Biochemical evaluation between obese carriers and non-carriers of polycystic ovary syndrome

Avaliação bioquímica entre obesas portadoras e não-portadoras da síndrome dos ovários policísticos

Evaluación bioquímica entre obesas portadoras y no portadoras del síndrome de ovario poliquístico

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RESUMO

Objetivo: Realizar uma análise bioquímica dos perfis lipídicos e glicêmicos comparativa entre obesas portadoras e não portadoras da Síndrome do Ovário Policístico (SOP). **Método:** Pesquisa transversal do tipo caso-controle, através de exames laboratoriais bioquímicos para perfil lipídico e glicêmico em dois grupos de voluntárias, obesas portadoras e obesas não-portadoras da SOP. Foram realizadas análises estatísticas através de testes não paramétricos (Mann-Whitney) e paramétricos (t-student) utilizando valores estatisticamente significativos para p < 0,05. **Resultados:** As análises dos parâmetros bioquímicos demonstraram diferenças estatisticamente e biologicamente significativas entre os itens analisados. As alterações do perfil lipídico foram clinicamente relevantes entre os grupos, com as portadoras com níveis de riscos clínicos por LDL elevado. Tanto as portadoras como as não-portadoras não apresentaram alterações quanto a glicose em jejum, com níveis dentro da referência. Entretanto, HbA1c mostrou diferença clínica entre os grupos, porém não significativa estatisticamente, ressaltando que 50% das pacientes portadoras possuem risco aumentado para desenvolver DM. **Conclusão:** Foi possível verificar que as obesas portadoras da SOP estão mais propensas aos riscos de diabetes e doenças cardiovasculares em comparação às congêneres não-portadoras.

Descritores: Obesidade; Diabetes Mellitus; Doenças Cardiovasculares; Lipoproteínas

ABSTRACT

Objective: To perform a biochemical analysis of the lipid and glycemic profiles comparative between obese patients with and without Polycystic Ovary Syndrome (PCOS). **Method:** Cross-sectional case-control study through biochemical laboratory tests for lipid and glycemic profile in two groups of volunteers, obese carriers and non-carriers of PCOS. Statistical analyzes were performed using nonparametric (Mann-Whitney) and parametric (t-student) tests using statistically significant values for p <0.05. **Results:** The analysis of biochemical parameters showed statistically and biologically significant differences between the analyzed items. Changes in lipid profile were clinically relevant between the groups, with carriers with high LDL clinical risk levels. Both carriers and non-carriers showed no changes in fasting glucose, with levels within the reference. However, HbA1c showed clinical difference between the groups, but not statistically significant, emphasizing that 50% of the patients with PCOS are at increased risk for developing DM. **Conclusion:** It was possible to verify that obese patients with PCOS are more prone to the risks of diabetes and cardiovascular diseases compared to non-carriers.

Descriptors: Obesity; Diabetes Mellitus; Cardiovascular Diseases; Lipoproteins

RESUMEN

Objetivo: realizar un análisis bioquímico de los perfiles lipídicos y glucémicos comparativos entre pacientes obesos con y sin síndrome de ovario poliquístico (SOP). **Métodos:** Investigación transversal de casos y controles mediante pruebas de laboratorio bioquímicas para el perfil lipídico y glucémico en dos grupos de voluntarios, portadores obesos y no portadores de SOP. Los análisis estadísticos se realizaron mediante pruebas no paramétricas (Mann-Whitney) y paramétricas (t-student) utilizando valores estadísticamente significativos para p <0,05. **Resultados:** El análisis de los parámetros bioquímicos mostró diferencias estadísticamente y biológicamente significativas entre los ítems analizados. Los cambios en el perfil lipídico fueron clínicamente relevantes entre los grupos, con portadores con altos niveles de riesgo clínico de LDL. Tanto los portadores como los no portadores no mostraron cambios en la glucosa en ayunas, con niveles dentro de la referencia. Sin embargo, la HbA1c mostró diferencias clínicas entre los grupos, pero no fue estadísticamente significativa, enfatizando que el 50% de los pacientes con la enfermedad tienen un mayor riesgo de desarrollar DM. **Conclusión**: fue posible verificar que los pacientes obesos con PCOS son más propensos a los riesgos de diabetes y enfermedades cardiovasculares en comparación con los no portadores.

Descriptores: Obesidad; Diabetes Mellitus; Enfermedades Cardiovasculares; Lipoproteínas.

