

METABOLIC SYNDROME IN REPRODUCTIVE FEMALES

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DISCLOSURES

- Nothing to disclose

OBJECTIVES

- What is Metabolic Syndrome?
- How is Metabolic Syndrome related to family history?
- Association of P.C.O.S. and Metabolic Syndrome
- Address concerns with key objective evidence
- Preparing for reproduction
- Prepare for intervals between children
- Discuss osteopathic and holistic means to optimize metabolic parameters for reproductive and ongoing health

WHAT IS METABOLIC SYNDROME?

- Clustering of metabolic abnormalities
- Women affected by preeclampsia have an increased risk of developing metabolic syndrome after delivery, linking preeclampsia to Cardiovascular Disease
- Mainly in older reproductive women
 - Problem: Studies do not show whether metabolic syndrome exists before index pregnancy due to lack of data on pre-pregnancy metabolic health

CONCERNS AND CHARACTERISTICS OF M.S.

- Increasing abdominal adiposity
- Hyperglycemia
- Hyperinsulinism
- Dyslipidemic



PREECLAMPSIA

- Disorder of pregnancy characterized by hypertension after 20 weeks gestation, combined with proteinuria
- Increases the risk of developing hypertension, future diabetes mellitus, cardiovascular disease, stroke, and overall increased mortality



CONCERNS

- Pre-pregnancy factors can lead to placental disorders
- Family history can be a useful tool to predict preeclampsia and metabolic syndrome

PRE-PREGNANCY FACTORS

- Women who show pre-pregnancy factors have higher risk for placental disorders
- Women who develop preeclampsia tend to be older and have a family history of hypertension
- Metabolic syndrome in the non-pregnancy state is associated with an increased risk of preeclampsia
- Components of Metabolic Syndrome
 - Obesity
 - Hypertension
 - Dyslipidemia
 - Insulin resistance
 - Hyperglycemia



FAMILY HISTORY

- National Cholesterol Education Program's and the International Diabetes Federation's definition of the metabolic syndrome phenotype
 - Obesity
 - Elevated fasting glucose
 - Hypertension
 - High Serum triglyceride levels
 - Lowered High density lipoprotein cholesterol



METABOLIC SYNDROME AND FAMILY HISTORY

- Endothelial dysfunction and excessive inflammatory response are common mechanisms involved in the development of CVD and are an important factor in metabolic syndrome
- Longer duration of lactation was associated with lower incidence of the metabolic syndrome years after weaning among women with a history of Gestational Diabetes Mellitus (GDM) and without GDM (CARDIA-Coronary Artery Risk Development in Young Adults)
- Few studies suggest whether lactation favorable effects on cardiometabolic risk factors persist after weaning to protect women against future disease

STUDIES TO BE DISCUSSED...

- Several studies examine different factors of metabolic syndrome and different reproductive groups of women that are involved with metabolic syndrome
 - Test on obesity and metabolic syndrome
 - Proteinuria leading to metabolic syndrome and its screening
 - Certain ethnicities studied that have a prevalence to metabolic syndrome
 - Test on a group of women in Puerto Rico that have a prevalence to metabolic syndrome

STUDY ON OBESITY

- Obesity is caused by an increase insulin resistance
- Study about a test on women show that urinary Bisphenol A levels were positively correlated with BMI, waist circumference, fasting serum insulin, and HOMA-IR (Homeostatic Model Assessment of Insulin Resistance)
- Adjusted specifically for age, smoking and alcohol consumption, triglycerides, total cholesterol, and high density lipoprotein
- Higher urinary BPA levels and fat accumulation in liver and muscle are associated with obesity, insulin resistance, and metabolic disruption in a study of Korean reproductive-aged women
- Endocrine-disrupting chemicals such as dioxin, bisphenol A, and phthalates interfere with the endocrine hormonal system which causes insulin resistance and alter beta-cell function
- Fasting insulin, BMI, waist circumference and HOMA-IR values were positively associated with BPA levels

