

# The Early Detection in Gestational Diabetes Mellitus at Indonesia Primary Health Care

Erni Rosita Dewi<sup>1</sup>, Budi Prasetyo<sup>2</sup>, Muhammad Ardian Cahya Laksana<sup>2</sup>, Hermanto Tri Joewono<sup>2</sup>, Ivon Diah Wittartika<sup>1</sup>

<sup>1</sup>*School of Midwifery, Faculty of Medicine, Universitas Airlangga,* <sup>2</sup>*Department of Obstetric Gynecology, Faculty of Medicine, Universitas Airlangga*

## Abstract

**Background:** Gestational diabetes mellitus (GDM) is diabetes that is first diagnosed during pregnancy. Uncontrolled GDM or late found can increase mortality for both mother and baby. Not only bad medical conditions, but also it can decline the community productivity, affect socio-economic and increasing financial health. Early detection of GDM is crucial to be implemented by providers, especially in the primary health care.

**Objective:** to determine the framework of early detection in gestational diabetes mellitus at primary health care

**Methods:** The method used is a literature review, which was published in 2008-2018. The literature were collected using some keywords such as “detection”, “gestational diabetes mellitus”, and “primary health care” using PubMed and another electronic journal website. Furthermore, the findings were filtered based on our inclusion criteria and analyzed qualitatively.

**Results:** Early detection of GDM in primary health care with risk factor assessment (age of pregnant women  $\geq 35$  years, some of bad history namely GDM in previous pregnancies, anti-diabetic drug use, diabetes mellitus in the family, congenital of infants, IUFD, preeclampsia, macrosomia, blood pressure examination, calculation of body mass index and random blood sugar examination). Furthermore, early detection of GDM is carried out by examining blood glucose accompanied by the provision of appropriate glucose solution interventions (OGCT and OGTT).

**Conclusion:** primary health care can take more action in early detection of GDM through quality antenatal care, which can be done by applying the framework of early detection in gestational diabetes mellitus.

**Keywords:** *Early detection, gestational diabetes mellitus, primary health care*

## Introduction

GDM is a glucose tolerance disorder that was first discovered during pregnancy, this condition occurs in a woman who has never been diagnosed with diabetes

then shows high glucose levels during pregnancy<sup>1</sup>. GDM begins to be diagnosed at gestational age above 20 weeks<sup>2</sup>. The prevalence of GDM in Indonesia is around 14% of the total number of pregnancies, while the number of undiagnosed or diagnosed GDMs is around 10-25% of the total cases handled, this number is certainly quite large and needs to be better managed. Uncontrolled diabetes mellitus during pregnancy can increase mortality and morbidity for both mother and baby. Abortion can occur in the mother, preeclampsia, polyhydramnios, labor trauma and other complications such as diabetic retinopathy, diabetic nephropathy. In

### Corresponding author:

**Budi Prasetyo**

budi-p@fk.unair.ac.id

Kampus A UNAIR – Jl. Mayjen Prof. Dr. Moestopo

47, Surabaya – 60131, Telp. (031) 5020251,

Fax. (031) 5022472

infants can occur cardiac abnormalities, abnormalities of the central nervous system, premature, macrosomia, brachial nerve damage, respiratory distress syndrome, jaundice, hypoglycemia, hypocalcemia and fetal death<sup>3</sup>.

At the long-term risks accepted are obesity, impaired permanent glucose tolerance (DM type 2) and low intelligence whether there are mothers or babies born. Antenatal care is one of the interventions recommended to prevent maternal and infant mortality and morbidity worldwide, including in the effort to detect and treat high risk cases<sup>4</sup>. Early diagnosis and detection are the key to successful management of GDM in order to achieve improved quality of life for mothers and infants<sup>5</sup>.

The implementation of antenatal care in health facilities so far refers to the minimum standard elements of 10T antenatal care, namely (1) weight measurement and height measurement (2) blood pressure measurement (3) measurement of Upper Arm Circumference (LILA) (4) height measurement uterine crest (fundus uteri) (5) determination of tetanus immunization status and administration of tetanus toxoid immunization according to immunization status (6) Administration of blood tablets at least 90 tablets during pregnancy (7) Determination of fetal presentation and fetal heart rate (FHR) (8) Implementation conversation (interpersonal communication and counseling, including family planning) (9) Simple laboratory test services, minimal blood hemoglobin (Hb) test, urine protein examination and blood type examination (if it has never been done before) (10) Case management<sup>4,6</sup>.

