Original Study

Menstrual Cycle Alterations during Adolescence: Early Expression of Metabolic Syndrome and Polycystic Ovary Syndrome

Isabel Cristina da Silva Bouzas MCM [1], Samária Ali Cader PhD [2,*], Lenora Leão DCM [1], Maria Cristina Kuschnir DCM [1], Claudia Braga DCM [1]

[1] *Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil*
[2] *Universidade Catolica "Nuestra Señora de la Asunción," Asunción, Paraguay*

A B S T R A C T

Study Objective: To assess the importance of the menstrual pattern as a marker for clinical and laboratory alterations related to metabolic syndrome (MS) and polycystic ovary syndrome (PCOS) among Brazilian adolescents.
Design: A cross-sectional study.
Setting: Endocrine Gynecology Outpatient Clinic of the Adolescent Health Studies Center (NESA) at the Pedro Ernesto University Hospital.
Participants: 59 girls (12-19 years old) were classified by their menstrual cycles as regular (n = 23) and irregular (n = 36).
Intervention: None.
Main Outcome Measures: Biochemical collections were made of peripheral blood after fasting for 12 hours, and the oral glucose tolerance test with 75 g of anhydrous glucose.
Results: PCOS, MS, and the criteria for MS were significantly more frequent ($P < .05$) in the subgroup with irregular menstruation. Adolescents with irregular cycles presented a significant increase in waist circumference, glycemia 2 hours after oral glucose overload (2 h), fasting and 2-h insulin, HOMA-IR, and triglycerides. In contrast, the glucose/insulin ratio, quantitative insulin-sensitivity check index, and HDL serum levels were significantly lower among patients with irregular menstruation, compared to those with regular cycles. In the logistic regression, we noted that insulin 2 h $\geq$ 75 μIU/mL (r = 1.90; $P = .018$), waist circumference > 95 cm (r = 2.21; $P = .006$) and diagnosis of PCOS (r = 1.93; $P = .023$) were significantly correlated to irregular cycles.
Conclusions: We concluded that close observation of menstrual cycle patterns is an important tool for identifying adolescents at higher risk of developing PCOS and MS.
Key Words: Menstrual cycle, Adolescents, Insulin resistance, Metabolic syndrome, Polycystic ovary syndrome

Introduction

Puberty is the biological component of adolescence, characterized by the appearance of secondary sexual characteristics and the acquisition of reproductive capacity, with widespread repercussions on adolescent behavior, extending through into adult life.[1] These alterations are accompanied by the redistribution of body fat and weight gain, triggered by changes in hormonal appetite regulation and feeling of fullness, which seem necessary for the physiological development of height and reproductive capacity.[2,3]

However, excessive weight gain during adolescence, particularly the build-up of intra-abdominal fat, is linked to metabolic syndrome (MS), which is a condition defined by different criteria, clustering together assorted parameters related to higher cardiovascular risks. Although traditionally noted among adults, reports of MS among adolescents, particularly obese adolescents, have become more frequent over the past decade, regardless of the definition criteria used.[4-7]

Insulin resistance (IR) is directly related to obesity, playing a key role in pathophysiology and the interrelationship among the components of MS and polycystic ovary syndrome (PCOS). It is known that IR is offset by an increase in insulin production by the pancreatic beta cells, with consequences on the glycid and lipid metabolism, inflammatory factors, and endothelial function.[8-12] Furthermore, hyperinsulinemia may contribute to irregular menstruation, altering the gonadotropin-releasing hormone (GnRH) pulse secretion pattern, suppressing the sex hormone-binding globulin (SHBG) and stimulating ovarian androgenesis, which is a mechanism that is particularly important for patients with PCOS, an ovarian dysfunction characterized by oligomenorrhea, hyperandrogenism and /or polycystic ovaries.[13-18]

Based on work dating back to the 1970s, there is a classic concept that menstrual cycles may be irregular during the 2 post-menarche years, due to the immaturity of the hypothalamic-hypopituitary-ovarian axis (HPO) axis; as the girl matures, there would consequently be no need for any intervention in these situations. Projects implemented from 1990 onwards began to question this concept, demonstrating that alterations in menstrual cycle patterns during the initial post-menarche years may indicate diseases leading to disorders of this axis,[8,19] including those related to IR.[8,19-21]

The authors indicate no conflicts of interest.

* *Address correspondence to:* Samária Ali Cader, PhD, Rua General Orlando Geisel, n.261, bl.2*/ 202—Recreio dos Bandeirantes, Rio de Janeiro, RJ, Brasil, CEP: 22790-280

E-mail address: samariacader@gmail.com (S.A. Cader).

1083-3188/$ - see front matter © 2014 North American Society for Pediatric and Adolescent Gynecology. Published by Elsevier Inc.
http://dx.doi.org/10.1016/j.jpag.2014.01.002

It is important to stress that these menstrual alterations may precede metabolic disorders, linked to a reduction in insulin sensitivity. Consequently, close observation of the menstrual patterns of adolescent girls may constitute a valuable early warning tool for future metabolic and cardiovascular risk.[8,22] Along these lines, the main objective of this study was to assess the importance of menstrual patterns as markers for clinical and laboratory alterations related to metabolic risk among Brazilian adolescent girls, beyond 2 years after menarche.

