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CASE REPORT: HYPERGLYCEMIA IN PREGNANCY AND THE IMPACTS ON FETAL WELFARE

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ABSTRACT

Background: Hyperglycemia in pregnancy is related to the outcome of pregnancy. According to the American Diabetes Association, diabetes diagnosed in the second or third trimester of pregnancy without a history of diabetes is associated with macrosomia, perinatal complications, and neonatal and maternal morbidity. **Case Presentation:** This study involved 3 pregnant women with different characteristics of age, parity, and gestational age. All the women in the cases were found to have high glucose levels in the 2nd trimester of pregnancy and received therapy. **Conclusion:** Based on observational studies, patients with pregestational DM have better outcomes if the HbA1c level is <6-6.5%. In the second and third trimesters, the risk of macrosomia, preterm delivery, and preeclampsia is lower if the HbA1c level is <6%.

Keywords**:** *BMI, Diabetes Gestational, Glucose level, Pregestational Diabetes*

INTRODUCTION

One of the Sustainable Development Goals (SDGs) includes the primary indicator of civil health the maternal mortality rate (MMR) and the neonatal mortality rate (NMR)[8]. One of the most significant non-communicable diseases in the world, diabetes mellitus (DM) causes 4.8 million deaths, significant morbidities, and permanent disabilities annually, due to the complexity of its management, diabetes during pregnancy is particularly challenging. Because it is linked to a higher risk of severe pregnancy complications that can affect both the mother and the child, total diabetes during pregnancy is clinically more important.

There is currently a lack of information regarding the prevalence of total diabetes in pregnancy in the Indonesian population, which is one of the ten countries with the highest number of people with diabetes and undiagnosed diabetes worldwide. Total diabetes in pregnancy is known to be prevalent among countries in the Western Pacific Region[7]. There are couple reasons of the insufficiency data about the number of diabetes in pregnancy are firstly, primary health care in Indonesia does not yet provide Gestational Diabetes Melitus (GDM) early screening, and antenatal care guidelines for primary and secondly health facilities have not yet been established[8].

Hyperglycemia First Detected In Pregnancy (HFDP) is linked to more problems and worse outcomes for both the mother and the child. Hyperglycemia in pregnancy (GDM or DM type II) is closely related to outcome in pregnancy. According to the American Diabetes Association, diabetes diagnosed in the second or third trimester of pregnancy with previously undiagnosed diabetes is associated with macrosomia and perinatal complications such as shoulder dystocia, cesarean section (SC), and neonatal and maternal morbidity[1]. According to the American Diabetic Association (ADA), studies of women without a history of DM suggest that elevated HbA1c level lead to poor pregnancy outcome. In the HAPO (Hyperglycemia and Adverse Pregnancy Outcomes) study, increased levels of glycemia were also stated the same thing. Based on observational studies, patients with pregestational DM have a better outcome if HbA1c < 6.5-6%. In the second and third trimesters, the risk of macrosomia, preterm labor, and preeclampsia is lower if the HbA1c level is <6%[2].

This study aimed to describe a case of Hyperglycemia in pregnancy and its impact on fetal walfare in Budi Kemulian Hospital.

CASE REPORT

First Case

Mrs. N, a 29-year-old woman who has a BMI of 31.6, is being treated at Budi Kemulian Hospital and diagnosed with G1P0A0 at 37 weeks gestation, Intrauterine Fetal Death (IUFD), macrosomia, Type 2 DM, and a single breech presentation. Routine antenatal checks are carried

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out by obstetricians. The results of the ultrasound revealed a breech presentation, 4700 grams of weight, and no fetal heartbeat. Abdominal pain, bloody mucus discharge, watery discharge, and trauma history were all denied.

When the antenatal examination was held at 16 weeks of gestation, the Random Blood Glucose (RBG) test result was 233. The patient was planned to have an Oral Glucose Tolerance Test (OGTT) and HbA1c checked. At 22 weeks gestational age, the result of Fasting Blood Glucose (FBG) test and Postprandial Blood Glucose (PPBG) test was 130/230 and HbA1c was 8.4. The patient was consulted by the internist and began taking 3 x 500 mg doses of metformin at 23 weeks gestation. At 28 weeks of gestation, a repeat blood check was carried out for FBG/PPBG with a result of 130/184, then the dose of metformin was increased to 3 x 850 mg. Two weeks later, an evaluation of the FBG/PPBG examination was carried out with a result of 135/192, then the patient has given metformin 3 x 500 mg and novorapid 3 x 6 u SC. A follow-up assessment was done at 36 weeks of gestation for FBG/PPBG was 94/134, HbA1c, and patients receive additional therapy of Lantus treatment 1 x 6 SC. Two days before the patient came to the last antenatal examination, the patient checked his blood sugar independently, with the result FBG/PPBG being 139/147.