In the integrated ANC program, every pregnant woman receives at least one more comprehensive service, one of which is for laboratory examinations. However, the implementation of existing laboratory tests is not effective enough for early detection of GDM. In many of the findings of the integrated ANC laboratory results, the components examined focus on hemoglobin, blood group, hepatitis B, sexual transmitted illness (HIV and syphilis), urine protein and urine reduction. On examination of urine reduction results positive or negative. When linked to the gold standard for early detection of GDM (blood glucose testing by providing glucose solution interventions to produce results in the form of numbers), then the routine antenatal implementation has not been effective enough and has not been focused on diagnosing GDM<sup>1,7</sup>. The routine antenatal examination refers more to the efforts of early detection of preeclampsia, anemia, sexually transmitted

diseases, risk of bleeding and others. Based on the description above, the aim of this study is to determine the framework of early detection in gestational diabetes mellitus at primary health care.

## **Method**

The method used is a literature review through an electronic search of published literature in 2008-2018. The literatures are available in soft copies; such as PDF journals and direct reading from online journal articles scientifically proven.

The literature were collected using some keywords such as “detection”, “gestational diabetes mellitus”, and “primary health care” using PubMed and another electronic journal website. Furthermore, the findings were filtered based on our inclusion criteria and analyzed qualitatively.

The inclusion criteria of the studies consists of: (1) the definition of gestational diabetes mellitus (2) the study explained the risk factor and the management of gestational diabetes mellitus (3) the studies showed the outcome of implementation the management of gestational diabetes mellitus (4) the sampling of studies, data collection and analysis are clearly described and correlating to the research questions (5) the studies included in the review were restricted to English and Indonesia languages. The result of the studies was explained qualitatively provided in the result and discussion section.

## **Result and Discussion**

Based on the regulation of the Minister of Health of the Republic of Indonesia in 2014s, routine laboratory tests must be performed on every pregnant woman, namely blood type, blood hemoglobin, and specific examination of endemic/epidemic areas (malaria, HIV, etc.). While a special laboratory examination is another laboratory examination carried out on indications. Pregnant women suspected of having diabetes mellitus should have a blood sugar check during their pregnancy at least once in the first trimester, once in the second trimester, and once in the third trimester<sup>8</sup>.

Gestational Diabetes Mellitus is diabetes that first arises (first onset) or is diagnosed (first recognition) during pregnancy. More than half of women with GDM eventually develop overt diabetes within the next 20 years, and there is increasing evidence of long-term

complications including obesity and diabetes in offspring caused by GDM. At more than 26 weeks' gestation, the body produces several hormones, such as estrogen, progesterone, cortisol and HPL (Human Placental Lactogen) which have insulin resistance effects. The function of this hormonal effect is to increase nutrition and sugar in blood circulation so that it helps the growth of the fetus. As compensation, the body produces more insulin. GDM occurs when pregnant women cannot produce enough insulin or body cells are more resistant to insulin<sup>12</sup>.

GDM has no specific signs and symptoms. Pregnant women with GDM almost never give a complaint. This disease is considered mild, without any real symptoms but has a major influence on maternal and fetal morbidity both short and long term, so early detection is needed to improve the well-being of the mother and fetus both during pregnancy and after pregnancy<sup>9</sup>.

Early detection of GDM is done universally in all pregnant women, not elective screening. This means conducting an examination without looking at risk factors. If only those who have risk factors are examined, then almost 50% of GDM cases will pass undiagnosed. But in the study of Trauffer (2008) recommends screening or early detection at high risk because at low risk only 0.9% suffer from GDM, at high risk around 4-7%. However, the gold standard set is for all pregnant women aged 24-28 weeks once with a 50 gram load and if the next 1 hour plasma glucose is more or equal to 130 or 140 followed by a 100 gram TTGO. Screening is done at 24-28 weeks gestation. Because an increase in pregnancy hormone levels reaches a peak in the early third trimester and not more than 28 weeks, so that fetal B cells have not been stimulated so that fetal hyperinsulin has not yet occurred. At this gestational age a balance is obtained between sensitivity and specificity so that it is suitable for metabolic intervention. Screening is done at the first visit at high risk and is repeated at weeks 24 and 28 if the results are negative<sup>7,13</sup>.

