results of the study. It should be noted that the period of pregnancy is known for polyphagia in pregnant women, and a recent study on the thermogenesis defect and obesity, showed in obese women a reduction in the thermal effect linked to the ingestion of three meals in the course of 24 hours, as well as a reduction in the activity of the sympathetic system (Marec et al., 2018).

- *Leukocytes, C-Reactive Protein*

The study demonstrated hyperleukocytosis that increases with gestational age. Note that CRP is the most sensitive and early diagnostic marker. As well as a correlation with fasting blood sugar (R: .154*) which is perfectly consistent with the study (Bhasym et al., 2019). In comparison, C-Reactive Protein, The biological marker of CRP infection is inversely correlated with gestational age (R: -.638*), this is perfectly consistent with recent results (Ikeagwulonu et al., 2021). On the other hand, CRP was correlated with the number of cigarettes smoked by pregnant women (R: .453). Note that tobacco also increases cardiovascular risk. Among pregnant women, 25% continue to smoke during pregnancy (Mishra et al., 2019).

- *Gyneco-Obstetric Factors Dystocic Delivery*

In multivariate analysis by binary logistic regression of dystocia factors, Breisky pelvimetry diameters were statically associated with the risk of dystocic delivery, mainly : Trilla, Bi-ischiatic, Ss-coccy –Pubic and on the other hand, there is a significant correlation with the size of the parturient. (Malonga et al. 2018). Note that the most complex complication shoulder dystocia, and fetal weight >90^e

- *Polycystic Syndrome*

According to the results of the present study, it turns out a high exposure of women with a history of polycystic to gestational diabetes of ATCD Polycystic syndrome of 13.7 times, and the association is very significant P < 0.0001, this is perfectly in line with the results published in 2019 on the prevention of gestational diabetes (Mishra et al., 2019)

- *History of Urinary Tract Infection*

In addition, the binary logistic regression study of risk factors for gestational diabetes highlighted the very close relationship between GDM and history of urinary tract infection and very significant (p < 0.001). This is perfectly consistent with the results of the study (Abariga & Whitcomb, 2016).

- *Neonatal Complications : Macrosomia, Retinopathy, Early Bacterial Infection*

The most common complication is macrosomia which is often the cause of hypoglycemia, usually occurring in 10% of the population. Compared to the present study, macrosomia exhibits 12.7 (p < 0.001) this corroborates with the results of the study Risk factors and maternal-fetal prognosis of fetal macrosomia : comparative study about 820 cases Risk factors and maternal-fetal prognoses (Abariga & Whitcomb, 2016).

By its nature, retinopathy is a common complication especially in premature babies. The present study revealed as a complication of gestational diabetes the high prevalence of premature births of mothers with gestational diabetes and who are carriers of GSB and E. coli. The binary logistic regression model of the risk factors for retinopathy highlighted AG<34 SA, maternal temperature (O R: 2.6 95% CI [1.72; 2.65] <0.001), hyper Leukocytosis>11. 103 (OR : 1.9, 95% CI [7.32; 9.35], RPM (OR: 1.31) 95% CI [45.1; 78.6]), this is perfectly consistent with the results of the study (Elsevier, 2017.)

Indeed, by Adjusting for gestational diabetes, respiratory distress in premature newborns is 12 times higher than in full-term newborns. As well as premature babies who have had a blood transfusion are 3.1 times and infants with low birth weight. This corroborates with the results of a study conducted by the Canadian Paediatric Society (Jefferies, 2016).

IV. CONCLUSION

Diagnosis of pregnancy in a diabetic woman has improved enormously in recent years thanks to targeted and systematic screening methods. These have been acquired thanks to abundant scientific research and the efforts made by international organizations, including the American Diabetes Association, the International Federation of Gynecology and Obstetrics, and the World Health Organization.

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Determining factors influence exposure to gestational diabetes : age, ethnicity, level of education, maternal history, symptoms of urinary tract infection, polycystic syndrome. In addition, complications can occur in the absence of follow-up for mothers and newborns. For the mother and newborns Diagnostic and screening methods have been established thanks to better management, based on the programming and monitoring of pregnancy justifying the use of better monitoring and good dietary hygiene, on glycemic balance at the time of pregnancy, as well as on rigorous multidisciplinary monitoring consisting of collaboration between the obstetrician, the diabetologist and then the neonatologist. In light of our study and its comparison with some data from the literature, it seems appropriate to emphasize a certain number of points: 1) The importance of preconception management, in order to optimize glycemic balance before pregnancy based on the education and information of the patient on hygiene and dietary rules, the importance of self-monitoring and the implementation of insulin therapy techniques. 2) Excessive weight abnormalities, hygiene and dietary rules should be sought and managed in preconception, to prevent worsening, or the appearance of other secondary complications during pregnancy. 3) Recommend early screening of gestational diabetes on risk factors rather than universal screening. 4)Emphasize protocols for the management of diabetic pregnancies, which must be accessible to all health personnel and which must be established in level 2 and 3 centers. 5)Management of diabetic pregnancy must be multidisciplinary. 6) Postpartum monitoring and surveillance to prevent long-term risks and complications occurring in the mother and child. These recommendations can reduce the risk of maternal and fetal complications and improve the prognosis of diabetic pregnancy.

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