The patient gave birth by SC and found a stillborn female baby, maceration gr III, baby weight 4560gr, blackish amniotic fluid ±200 ml. The results of checking the postoperative FBG were 108.

Second Case

Mrs. M, 33 years old, is overweight (BMI 27.6). She was treated at Budi Kemuliaan Hospital with a diagnosis of G3P2A0 at 30 weeks gestation, IUFD, Type 2 DM, severe polyhydramnios, and had a history of SC twice.

The woman complained of decreased contractions and fetal activity when she arrived at the Maternity ward. Regular antenatal examinations are performed by patients under the supervision of specialized obstetricians and gynecologists. The results of an ultrasound revealed no fetal heartbeat. There were no reports of bloody mucous, watery discharge, or trauma history.

The examination findings during the 26 weeks of gestation revealed FBG/PPBG to be 117/184 and HbA1c to be 8. The patient was referred for examination to a fetomaternal specialist and consulted an internist. Based on the findings of these tests, the patient was given novarapid treatment 3 x 4 U. The fetus's weight was determined via fetomaternal ultrasound to be 1300 grams and ICA 42. The patient was recommended for amnioreduction during the 29 weeks of gestation. The ICA was lowered to 33 after the amnioreduction procedure. The patient came for follow-up three days after the amnioreduction, and the patient was diagnosed with IUFD. An SC was performed at 30 weeks gestation, and a stillborn infant weighing 1500 grams was discovered.

Third Case

Mrs. A, 38 years old, Obese with BMI 33. She was treated at Budi Kemuliaan Hospital with a diagnosis of G4P2A1 35 weeks + 5 days gestational age in latent phase with DMG and chronic hypertension, and a single live fetus with cephalic presentation. The patient complained of having contractions and active fetal movements when they arrived at the Maternity ward. A 2-centimeter open ostium was discovered after an investigation. Fetal weight determined by ultrasound: 2880 grams, ICA 14, NST category 1. Expectant planning is made for the patient.

At 14–15 weeks gestation, the first prenatal examination was performed. The RBG was tested during the exam with a score of 109. An FBG/PPBG assessment was performed between 27-28 weeks gestation, and the outcome was 87/178. The patient was then given a 1 x 500 mg dose of metformin treatment. An HbA1c test was done at 32 weeks of pregnancy, and the result was 6.3. She was hospitalized for labor at 35 weeks gestation, and an FBG/PPBG examination was done, with an 81/114 score. The patient naturally gave birth to a baby boy, 2975 grams with an 8/9 APGAR score.

Table 1. Characteristics of the cases

	1st case	2nd case	3rd case
Age	29	33	38
Parity	G1	G3P2	G4P2A1
BMI	31.6	27.6	33
Weeks	24	26	27
Ultrasound findings	Macrosomia	Poly hydramnios	Normal

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Therapy	Metformin Insulin	Insulin	Metformin
Termination	36	30	35
Delivery	SC	SC	Spontaneous
Weight (g)	4560	1500	2975
Outcome	IUFD female	IUFD	Live births male

Table 2. 1st case history of glucose level

GA (weeks)	RBG	FBG	PPBG	HbA1c
16	233			
20		130	230	8.4
28		130	184	
30		135	192	
36		94	134	
		139	147	

Table 3. 2nd case history of glucose level

GA (weeks)	FBG	PPBG	HbA1c
26	117	184	8

Table 4. 3rd case history of glucose level

GA (weeks)	RBG	FBG	PPBG	HbA1c
14	109			
27		87	178	
32				6.3
35		81	114	

*RBG: Random Blood Glucose
*FBG: Fasting Blood Glucose
*PPBG: Postprandial Blood Glucose
*HbA1c: Hemoglobin Glycated

DISCUSSION

In the first case, there were risk factors for obesity in the patient, so an RBG was performed at 16 weeks gestation with the result being 233. At 20 weeks gestation, the patient was diagnosed with type 2 DM with FBG/PPBG 130/230, and HbA1c 8.4. After treatment, the patient's glucose level has not reached the target. Uncontrolled glucose levels result in poor outcomes for the fetus and cause IUFD.

In the second case, the patient was diagnosed with type 2 DM at 26 weeks gestation with FBG/PPBG 117/184 and HbA1c 8. In this patient, there were risk factors for being overweight with a BMI of 27.6. At 30 weeks gestation, the patient was advised to undergo amnioreduction for indications of polyhydramnios (ICA 42). Three days after the amniocentesis, the patient was diagnosed with IUFD. In these patients, high initial HbA1c levels resulted in poor outcomes, such as polyhydramnios and IUFD.