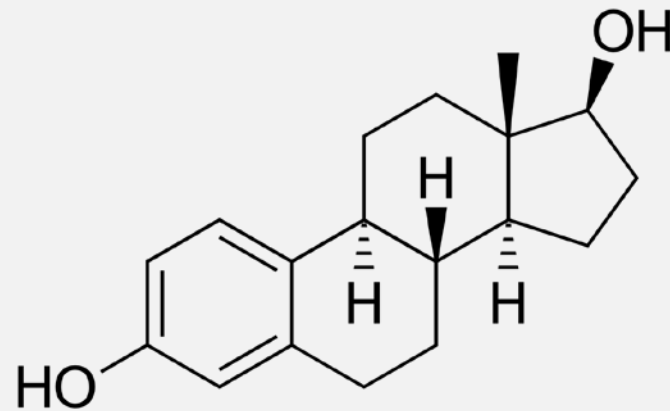
**OBESITY IS NOW A
GLOBAL EPIDEMIC!**



Source: Hong, SH. Urinary bisphenol A is associated with insulin resistance and obesity in reproductive-aged women. *Clinical Endocrinology* 2017 Apr;86(4):506-12

STUDY ON OBESITY

- Bisphenol A mimics the action of estradiol (xenoestrogen) and affects energy balance and glucose homeostasis
 - May promote insulin secretion in the pancreas, resulting in hyperinsulinemia
 - Binds to estrogen receptors in both adipocytes and pancreatic Beta cells and BPA cells develop lipid accumulation



STUDY ON PROTEINURIA

- Study: almost 11,000 women age 20-39 were screened
- Attention to proteinuria, abnormal quantities of protein in urine, may be necessary in asymptomatic young women aged 20 to 39 years if they have metabolic syndrome or a wide pulse pressure
 - If unrecognized or ignored, there could be complications during pregnancy from urinary tract infections to chronic kidney disease
- Metabolic syndrome, comprised of central obesity, dyslipidemia, high blood pressure, and impaired fasting glucose, is a known risk factor for proteinuria in the general population



PROTEINURIA SCREENING

- Testing health status of diabetes, hypertension, alcohol, smoking, exercise, medication, marital status, and childbirth
- Physical examination of height, weight, waist circumference, body mass index and blood pressure, blood urine tests
- Blood test during fasting state that testing hemoglobin, glucose, total cholesterol, high-density lipoprotein, cholesterol, triglycerides, and creatinine were measured
- Prevalence of proteinuria was higher in subjects with BMI greater than 25 kg/m² and with an increased pulse pressure

ETHNICITY

- In the United States, metabolic syndrome in Mexican-American women is 1.5 times higher than among White reproductive females
- Hispanics are disproportionately affected by overweight and obesity, and at each BMI level, Hispanics have a higher prevalence of diabetes than non-Hispanic whites
- Puerto Ricans are at high risk for CVD and diabetes, the first and third leading cause of death in the island



STUDY IN PUERTO RICO

- Puerto Rican women with metabolic syndrome were mostly overweight (88%) and significantly older
- The study in Puerto Rico found that BMI and age are the most significant predictors of metabolic syndrome for both men and women
- A history of having a macrosomic baby (related to GDM) was also related to metabolic syndrome
- The study showed a strong correlation between menopause and metabolic syndrome
 - Explained by estrogen deficiency because many of the risk factors are more prevalent in postmenopausal women
- Conclusion
 - increased age, BMI, physical inactivity, history of GDM are all positively associated with metabolic syndrome among women in San Juan Metropolitan Area of Puerto Rico



Source: Ortiz, AP. Correlates of the metabolic syndrome among a sample of women in the San Juan Metropolitan area of Puerto Rico. *Metabolic Syndrome and Related Disorders* 2010 Jun;8(3):235-42

STUDY ON ETHNICITY

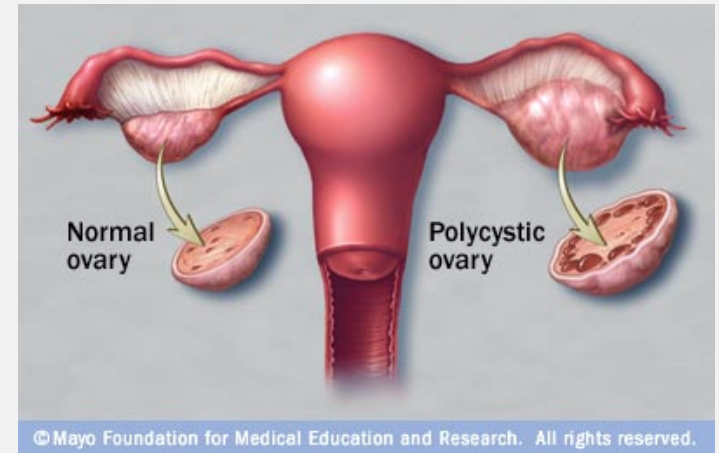
- Non Hispanic blacks and Hispanics experience greater health disparities because of diabetes, obesity, and CVD
- Higher percentage of non-Hispanic black women possessed at least 2 of the metabolic components, but not the metabolic syndrome phenotype
- Compared to Non Hispanic White women, Hispanic women were more likely to have at least 2 of the clinical characteristics or metabolic abnormalities typical of the metabolic syndrome
 - At least 50% in this one study