Materials and Methods

Study Design and Sample

A cross-sectional study was conducted at the Endocrine Gynecology Outpatient Clinic of the Adolescent Health Studies Center (NESA) at the Pedro Ernesto University Hospital (HUPE), Rio de Janeiro State University (UERJ) between December 2007 and December 2010. This study complied with the standards for conducting research in humans, viz. Resolution N° 196/96 issued by the National Health Council (CNS) on October 10, 1996,[23] and the Declaration of Helsinki,[24] being approved by the Research Ethics Committee of this Hospital.

After a close analysis of the inclusion criteria (female, chronological age between 12 and 19 years old, time since menarche (gynecologic age) > 2 years, and the presence of at least 1 of the following factors associated with MS: overweight (BMI > 85 percentile), obesity (BMI > 95 percentile) and/or *Acanthosis nigricans*) and exclusion of pregnancy, Cushing syndrome, androgen secreting tumors, congenital hyperplasia of the adrenal glands, prolactinomas, and medications taken during the past 3 months, 59 adolescent girls were selected.

Procedures

The selected adolescents were assessed in a hospital setting, with detailed information on the objectives/procedures of the study and signature of the Deed of Informed Consent. Data on their backgrounds and physical examinations were recorded on a standardized datasheet, stressing their family and gynecologic histories, recording anthropometric measurements (weight, height, waist circumference (WC), blood pressure), *Acanthosis nigricans* and cutaneous expressions of hyperandrogenism, such as acne, androgenic alopecia, and hirsutism.

Menstrual cycles were considered as regular with an average duration between 22 and 41 days, even if 1 cycle lasted less than 22 or more than 41 days; non-regular cycles (called irregular cycles in this study) were characterized by 2 or more cycles lasting less than 22 or more than 41 days during the past year; oligomenorrhea was defined as cycles lasting an average of 42 to 180 days; secondary amenorrhea was defined as the absence of menstruation for more than 180 days; polymenorrhea was defined as cycles lasting less than 22 days on average.[25,26] As there is no consensus among authors in the literature, the criteria in the work by Vanhoff et al[25,26] were used, as this is the most complete definition for alterations to the menstrual cycle.

The girls were weighed on a pre-calibrated Fillizola scale (model 31), with weight resolution of 100 g, wearing light clothing and no shoes. Their heights were obtained through a Tonelli Harpender Holtain stadiometer with a resolution of 1 mm, using the average of 2 consecutive measurements. The WC was recorded as being the smallest circumference between the rib cage and the navel, using the average of 3 consecutive measurements taken with a measuring tape, with the smallest interval being 0.5 cm. Blood pressure was measured in the right upper arm, with the patient seated after at least 5 minutes in repose, using a properly calibrated aneroid sphygmomanometer. We followed the recommendations of the National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents[27] for diagnosing hypertension in minors under 18 years old, and those of the Brazilian Cardiology Society[28,29] for participants more than 18 years old.

Their weight was used to calculate their body mass index (BMI; kg/height in m^2), classifying girls as overweight with a BMI above the 85th percentile, and obese above the 95th percentile, as proposed by the National Health and Nutrition Examination Survey, NHANES II.

The biochemical assessments were handled by the Central Laboratory at the Pedro Ernesto University Hospital, immediately after morning collections of peripheral blood after fasting for 12 hours, between the 3rd and 7th days of a spontaneous menstrual cycle for girls with infrequent menstrual bleeding or with regular menstrual cycles, or randomly for adolescents with amenorrhea. The patients then underwent an oral glucose tolerance test (OGTT) with 75 g of anhydrous glucose in order to assess the baseline glucose and insulin levels, and again after 2 hours. Serum measurements were then taken of the following laboratory variables: baseline and post-overload glucose; total cholesterol, HDL cholesterol (HDL-C), and triglycerides (TG). Biochemical testing was handled through the Konelab equipment, using the BT 300 Winer kit, which uses the GOD-PAP enzymatic method (oxidase) for glucose; the CHOP-POD enzymatic method (esterase-oxidase) for cholesterol; the GPO/PAP enzymatic method (oxidase) for TG; and the colorimetric method without precipitation (colorimetric enzymatic) for HDL-C.

The interpretation of the OGTT followed the same parameters as those used for adults: fasting glucose > 126 mg% = diabetes mellitus; glucose 2 h: 140 mg%-200 mg% = glucose intolerance; glucose 2 h > 200 mg% = diabetes mellitus.

The hormone assessment was handled by the Endocrinology Laboratory at the HUPE, using frozen serum stored at −80°C, with the following doses: follicle stimulating hormone (FSH); luteinizing hormone (LH); estradiol (E2); total testosterone (T); androstenedione (andro); dehydroepiandrosterone sulfate (DHEA-S); 17α- hydroxyprogesterone (17OHP); prolactin (PRL), free thyroxin (FT4), thyroid-stimulating hormone (TSH); and pre-/post- OGTT insulin levels. The insulin was dosed on the GAMA-C12 equipment through a kit using the Coat-A-Count method,

Download English Version:

https://daneshyari.com/en/article/3965055

Download Persian Version:

https://daneshyari.com/article/3965055

Daneshyari.com