In addition to examining glucose tolerance, another screening for GDM is the assessment of risk factors. Assessments that need to be carried out include:

a. Pregnant women age  $\geq 35$  years

Pregnancy at too old age is included in the criteria of high risk pregnancy, death and maternal complications increased 9-fold in pregnant women aged  $\geq 35$  years. The incidence of GDM tends to be high in old age which is

expected due to the influence of the aging process and damage to vessel endothelial progressive blood.

b. History of diabetes GDM in a previous pregnancy

The risk will increase in the history of pregnant women who have been exposed to GDM in previous pregnancies.

c. History of diabetes mellitus/ use of OAD/ special diet

In the history taking, there is a history of diabetes mellitus that is being suffered by the mother or the use of certain diets or the use of anti-diabetic drugs (OAD) or routine use of insulin can lead to a diagnosis of GDM so that further referral can be made immediately.

d. Family history of diabetes mellitus

Diabetes mellitus tends to be inherited or inherited, and is not transmitted. Genetic factors provide a greater chance of suffering from diabetes mellitus compared to family members who do not suffer from diabetes mellitus. If there are parents or siblings who suffer from diabetes mellitus, then the person has a 40% risk of suffering from diabetes mellitus<sup>14</sup>.

e. History of congenital defects

The incidence of major fetal malformations increased by 5% in women with diabetes. Lack of diabetes control during pregnancy increases malformations in the fetus. One of them is heart defects is that oxidative stress triggered by hyperglycemia inhibits the migration of heart-filled cysts. Women who exercise glucose control in preconception care can reduce the risk of congenital anomalies<sup>15</sup>.

f. History of unborn fetus (IUFD)

This incident is related to fetal metabolic disorders. Ketoacidosis can cause fetal death. In addition, mothers with GDM can find a placenta experiencing hydrops due to chorion villus edema that is triggered by osmotic pressure which causes disruption of oxygen delivery to the fetus<sup>14</sup>.

g. History of preeclampsia

The incidence of preeclampsia has a relationship with glucose control during pregnancy especially at HbA1c levels<sup>16</sup>.

h. History of childbirth (> 4000gram)

The incidence of macrosomia increases significantly if the mother's glucose concentration exceeds 130 mg / dl. The distribution of birth weight of infants of diabetic mellitus mothers always tends to be higher than that of infants of normal pregnancy.

i. Blood pressure check: hypertension results ( $\geq$  140/90 mmHg)

Pregnant women with diabetes mellitus can trigger hypertension and most often force labor less than 8 months<sup>17</sup>.

j. Calculation of Body Mass Index (BMI)

BMI calculation results are said to be obese if  $\geq 30$  kg / m<sup>2</sup>. Obese women have a 1.7 times higher risk of giving birth to macrosomia babies compared to women who have normal weight. Gestational diabetes mellitus is found to be higher in women with a higher BMI and higher body weight before pregnancy. This shows that many groups of mothers giving birth to macrosomia have risk factors for giving birth to macrosomia babies and suffering from gestational diabetes mellitus<sup>17</sup>.

k. Random blood sugar (GDA) check

The results of blood sugar can indicate the condition of glucose intolerance. The normal value for random or temporal blood sugar examination results is <200 mg / dl. This finding can be confirmed by the discovery of the classic triad of diabetes (polyuria, polydipsia, polyphagia)<sup>17</sup>

In the framework of early detection of gestational diabetes mellitus above starting from pregnant women making the first ANC visit to primary health care, a risk factor assessment that increases the incidence of GDM is carried out. Risk factor assessments are carried out for all visiting pregnant women, regardless of gestational age. If a midwife or other health worker discovers one of the risk factors above, the midwife needs to take further management, which is to make a referral or collaborate with other health workers who have the authority to provide care according to the needs of the pregnant woman. If the risk factor data is not obtained in the assessment, pregnant women will be given routine ANC services according to standards by the midwife.

Furthermore, at 24-28 weeks of pregnancy, midwives will conduct an OGCT (Oral Glucose Challenge Test)

without prior fasting preparations. In this examination, pregnant women will be given a 50 gram glucose solution. Furthermore, after 1 hour of giving glucose solution, pregnant women will be tested for blood sugar. If the results of the examination > 135 mg / dl, the mother will be advised for the next examination, namely TTGO / OGTT (Oral Glucose Tolerance Test). And if the result is <135mg / dl, pregnant women will be scheduled for routine ANC according to the schedule.

At the TTGO / OGTT (Oral Glucose Tolerance Test), pregnant women are asked to fast for 10 hours. Furthermore, the mother will be examined for fasting blood sugar (positive results, if:  $\geq$  95mg / dl). After checking fasting blood sugar, pregnant women are given 100 gram glucose solution. Furthermore blood sugar will be checked after administration of 100 gram glucose solution at 1 hour after administration (positive result, if:  $\geq$  180mg / dl), at 2 hours after administration (positive result, if:  $\geq$  155mg / dl) and 3 hours after administration (a positive result, if:  $\geq$  140mg / dl). The diagnosis of GDM is made if at least 2 of the TTGO / OGTT results are positive. If only 1 positive test results are found, then antenatal care is treated the same as GDM. If the five blood sugar tests in TTGO / OGTT are negative, pregnant women will be scheduled for routine ANC according to schedule.