ORIGINAL

Introduction

The ovary works as an endocrine gland, secreting the sex hormones that transform a woman's body, such as estrogen and progesterone. FSH (follicle stimulating hormone) and LH (luteinizing hormone) that are produced by the pituitary regulate the functioning of the ovary and participate in the menstrual cycle. Ovarian cyst formation occurs when the oocyte does not undergo complete maturation and during ovulation, the formation of body albicans causes small ovarian cysts, known as microcystic ovary syndrome or ovarian micropolicystosis.[1]

Micropolicystic ovarian syndrome (PCOS) affects 4 to 13% of the entire Brazilian female population of reproductive age, an endocrine-metabolic disorder.[2] The syndrome can be assessed by clinical criteria - such as menstrual disorders (oligomenorrhea and amenorrhea), acne, obesity, and laboratory-related hirsutism, luteinizing hormone (LH) change, androgenism (testosterone levels), and follicle hormone change stimulation (FSH) - and anatomical criteria - through ovarian ultrasound to detect micropolicystosis.[1-2]

For the diagnosis of PCOS to be made, the Rotterdam criteria are used, which defines it from the appearance of two of the following parameters: Clinical or laboratory hyperandrogenism; Oligomenorrhea; Anovulation; Ovaries with ultrasound polycystic appearance (appearance of 10 or more cysts, measuring 2-9mm in diameter or enlarged ovarian volume> 10cm3).[1-2]

Patients with the syndrome often have obesity, dyslipidemia (increased low-density lipoprotein-LDL), hypertriglyceridemia, decreased high-density lipoprotein (HDL), and type 2 diabetes mellitus (DM2), all of which are important factors. determinants for cardiovascular disease (CVD). Among all these factors, obesity is the most recurrent in PCOS, affecting from 33 to 88% of the carriers of the syndrome.[3-6]

Many studies explore the fact that there are carriers of PCOS, varying across the spectrum of body mass index. However, as obesity is the most prevalent factor in PCOS and its metabolic risks being present also in women without the syndrome, it is important to strictly evaluate these factors. Therefore, the present study aimed to evaluate the differences in lipid and glycemic biochemical profile between obese patients with and without PCOS.

Method

A cross-sectional case-control study was conducted from April to June 2019, in Brasilia, where two groups of volunteers were evaluated, one group of obese carriers and one group of obese non-carriers of PCOS.

The choice of volunteers for the study occurred within a general female population in a health care effort, known as "UNIP in the park". nclusion criteria were nulliparous patients diagnosed with polycystic ovary syndrome, of reproductive age between 20 and 30 years old and with Body Mass Index (BMI) between 30 and 35 kg / m². Exclusion criteria were patients undergoing contraceptive treatment for more than one year, who had already had an abortion and who were older than 30 years.

The collection of biological samples (peripheral blood) was performed in a private laboratory of clinical analysis, favoring the delivery of reliable results

and quality control. The collection was performed by vacuum method, in the morning, with fasting of at least 8 hours and at most 12 hours.

The Total Cholesterol, HDL Cholesterol and Triglyceride assays were performed using the enzymatic colorimetric method, which consists of a chemical reaction that provides the formation of colors that are measured from the absorbance of the color formed. While the determination of LDL cholesterol was performed through Friedewald equation. The risk of cardiovascular disease can be calculated by the Castelli Indexes (I = total cholesterol / HDL and II = LDL / HDL), and will be increased when Castelli I Index is greater than 4.4 and Castelli II Index: greater than 2.9.

The Glucose assay was performed by the hexokinase enzymatic method and the Glycated Hemoglobin assay was performed by the Turbidimetry method. The reference values used for clinical criteria were the same as those established by the private laboratory and medical societies.

Data were tabulated in Microsoft Office Excel ® spreadsheets and statistical analyzes were performed by Student's t-test for parametric tests and U-Man Whitney test for nonparametric tests to verify differences in means between groups. , with a significance level of 5%, in the Socscistatistics platform. The graphics were assembled electronically through https://goodcalculators.com/box-plot-maker and edited in Microsoft Office PowerPoint®.

This study was approved by the Research Ethics Committee of Universidade Paulista - UNIP (Opinion Number: 3.233.123 and CAAE: 03245218.4.0000.5512) and all volunteers participated after signing the informed consent form.