Source: Vladutiu, CJ. Parity and components of the metabolic syndrome among US Hispanic/Latina women. *Circulation and Cardiovascular Quality Outcomes* 2016 Feb; 9 (suppl)

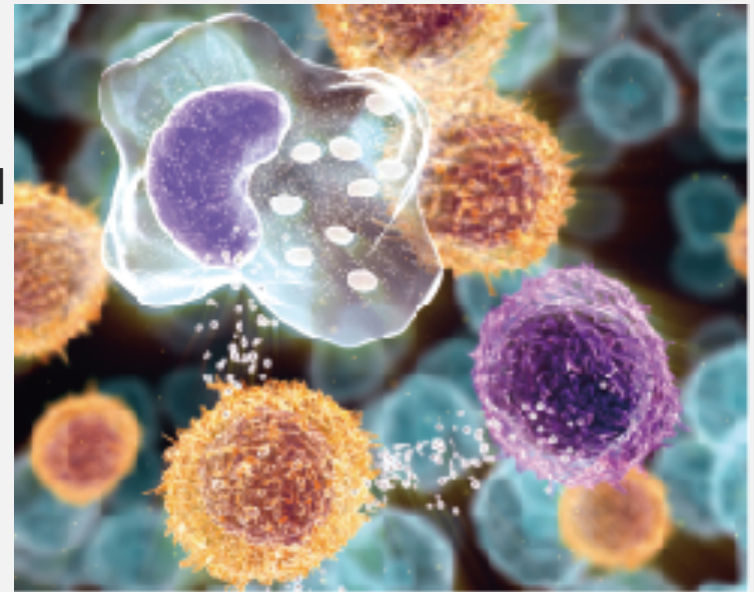
POLYCYSTIC OVARIAN SYNDROME

- Polycystic ovary syndrome is a common endocrine disorder affecting up to 8% of women with reproductive complications including infertility, menstrual irregularity, anovulation, and pregnancy complications
- Inflammation is a key etiological factor
- Leptin has a pro-atherosclerotic effects and elevated levels are associated with CVD and inflammation
 - Such as, impairing endothelial nitric oxide-dependent vasorelaxation and modulating cytokine production and macrophage activation
- PCOS has been associated with metabolic syndrome and is related to increased risk of impaired glucose tolerance, type 2 diabetes, and cardiovascular risks



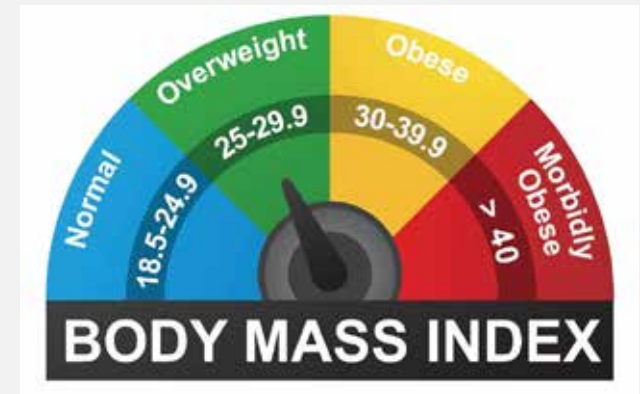
INFLAMMATION MARKERS FOR PCOS

- Cell adhesion molecules
- Cytokines
- Acute-phase reactants [fibrinogen and highly sensitive C-reactive protein]



