

Macrosomic Newborn and Glucose Level in Lean Pregnant Diabetes Mellitus Patients at Dr. Soetomo General Hospital Surabaya

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Abstract

Background: Gestational diabetes mellitus, defined as glucose intolerance in variable degree with onset during pregnancy, is a risk factor for the development of fetal macrosomia, a newborn with the birthweight of more than 4000g. The objective of this study was to explore an association between glucose level in lean pregnant diabetes mellitus patients, resulting in babies and the incidence of macrosomia in Dr Soetomo General Hospital in Surabaya.

Methods: This was a retrospective analytic study with a cross sectional design by using medical records at Dr. Soetomo General Hospital Surabaya, collected from January 2016 to December 2017. The correlation between fasting glucose level, 2-hour postprandial glucose and glucose level at the time of birth and weight of newborn was assessed.

Results: Controlled and uncontrolled fasting glucose level, 2-hour postprandial glucose level and glucose level at the time of birth of mother were not significantly associated with macrosomia newborns. Macrosomia newborn were born with gestational diabetes mellitus mothers compare with pregestational mellitus mothers.

Conclusions: There is no association between macrosomia with glucose level of lean gestational and pregestational diabetes mellitus, however, therapeutic approach such as physical exercise should be implemented to reduce effects of uncontrolled glucose level.

Keywords: Gestational diabetes mellitus, macrosomia, glucose level

Introduction

Newborn macrosomia, a newborn with the birthweight of more than 4000g has a high percentage in Indonesia, that has reached 6.4%.¹ Gestational diabetes mellitus (GDM), defined as glucose intolerance in variable degree with onset during pregnancy, is a risk factor for the development of fetal macrosomia, There are more than 150,000 cases of GDM in Indonesia with the prevalence ranging from 1.9 to 3.6% across the country.

Pregnancies, that are closely linked to diabetes, poor blood sugar control, may cause complications for the mother and child being born. Even according to research results conducted by the health research institute Confidential Inquiry into Maternal and Child Health (CEMACH), although mother blood sugar levels has been controlled, a baby still has risk of complications. Newborn by mother

diabetics has risk of 5 times greater for death, would have birth defect risk of 2 times larger, and can be born with weights of more than 4000 grams or greater.²

Several studies have been conducted on risk factors of macrosomia, however, information and study in macrosomia complications are scarce.³ Fetal macrosomia may result in complications such as shoulder dystocia, birth asphyxia, nerve injuries, clavicular and humerus fractures in neonates, leading to admission to the intensive-care nursery and an increased of perinatal mortality for the newborn. Furthermore, vaginal and perineal trauma, uterine rupture, postpartum infection and hemorrhage to the mother may occur.⁴ Therefore, this study was conducted to identify the relationship between macrosomia and glucose level during pregnancy. Result of this study is expected to assess the importance of glycemic control to decrease the incidence of newborn macrosomia.

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Methods

This was an analytic retrospective cross sectional study, conducted after obtaining approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Hospital, Surabaya. A total data on newborns from medical record from the year 2016 to 2017 medical record data of newborns at the delivery room of Obstetrics and Gynaecology Department were collected. The inclusion criteria were data of women who had gestational and pre-gestational diabetes mellitus aged 21–35 years old with a normal pre-pregnancy body mass index of lower than

25 and had a complete medical data of glucose level. Data on women who had a history of smoking or still smoke as well as previous history of pregnancy complications other than diabetes mellitus were excluded from this study.

The measurement of fasting plasma glucose (FPG) level, 2 hour postprandial (2HPP) and glucose at the time of birth were categorised based on Glycemic Targets in Pregnancy by American Diabetes Association (ADA) year 2016 guidelines.⁵ Glycemic status was designated as controlled with FPG \leq 95 mg/dL, 2hPP \leq 120mg/dL and glucose at the time of birth \leq 120mg/dL. The results were analysed using Fisher's exact test to assess statistical

Table 1 Clinical Characteristic among Gestational and Pregestational Diabetes Women with Controlled and Uncontrolled Fasting Plasma Glucose Level at Dr. Soetomo General Hospital, Surabaya from January 2016 to December 2017

	Fasting plasma glucose level		Total N(%)	p-value*
	Controlled (\leq 95mg/dL) n(%)	Uncontrolled ($>$ 95mg/dL) n(%)		
Age (years)				
31–35	9(69.2)	13(65)	22(66.7)	0.714
26–30	4(30.8)	6(30)	10(30.3)	
21–24	-	1(5)	1(3)	
Parity				
Nullipara	4(30.8)	4(20)	8(24.2)	0.681
Multipara	9(69.2)	16(80)	25(75.8)	
Mode of delivery				
Caesarean	10(76.9)	16(80)	26(78.8)	1.000
Vaginal	3(23.1)	4(20)	7(21.2)	
Total	13(39.4)	20(60.6)	33(100)	

Note: *Fisher's exact test

Table 2 Fasting Plasma Glucose Level among Gestational and Pre-gestational Diabetes Women and Macrosomia State in Newborn in Delivery Room of Dr. Soetomo General Hospital, Surabaya from January 2016 to December 2017.