Results

In all, 12 volunteers were selected, 6 in the carrier group and 6 in the non-carrier group. The analysis of the biochemical parameters showed between the analyzed parameters that in some cases there were significant statistical differences, in other clinical differences or both occurring at the same time. Both groups had volunteers with results different from the reference values as well as volunteers with normal results.

When observing the Total Cholesterol parameter (Figure 1), it can be observed that 50% of the volunteers with the syndrome had cholesterol above the reference value, while the non-carriers only had 17% of the results outside the reference value. Statistically and biologically demonstrating significance of the results.
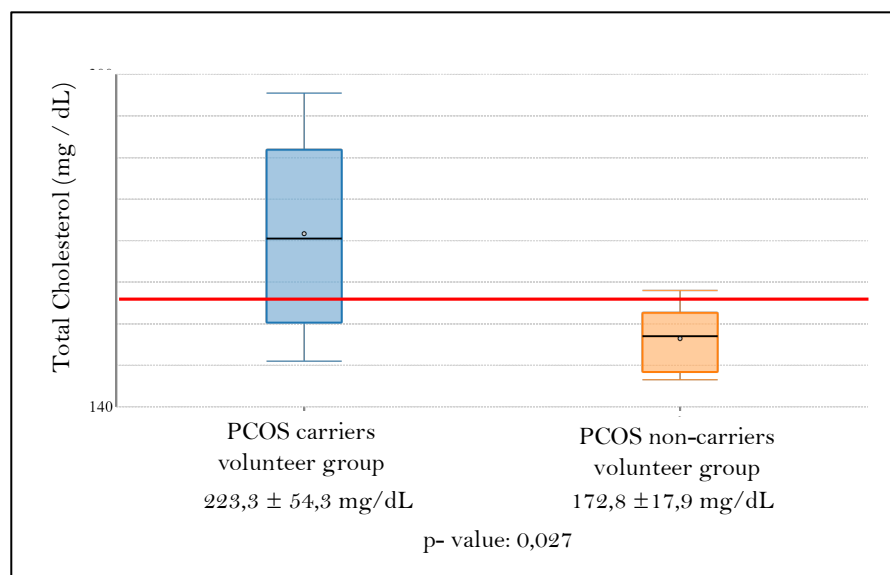
Figure 1- Distribution of Total Cholesterol results among volunteers with and without Polycystic Ovarian Syndrome (mean ± standard deviation and p-value. Reference Value <190 mg / dL)

Among the parameters analyzed, the triglyceride dosage was the fundamental dosage within the analysis of the development of cardiovascular disease, noting that the results had no significant differences between the groups, where the group of volunteer carriers obtained only 50% of out-of-range results. the non-carrier volunteer group had a 17% result outside the reference value (Figure 2).
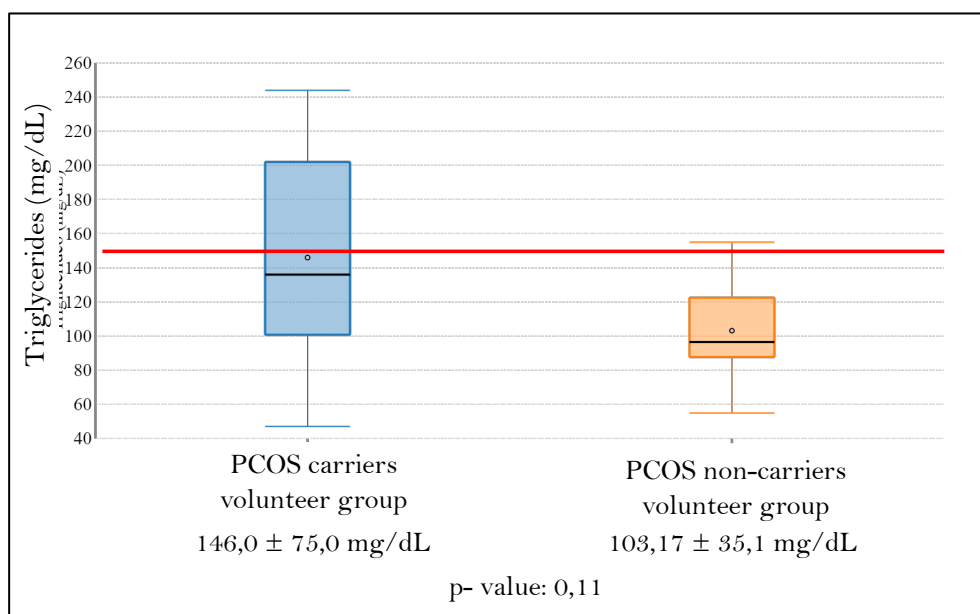