STUDY: INFLAMMATION EXPERIMENT

- Study: Testing inflammatory markers in overweight women with PCOS and measuring BMI and waist-hip ratio
 - Collected blood samples after an overnight fast for glucose, insulin, testosterone, SHBG, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, hsCRP
 - Women with PCOS had higher fasting insulin and HOMA-IR, total cholesterol, triglycerides, HDL-C, testosterone, and FAI (Free Androgen Index) and lower SHBG at baseline than the controls
 - Change in leptin correlated with change in weight, waist circumference, and BMI
 - Metformin and OCP similarly reduced leptin and aldosterone
 - Testosterone and estradiol both induce adiponectin receptor expression
 - Aldosterone, leptin, and adiponectin, fluctuate over the menstrual cycle
- Overall, novel markers of inflammation show minimal relationships with IR or cardiovascular risk factors with leptin primarily related to adiposity
- Future research should focus on the best means for assessing inflammation and the optimal method for reducing inflammation as a cardiovascular risk factor in PCOS



Source: Source: Moran, L.J. Novel inflammatory markers in overweight women with and without polycystic ovary syndrome and following pharmacological intervention. J of Endocrinological Investigation 2010 Apr; 33 (4): 258-65

PREPARING FOR REPRODUCTION

- Metabolic syndrome and its clinical is associated among women of childbearing age as a separate group (18-44 years)
- It is known from studies that an exposure to a nutrient-restrictive intrauterine environment appears to reprogram the metabolism of the developing fetus, resulting in an altered phenotype during childhood or adult life
- Less is known about the effects of intrauterine exposure to the cluster of the components of metabolic syndrome, the critical periods of fetal exposure
 - If an association exists between intrauterine exposure and chronic disease later in life, the impact of this emerging public health issue and its implication for health disparities has yet to be discovered



PREPARING FOR REPRODUCTION

- History of maternal disease like diabetes and hypertension is associated with an increased risk of chronic disease in the offspring
- There is no difference in maternal pre-pregnancy body weight, body weight at delivery, BMI at recruitment, gestation at diagnosis of GDM, plasma glucose at OGTT, gestation at delivery, birth weight, or length of baby
- Post Partum
 - Increased anthropometric characteristics in the postpartum period such as BMI, body weight, body fat weight, waist to hip ratio are known to be associated with increased risk of developing type 2 diabetes mellitus among women with previous GDM



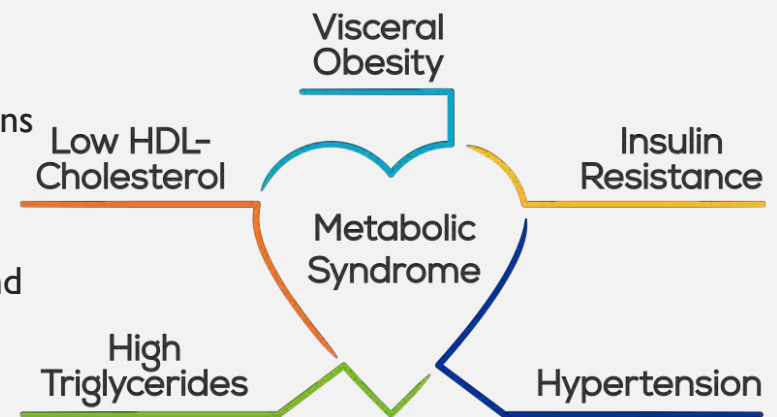
PREPARATION FOR INTERVALS BETWEEN CHILDREN

- Limiting chances of preeclampsia
- Lifestyle modifications
- Blood tests to keep high HDL levels, low triglycerides, adequate insulin levels, and adequate blood pressure
- Stay active after giving birth to reduce risk of Cardiovascular Disease



OSTEOPATHIC AND HOLISTIC MEANS TO OPTIMAL HEALTH

- Lifestyle and dietary intervention has been also known to reduce risk of preeclampsia that increases changes of metabolic syndrome
- Treatment of insulin resistance with pharmacological or lifestyle modifications improves metabolic parameters and reduces the relative risk of developing type 2 diabetes mellitus
- Adipose tissues release adipokines, which stimulate inflammatory activity and impair glucose tolerance



LIFESTYLE MODIFICATIONS AND FUTURE ACTIONS

- Physical activity reduced the odds for metabolic syndrome
- In the future, the studies of metabolic syndrome should consider the relationship between the increasing prevalence of the metabolic syndrome phenotype among women of childbearing age and increasing morbidity and mortality from CVD among girls and women of all ages



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- Pictures: Google Images, Facebook: Adrienne Orris

THANK YOU