	State in newborn		p-value*
	Non-macrosomia n(%)	Macrosomia n (%)	
Controlled	13 (100%)	-	0.508
Uncontrolled	18 (90%)	2 (10%)	
Total	31 (93.9%)	2 (6.1%)	

*Note: Fisher's exact test

Table 3 Two-hour Postprandial Glucose Level among Gestational and Pregestational Diabetes Women and Macrosomia State in Newborn in Delivery Room of Dr. Soetomo General Hospital, Surabaya from January 2016 to December 2017.

2-hour Postprandial Glucose Level	State in newborn		p-value*
	Non-macrosomia n (%)	Macrosomia n (%)	
Controlled	7(100%)	-	1.000
Uncontrolled	24 (92.3%)	2 (7.7%)	
Total	31 (93.9%)	2 (6.1%)	

*Note: Fisher's exact test

Table 4 Glucose Level at Birth among Gestational and Pregestational Diabetes Women and Macrosomia State in Newborn in Delivery Room of Dr. Soetomo General Hospital, Surabaya from January 2016 to December 2017

Glucose Level at Birth	State in newborn		p-value*
	Non-macrosomia n (%)	Macrosomia n (%)	
Controlled	15 (93.8%)	1 (6.3%)	1.000
Uncontrolled	16 (94.1%)	1 (5.9%)	
Total	31 (93.9%)	2 (6.1%)	

*Note: Fisher's exact test

Table 5 Diabetes State among Pregnant Women with Newborn Macrosomia in Delivery Room of Dr. Soetomo General Hospital, Surabaya from January 2016 to December 2017

	Non-macrosomia n (%)	Macrosomia n (%)	p-value
Gestational	22(70.97)	2(6.45)	1.000
Pregestational	9(29)	-	
Total	31(93.9%)	2(6.1%)	

*Note: Fisher's exact test

significance. A p-value <0.05 was considered statistically significant.

Results

In total, there were 33 data of pregnant women with poor glycemic control. Glycemic status was more likely to be poorly controlled among older patients, multipara patients and caesarean delivery was mode of delivery (Table 1).

Discussions

This study has assessed the association between uncontrolled and controlled glucose level in lean gestational and pregestational

diabetes mellitus women, resulting in birth of newborns with macrosomia. Uncontrolled blood glucose levels has been found in majority of the patients, and older age of pregnant women (31–35 years old) tends to have more uncontrolled glucose level, although no significant association between age and glycemic control. This result is in contrast to other study that showed that younger patients had more uncontrolled glucose level.⁶ In line with the study among Chinese women in Singapore⁷, our result showed that the majority of uncontrolled glucose level was among multipara women, however, no statistically significant association of parity with uncontrolled glucose level has been found in this research. More than half of patients (78.8%) with gestational and pregestational

diabetes underwent caesarean section, as delivery need to be well planned.⁸ Again, no significant association can be erected between fasting and postprandial glycemia with increased caesarean rates as shown in other study among urban women in Sri Lanka.⁹

The prevalence of newborn macrosomia among women with uncontrolled glucose level is 6.1%, similar to other study, yet there no association between glucose control in pregnancy.¹⁰ In contrast to a general thought of a significant association between glucose control and macrosomia newborn.¹¹ Moreover, study showed that pregestational diabetic mellitus patients is significantly associated to small birth weight and appropriate birthweight newborn.¹²

The limited number of pregestational and gestational women over two year period is an obstacle in this study. Therefore, further research on larger population is needed. In addition, this research has analysed fasting plasma glucose level and 2-hour postprandial glucose level within two weeks of birth as well as glucose at the time of birth to identify uncontrolled and controlled glucose level. However, this data does not represent glucose control for the whole duration of pregnancy. A better glicemic state such as HbA1c may serve as a good indicator for this study.

In conclusion, no association between fasting plasma glucose, 2-hour postprandial glucose and glucose at the time of birth of lean gestational and pregestational diabetes mellitus patients and macrosomic newborn have been found.

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