The framework is expected to be a reference source for primary level health facilities in providing quality antenatal services, especially in the early detection of GDM without reducing elements or antenatal service standards set by the government (ANC 10 T program and integrated ANC).

## Conclusion

Improving the quality of antenatal services, especially in the early detection of GDM, can be done in primary health facilities through implementing an early framework for GDM detection based on screening of risk factors and further examination management.

**Conflict of Interest:** There is no conflict of interest.

**Source of Funding:** This research was funded by author.

**Ethical Clearance:** This study has been through a review and has been declared eligible ethics from the Faculty of Medicine, Universitas Airlangga, Surabaya Indonesia.



## Reference

1. Bellamy L, Casas J-P, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. *Lancet*. 2009;373(9677):1773–9.
2. Retnakaran R. Glucose tolerance status in pregnancy: a window to the future risk of diabetes and cardiovascular disease in young women. *Curr Diabetes Rev*. 2009;5(4):239–44.
3. Feghali MN, Abebe KZ, Comer DM, Caritis S, Catov JM, Scifres CM. Pregnancy outcomes in women with an early diagnosis of gestational diabetes mellitus. *Diabetes Res Clin Pract*. 2018;138:177–86.
4. KeMenKes RI. Profil kesehatan Indonesia tahun 2015. Jakarta Kementerian Kesehat Republik Indones. 2016;
5. Alfadhli EM. Gestational diabetes mellitus. *Saudi Med J*. 2015;36(4):399.
6. Kementerian Kesehatan RI. Data dan Informasi: Profil Kesehatan Indonesia. Jakarta Kemenkes RI. 2017;
7. Joewono HT. Kehamilan dengan Diabetes Mellitus dalam Ilustrasi. Surabaya: Global Persada Press; 2015.
8. Kementrian Kesehatan RI. Peraturan Menteri Kesehatan Republik Indonesia Nomor 97 Tahun 2014 : Pelayanan Kesehatan Masa Sebelum Hamil, Masa Hamil, Persalinan, Dan Masa Sesudah Melahirkan, Penyelenggaraan Pelayanan Kontrasepsi, Serta Pelayanan Kesehatan Seksual. Jakarta; 2014.
9. Spaight C, Gross J, Horsch A, Puder JJ. Gestational diabetes mellitus. In: *Novelties in Diabetes*. Karger Publishers; 2016. p. 163–78.
10. Tobias DK, Zhang C, Van Dam RM, Bowers K, Hu FB. Physical activity before and during pregnancy and risk of gestational diabetes mellitus: a meta-analysis. *Diabetes Care*. 2011;34(1):223–9.
11. Mpondo BCT, Ernest A, Dee HE. Gestational diabetes mellitus: challenges in diagnosis and management. *J Diabetes Metab Disord*. 2015;14(1):42.
12. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care*. 2002;25(10):1862–8.
13. Chiefari E, Arcidiacono B, Foti D, Brunetti A. Gestational diabetes mellitus: an updated overview. *J Endocrinol Invest*. 2017;40(9):899–909.
14. Retnakaran R, Shah BR. Role of type 2 diabetes in determining retinal, renal, and cardiovascular outcomes in women with previous gestational diabetes mellitus. *Diabetes Care*. 2017;40(1):101–8.
15. Jafari-Shobeiri M, Ghojzadeh M, Azami-Aghdash S, Naghavi-Behzad M, Piri R, Pournali-Akbar Y, et al. Prevalence and risk factors of gestational diabetes in Iran: a systematic review and meta-analysis. *Iran J Public Health*. 2015;44(8):1036.
16. Ehrlich S, Lambers D, Baccarelli A, Khoury J, Macaluso M, Ho S-M. Endocrine disruptors: a potential risk factor for gestational diabetes mellitus. *Am J Perinatol*. 2016;33(13):1313–8.
17. Shin D, Song WO. Prepregnancy body mass index is an independent risk factor for gestational hypertension, gestational diabetes, preterm labor, and small-and large-for-gestational-age infants. *J Matern Neonatal Med*. 2015;28(14):1679–86.
18. Cypryk K, Szymczak W, Czupryniak L, Sobczak M, Lewiński A. Gestational diabetes mellitus-an analysis of risk factors. *Endokrynol Pol*. 2008;59(5):393–7.
19. Sacks KN, Friger M, Shoham-Vardi I, Abokaf H, Spiegel E, Sergienko R, et al. Prenatal exposure to gestational diabetes mellitus as an independent risk factor for long-term neuropsychiatric morbidity of the offspring. *Am J Obstet Gynecol*. 2016;215(3):380-e1.