Figure 2- Distribution of triglyceride results among volunteers with and without Polycystic Ovary Syndrome (mean ± standard deviation and p-value. Reference Value <150 mg / dL)

HDL results were satisfactory, where among all volunteers, both carriers and unaffected, only 33% presented results below the reference value. Only one of the carrier volunteers presented out-of-reference value, while non-carrier volunteers presented 50% of out-of-reference results, but these results were not statistically significant (Figure 3).
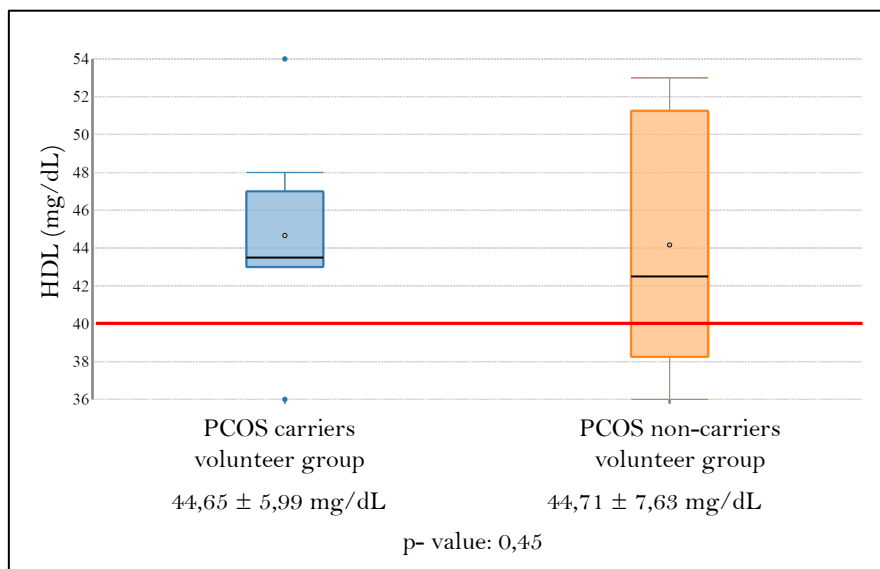
Figure 3- Distribution of HDL results among volunteers with and without Polycystic Ovarian Syndrome (mean ± standard deviation and p-value. Reference Value> 40 mg / dL)

LDL results expressed a significant mean increase in affected volunteers, both statistically and clinically, thus increasing the risk of developing some cardiac pathology (Figure 4).
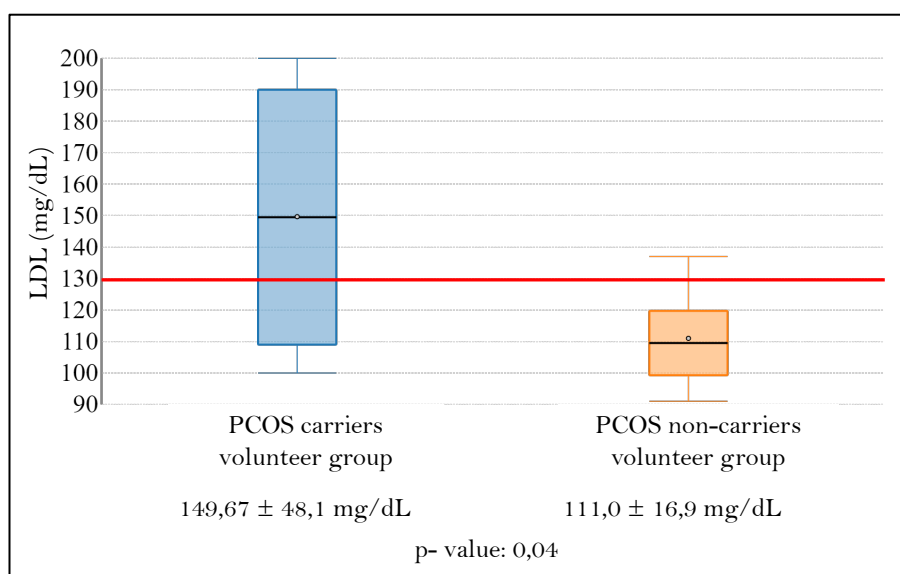

