

CHARACTERISTICS OF PREGNANCY IN WOMEN OF REPRODUCTIVE AGE WITH METABOLIC CHANGES

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Abstract

Metabolic changes are increasingly recognized as major determinants of maternal and fetal health during pregnancy. The growing prevalence of obesity, insulin resistance, metabolic syndrome, dyslipidemia, and gestational diabetes mellitus has significantly affected reproductive outcomes worldwide. Pregnancy itself is characterized by profound physiological metabolic adaptations designed to support fetal growth and development. However, pre-existing or pregnancy-induced metabolic disturbances may disrupt these adaptive mechanisms, leading to maternal complications, adverse obstetric outcomes, and long-term health consequences for both mother and child. The present study aimed to evaluate the characteristics of pregnancy in women of reproductive age with metabolic changes and to assess their impact on maternal and fetal outcomes. Clinical, biochemical, hormonal, and obstetric data were analyzed in pregnant women presenting with various metabolic abnormalities. The study demonstrated that metabolic disorders are associated with increased risks of gestational hypertension, preeclampsia, gestational diabetes, cesarean delivery, fetal macrosomia, preterm birth, and neonatal complications. Early identification and management of metabolic alterations can significantly improve pregnancy outcomes and reduce maternal-fetal morbidity. The findings emphasize the importance of multidisciplinary prenatal care and metabolic monitoring throughout pregnancy.

Keywords: pregnancy, metabolic changes, reproductive age, gestational diabetes mellitus, obesity, insulin resistance, dyslipidemia, maternal health, fetal development, metabolic syndrome.

1. Introduction

Pregnancy is a unique physiological state characterized by complex endocrine, metabolic, and immunological adaptations that ensure adequate fetal growth and maternal well-being. These changes involve modifications in carbohydrate metabolism, lipid metabolism, protein turnover, and energy expenditure. During normal pregnancy, insulin sensitivity gradually decreases, particularly during the second and third trimesters, allowing greater nutrient availability for the developing fetus. In recent decades, the prevalence of metabolic disorders among women of reproductive age has increased dramatically. Sedentary lifestyles, unhealthy dietary habits, obesity, and genetic predisposition have contributed to a rising burden of metabolic syndrome, insulin resistance, dyslipidemia, and glucose intolerance. These conditions frequently coexist and may substantially influence reproductive health before conception and throughout pregnancy. Metabolic disturbances during pregnancy represent a major public health challenge because they

affect both maternal and neonatal outcomes. Women with metabolic abnormalities are at higher risk for gestational diabetes mellitus, hypertensive disorders, preeclampsia, placental dysfunction, operative delivery, and postpartum complications. Furthermore, metabolic dysregulation may alter placental function, fetal growth patterns, and neonatal adaptation after birth.

Insulin resistance plays a central role in many pregnancy-related metabolic complications.

Physiological insulin resistance develops naturally during pregnancy under the influence of placental hormones, including human placental lactogen, progesterone, estrogen, cortisol, and placental growth hormone. However, excessive insulin resistance may result in hyperglycemia and gestational diabetes mellitus, which can adversely affect fetal development and increase the risk of obstetric complications.

Maternal obesity has emerged as one of the most significant risk factors affecting pregnancy outcomes. Excess adipose tissue promotes chronic low-grade inflammation, oxidative stress, endothelial dysfunction, and hormonal imbalance. These pathological mechanisms contribute to abnormal placental development and impaired maternal adaptation to pregnancy.

Dyslipidemia is another common metabolic alteration observed during pregnancy. Elevated triglyceride levels, increased low-density lipoprotein cholesterol, and altered lipid metabolism may contribute to vascular dysfunction and placental insufficiency. These abnormalities have been associated with preeclampsia, fetal growth restriction, and adverse cardiovascular outcomes.

Understanding the characteristics of pregnancy in women with metabolic changes is essential for improving prenatal care, reducing maternal and neonatal morbidity, and developing effective preventive strategies. Therefore, this study aimed to investigate the clinical and metabolic features of pregnancy among women of reproductive age with metabolic alterations and to evaluate their impact on pregnancy outcomes.

2. Materials and Methods

A prospective observational study was conducted among 150 pregnant women aged 18–40 years who received prenatal care in specialized obstetric and gynecological clinics between 2022 and 2025.

Participants were divided into two groups. The study group included 90 pregnant women diagnosed with metabolic changes, including obesity, insulin resistance, gestational diabetes mellitus, dyslipidemia, or metabolic syndrome. The control group consisted of 60 healthy pregnant women without significant metabolic abnormalities.

Inclusion criteria included singleton pregnancy, reproductive age, confirmed gestational age between 8 and 40 weeks, and informed consent. Exclusion criteria included multiple pregnancy, severe chronic systemic diseases unrelated to metabolism, congenital fetal abnormalities, and autoimmune disorders requiring immunosuppressive therapy.

Clinical assessment included detailed medical history, anthropometric measurements, body mass index calculation, blood pressure monitoring, gestational weight gain assessment, and obstetric examination.

Laboratory investigations included fasting blood glucose, oral glucose tolerance test, glycated hemoglobin, fasting insulin levels, lipid profile, liver function tests, kidney function tests, inflammatory markers, and hormonal assessments when clinically indicated.

Ultrasound examinations were performed during all trimesters to evaluate fetal growth, placental structure, amniotic fluid volume, fetal biometry, and Doppler blood flow parameters.

3. Results

The mean age of participants was 29.3 ± 4.8 years. Women in the metabolic disorder group had significantly higher body mass index values compared to controls. Obesity was present in 48.9% of women with metabolic changes, while overweight status was identified in 34.4%.