In the third case, the patient was diagnosed with DMG at 27-28 weeks gestation with FBG/PPGB 87/178. In this patient, there are risk factors for obesity so diabetes screening was carried out at 14 weeks of gestation, and re-screened at 27-28 weeks of gestation, with the result of HbA1c 6.3. After treatment, the patient's glucose level is controlled, and delivery a baby with 2975 grams of weight.

Gestational diabetes is a serious pregnancy condition that affects the mother and fetus in a number of ways and necessitates ongoing monitoring and treatment[3]. Women who did not previously have diabetes can develop gestational diabetes during pregnancy. In the US, gestational diabetes affects 2–10% of pregnancies each year. This is consistent with what happened in the first and second cases above.

Gestational diabetes occurs because the body can't produce enough insulin during pregnancy[1]. During pregnancy, the body produces hormones that cause insulin to work inefficiently, which is called insulin resistance. Women in pregnancy had physiological changes in glycemic. The female body experiences a progressive increase in insulin resistance, this occurs mainly due to increased placental hormones. Gestational diabetes is characterized by a relative deficit of insulin secretion, this condition made the insulin secretion of cells can't compensate for the progressive increase in insulin resistance during pregnancy. This caused in decreased glucose uptake, increased hepatic gluconeogenesis, and maternal hyperglycemia.

Increased insulin resistance also causes an increase in postprandial glucose and free fatty acid levels and an increase in facilitated diffusion across the placenta, leading to greater availability of glucose for the growing fetus[4].

Different from gestational diabetes which was only discovered during pregnancy, pregestational diabetes was diagnosed before pregnancy (this includes DM type 1, 2, or other types). The diagnosis of pregestational diabetes is based on 1 of the 3 criteria below:

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- RBG ≥200 mg/dL with the presence of diabetes symptoms
- FGB ≥126 mg/dL with fasting defined by no caloric intake for 8 hours
- PPGB ≥ 200 mg/dL after 75 gr oral glucose
- HbA1c ≥ 6.5%

In another hand, the diagnosis of gestational diabetes is still controversial, various guidelines still have various methods to determine it. The recommendation from The International Association of the Diabetes and Pregnancy Study Group (IADPSG) (2010) and World Health Organization (WHO) (2013) to determine this diagnosis is if one of the following criteria is found in pregnant women during 24-28 weeks of gestation or at another time during pregnancy:

- FGB 92-125 mg/dL
- 1 hour post 75 g oral glucose ≥180 mg/dL
- 2 hours post 75 g oral glucose ≥ 153 – 199 mg/dL[5]

Monitoring blood glucose levels, nutritional therapy, and insulin therapy are all effective ways to control diabetes during pregnancy when dietary changes alone are unable to achieve target blood glucose levels. The American Diabetes Association (ADA) defines nutritional therapy for gestational diabetes as giving enough food to support maternal and fetal health, achieve normoglycemia, and provide enough energy to encourage healthy weight gain. A nutritional evaluation in accordance with the Dietary Reference Intakes (DRI) for all pregnant women is the first step in nutrition therapy. In addition, according to the ADA and the American College of Obstetricians and Gynecologists (ACOG) glucose levels that are the target for pregnant women are fasting glucose levels <95 mg/dl, glucose levels one hour after eating <140 mg/dl (7.8 mmol/l).) and glucose levels two hours after meals <120 mg/dl (6.7 mmol/l).

When the glucose level is more than 30% above that was mentioned, pharmaceutical treatment is needed. The two pharmaceutical alternatives for treatment are insulin or oral antihyperglycemic drugs. Insulin is the primary line of treatment. But when dietary therapy fails and insulin delivery is rejected, oral hyperglycemia is the next step in the management of diabetes during pregnancy[6].

CONCLUSION

These three cases show that hyperglycemia in pregnancy has a negative impact on the mother and fetus, especially for patients with uncontrolled sugar levels especially those with high HbA1c. Based on observational studies, patients with pregestational DM have better outcomes if HbA1c < 6.5-6%. In the second and third trimesters, the risk of macrosomia, preterm delivery, and preeclampsia is lower if the HbA1c level is <6%. Recommendations for blood sugar control in pregestational DMG and DM were FBG< 95, PPBG 1 hour < 140, or PPBG 2 hour < 120. And if the recommended blood sugar target is reached, it will provide better pregnancy outcomes.

ETHICAL APPROVAL

There is no ethical approval for this article.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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AUTHOR CONTRIBUTIONS

The authors conduct research based on a case report in Budi Kemuliaan Hospital.

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