Figure 4- Distribution of LDL results among volunteers with and without Polycystic Ovarian Syndrome (mean ± standard deviation and p-value. Reference value <130 mg/dL)

In order to determine if patients with a higher risk of developing cardiovascular disease, the Castelli I and II indices were calculated. The Castelli I Index Quantification is based on the division between total cholesterol and HDL, whereas the Castelli II Index calculation is based on the division between LDL cholesterol and HDL cholesterol. There was no statistical difference between the groups for both indices: Castelli I in carriers = 5.0 ± 1.3 and non-carriers = 4.0 ± 0.7 (p-value = 0.076); and Castelli II in carriers = 3.38 ± 1.3 and non-carriers = 2.52 ± 0.55 (p-value: 0.055). However, according to these indices

it is noteworthy that clinically, PCOS carriers are at increased risk for cardiovascular disease compared to non-carriers.

Glycemic parameters were evaluated from fasting glucose and glycated hemoglobin levels. For the glucose parameter (Figure 5), there was no statistical difference between the groups and it was also observed that 83% of the volunteers expressed no change from the reference value, both groups being clinically without risk for developing diabetes. Only one volunteer from each group presented altered results.
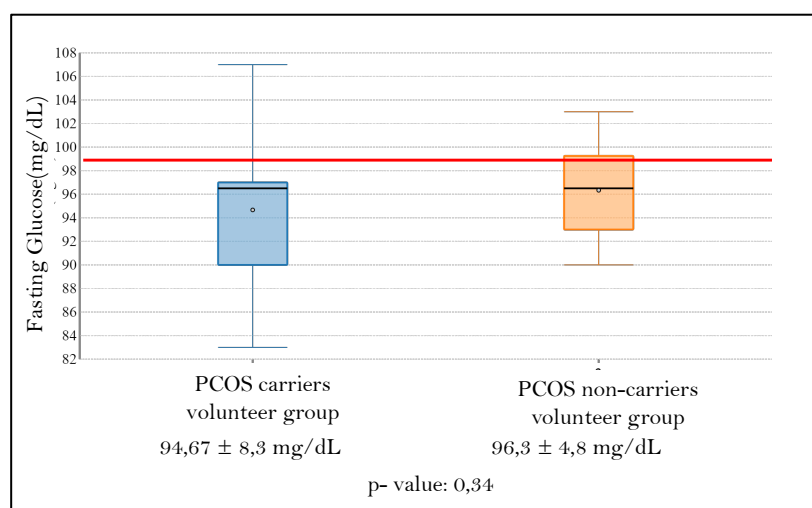

Figure 5- Distribution of fasting blood glucose results among volunteers with and without Polycystic Ovarian Syndrome (mean ± standard deviation and p-value. Reference Value between 70 to 99 mg / dL)

However, glycated hemoglobin results (Figure 6) show that there is an alteration in the risk of diabetes in the group of affected volunteers. Although there is no statistical difference between the groups, it brings a result of 33% of diabetes, with two HbA1c dosages above the reference value, while the group of non-carrier volunteers brings 17% of values outside the reference, with Only one volunteer with high value does not have a positive result for Diabetes but shows increased risk for its development.
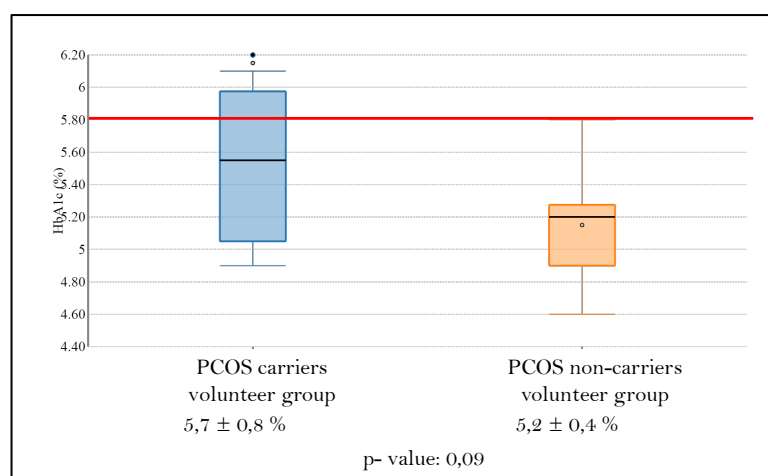