Insulin resistance was detected in 57.8% of participants in the study group. Gestational diabetes mellitus developed in 31.1% of women with metabolic abnormalities compared to 5.0% in the control group. Elevated fasting glucose and insulin levels were significantly associated with adverse pregnancy outcomes.

Hypertensive disorders occurred more frequently among women with metabolic disturbances.

Gestational hypertension was diagnosed in 22.2% of cases, while preeclampsia developed in 15.6% of women in the study group. In comparison, these complications occurred significantly less frequently

in the control group.

Abnormal lipid profiles were observed in 62.2% of participants with metabolic changes. Elevated triglyceride concentrations were associated with increased risks of preeclampsia, placental dysfunction, and excessive fetal growth.

Ultrasound evaluation revealed altered fetal growth patterns among women with metabolic disorders. Fetal macrosomia was observed in 18.9% of pregnancies, while fetal growth restriction occurred in 8.9%. Excessive fetal growth was particularly common among women with gestational diabetes and obesity.

Cesarean delivery was performed in 42.2% of women with metabolic abnormalities compared to 21.7% in controls. The most common indications included fetal macrosomia, labor dystocia, hypertensive complications, and fetal distress.

Preterm birth occurred in 14.4% of women with metabolic disorders and was significantly associated with preeclampsia and poorly controlled glucose metabolism. Neonatal complications included respiratory distress syndrome, neonatal hypoglycemia, hyperbilirubinemia, and admission to neonatal intensive care units.

Correlation analysis demonstrated strong associations between maternal body mass index, insulin resistance indices, fasting glucose levels, triglyceride concentrations, and adverse obstetric outcomes. Women presenting with multiple metabolic abnormalities experienced the highest rates of pregnancy complications.

4. Discussion

The findings of this study confirm that metabolic changes significantly influence pregnancy progression and outcomes. Pregnancy requires precise metabolic regulation to meet the nutritional demands of both mother and fetus. When underlying metabolic disorders are present, physiological adaptations may become insufficient, resulting in pathological complications.

The high prevalence of obesity observed among women with metabolic changes reflects global epidemiological trends. Maternal obesity contributes to chronic inflammation, endothelial dysfunction, and oxidative stress, all of which adversely affect placental development and vascular adaptation during pregnancy.

Insulin resistance emerged as a major factor influencing pregnancy outcomes. Excessive insulin resistance promotes hyperglycemia, increased fetal glucose exposure, and fetal hyperinsulinemia. These mechanisms explain the elevated rates of fetal macrosomia observed among women with gestational diabetes mellitus.

The increased incidence of hypertensive disorders identified in this study may be explained by vascular dysfunction associated with obesity and metabolic syndrome. Endothelial injury, inflammation, and abnormal placental implantation contribute to the development of gestational hypertension and preeclampsia.

Dyslipidemia also played an important role in pregnancy complications. Elevated triglyceride concentrations have been linked to placental oxidative stress, vascular damage, and impaired maternal-fetal circulation. These mechanisms may explain the increased frequency of placental insufficiency and abnormal fetal growth patterns.

The higher rate of cesarean delivery among women with metabolic abnormalities reflects increased obstetric risks associated with obesity, fetal macrosomia, and hypertensive complications. Operative delivery may reduce certain maternal and fetal risks but also increases postoperative morbidity.

The observed neonatal complications highlight the transgenerational consequences of maternal metabolic dysfunction. Exposure to hyperglycemia and altered intrauterine metabolism may affect neonatal adaptation and contribute to long-term risks of obesity, diabetes, and cardiovascular disease in offspring.

These findings support the importance of preconception counseling, early metabolic screening, nutritional interventions, physical activity promotion, and individualized prenatal care. Effective management of metabolic disorders before and during pregnancy may substantially improve maternal and neonatal outcomes.

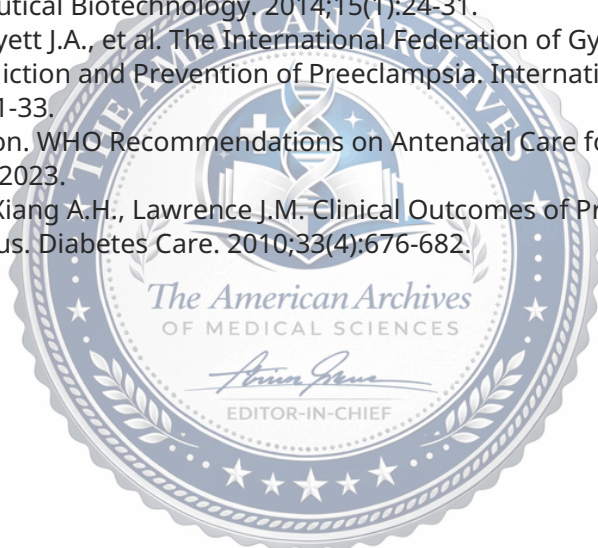
5. Conclusion

Pregnancy in women of reproductive age with metabolic changes is associated with a significantly

increased risk of maternal and fetal complications. Obesity, insulin resistance, gestational diabetes mellitus, and dyslipidemia contribute to the development of hypertensive disorders, abnormal fetal growth, preterm birth, operative delivery, and neonatal morbidity. Early diagnosis and comprehensive management of metabolic abnormalities are essential for optimizing pregnancy outcomes. Multidisciplinary prenatal care, metabolic monitoring, lifestyle modification, and timely therapeutic interventions can significantly reduce complications and improve the health of both mother and child.

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