Figure 6- Distribution of glycated hemoglobin (HbA1c%) results among volunteers with and without Polycystic Ovarian Syndrome (mean ± standard deviation and p-value. Reference value between normal 5.7%, increased risk for DM between 5 , 8 and 6.4%, DM> 6.5%)

Discussion

Polycystic Ovary Syndrome is a complex and heterogeneous endocrinopathy often associated with metabolic syndromes, which occur in more than 50% of carriers. Physical inactivity combined with metabolic syndrome generates an even more unfavorable cardiovascular risk profile. Obesity is a determining factor of metabolic syndrome and is a risk factor for the development of cardiovascular disease and type 2 diabetes mellitus.[6,2]

Most of the studies used as reference for the development of this study showed the prevalence of dyslipidemia and diabetes in patients with PCOS, characterized by increased serum glucose, hypercholesterolemia, hypertriglyceridemia and reduced HDL levels.[1-8] The present study did not observe all these changes, but found associations of other equally important factors.

Dyslipidemia is extremely common in patients with PCOS and can present several patterns, these patterns may be linked to the effects of hyperandrogenism, combined with diets and physical activity. The study of dyslipidemias has taken up space in the field of science, as lipids develop important roles in the body. [6-7]

Lipids are in significant amount in the synthesis of steroid hormones, cell membranes, vitamin synthesis as well as in the storage or maintenance of body energy. [4]

This study presents conflicting results with others regarding HDL, TG and CT results for patients with BMI above 30 kg/m². Within these parameters, the volunteers mostly demonstrated results within the reference having volunteers that also presented very high values compared to the reference. Changes in lipid profile were quantitatively relevant in this study. However, obese volunteers with PCOS had elevated LDL cholesterol levels increasing the risk of developing cardiovascular disease. The presentation of total cholesterol at high levels corroborates the idea of developing CVD and DM.[2-4,8]

Low HDL lipoprotein levels are recognized as an increased risk factor for the development of cardiovascular disease, regardless of LDL levels. The present study did not show quantitative changes in the HDL series in the volunteers with the syndrome, while in the non-carriers, 50% of them presented such alteration. Cardiovascular risk factors in women are related to metabolic changes as multifactorial conditions, thus, in the present study, the highest risk assessed by HDL in non-carriers was noted.[2]

The coexistence of PCOS with obesity has a summing effect on the development of DM.[6,8] Both the carriers and non-carriers of PCOS did not show quantitative changes in fasting glucose, but the HbA1c results show that both carriers and non-carriers have a high risk of developing DM in the future.

Obesity and diabetes are very common in PCOS patients and appear to be an additional risk factor for reproductive dysfunction in these women, in addition to aggravating their clinical,

hormonal, metabolic and social status. Today's treatment for PCOS is based not only on the reproductive aspect, but also on lifestyle change.[2,7-9] One study showed that the practice of physical activity and eating change over a period of six months corroborated positive changes in the clinical condition of the patients.[7]

To prove the relationship between obesity and hyperandrogenism, serum hormone levels should be measured, such as the quantification of testosterone, progesterone levels and the HOMA-IR index that quantifies insulin resistance.[10]

We emphasize that the result is statistically valid to the sample number, adapting to the proper statistical tests. In the present study, only twelve volunteers were used in view of the reference studies that used, on average, more than fifty volunteers, being a possible epidemiological representativeness bias.[11] However, it is emphasized that, according to the findings of the present study, more studies should be developed comparing a larger number of obese women with and without PCOS, using the same variables and adding others of equal relevance.

Clinical treatment in obese women is of paramount importance for the prevention of CVD and DM, regardless of whether or not they have PCOS. Health education as a tool for behavioral change, associated with regular physical exercise should be considered as the basis for the therapy of metabolic disorders. [9,12]

Conclusion

It was generally considered that the risks for cardiovascular disease and diabetes were higher in obese women with PCOS compared with their counterparts without the syndrome. Therefore, changes in metabolic profile should be routinely verified in people with these characteristics, since the syndrome is dynamic in nature. However, the development of obesity, cardiovascular disease and diabetes, as well as their clinical signs, do not have a direct causality with the symptoms of PCOS, but rather the associated multifactorial set, such as the obesogenic lifestyle.

Although the treatment for PCOS today is based on the patient's reproductive aspect, one must have a well-explored concern regarding the parameters researched in this paper, since they act and affect the long-term health of patients.

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