

DOI: <https://doi.org/10.36489/saudecoletiva.2021v11i60p4676-4685>

Influence of the factors "overweight" and "sedentarism" in the early appearance of diabetes in women with PCOS

Influencia de los factores "sobrepeso" y "sedentarismo" en la aparición temprana de diabetes en mujeres con SOP
Influência dos fatores "sobrepeso" e "sedentarismo" no aparecimento precoce de diabetes em mulheres com SOP

ABSTRACT

Objective: To know the influence of modifiable risk factors "overweight" and "sedentary lifestyle" in the early onset of type 2 diabetes mellitus (DM 2) in women with Polycystic Ovary Syndrome (PCOS). **Method:** literature review with search for the terms in the boolean scheme: (polycystic ovary syndrome AND type 2 diabetes mellitus) OR (lifestyle, obesity and sedentary behavior), on the PUBME and SciELO websites. **Results:** 3611 articles were found in PUBMED and 1713 in SciELO; in which - after screening by the researchers - 16 articles were found that met the established criteria. Ethnicity is a factor that predisposes to risk, as well as time spent on television and cell phones, which increase the risk of obesity by up to 23% and DM 2 in women with PCOS by up to 14%. **Conclusion:** Need for actions for women with PCOS to prevent early DM2, including actions in municipal health plans, with an emphasis on primary care.

DESCRIPTORS: Polycystic Ovary Syndrome; Type 2 Diabetes Mellitus; Lifestyle, Obesity, Sedentary Behavior.

RESUMEN

Objetivo: Conocer la influencia de factores de riesgo modificables "sobrepeso" y "estilo de vida sedentario" en la aparición precoz de la diabetes mellitus tipo 2 (DM 2) en mujeres con Síndrome de Ovario Poliquístico (SOP). **Método:** revisión de la literatura con búsqueda de los términos en el esquema booleano: (síndrome de ovario poliquístico Y diabetes mellitus tipo 2) O (estilo de vida, obesidad y comportamiento sedentario), en los sitios web PUBME y SciELO. **Resultados:** se encontraron 3611 artículos en PUBMED y 1713 en SciELO; en el que, tras un cribado por parte de los investigadores, se encontraron 16 artículos que cumplían con los criterios establecidos. La etnia es un factor que predispone al riesgo, así como el tiempo dedicado a la televisión y al celular, que aumentan el riesgo de obesidad hasta en un 23% y de DM 2 en mujeres con SOP hasta en un 14%. **Conclusión:** Necesidad de acciones para mujeres con SOP para prevenir la DM2 temprana, incluyendo acciones en los planes de salud municipales, con énfasis en la atención primaria.

DESCRIPTORES: Síndrome de Ovario Poliquístico; Diabetes Mellitus Tipo 2; Estilo de Vida, Obesidad, Comportamiento Sedentario.

RESUMO

Objetivo: Conhecer a influência dos fatores de riscos modificáveis "sobrepeso" e "sedentarismo" no aparecimento precoce de diabetes mellitus tipo 2 (DM 2) em mulheres com Síndrome do Ovário Policístico (SOP). **Método:** revisão da literatura com busca dos uni termos no esquema booleano: (síndrome dos ovários policísticos AND diabetes mellitus tipo 2) OR (estilo de vida, obesidade e comportamento sedentário), nos sites PUBME e SciELO. **Resultados:** Foram encontrados 3611 artigos no PUBMED e 1713 no SciELO; no qual – após triagem pelos pesquisadores – encontrou-se 16 artigos que atendiam os critérios estabelecidos. Etnia trata-se de um fator que predispõe a risco, bem como tempo gasto com televisão e celulares, que elevam risco de obesidade em até 23% e de DM 2 em mulheres com SOP em até 14%. **Conclusão:** Necessidade de ações para as mulheres com SOP para evitar DM2 precoce, incluindo ações em planos municipais de saúde, com ênfase na atenção primária.

DESCRIPTORES: Síndrome dos Ovários Policísticos; Diabetes Mellitus Tipo 2; Estilo de Vida, Obesidade, Comportamento Sedentário.

RECEIVED ON: 11/02/2020 APPROVED ON: 11/23/2020



Bianca Elicker Rosin

Graduating in Medicine, University of the Region of Joinville, UNIVILLE.
ORCID: 0000-0002-7174-5814

Felipe Reinert Avilla Machado

Graduating in Medicine, University of the Region of Joinville, UNIVILLE.
ORCID: 0000-0002-3221-0438

Sabrina Martina da Rosa

Graduating in Nursing, University of the Region of Joinville, UNIVILLE.
ORCID: 0000-0002-3852-1202

Aline Mirian Paszcuk

Graduating in Nursing, University of the Region of Joinville, UNIVILLE.
ORCID: 0000-0002-6943-0688

Luciana Ferreira Karstens

Adjunct Professor, Department of Nursing, University of the Region of Joinville, UNIVILLE.
ORCID: 0000-0001-9843-3047

Luciano Henrique Pinto

Adjunct Professor, Department of Medicine, Nursing and Pharmacy, University of the Region of Joinville, UNIVILLE, Coordinator of the Integrated Project ECOSAM.
ORCID: 0000-0003-0250-7502

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a multifactorial disease that is characterized by hyperandrogenic and reproductive changes. Its etiology is complex, influenced by genetic predisposition and environmental factors. The main clinical manifestations include acne, hirsutism, alopecia, menstrual changes and infertility.¹

This syndrome is one of the most frequent endocrinological disorders in women of reproductive age, with a prevalence of 6 to 10%. It is estimated that, worldwide, 105 million women between 15 and 49 years of age (being 4 million American) have PCOS, which is responsible for 72 to 82% of the causes of hyperandrogenism.¹ The ECOSAM Research group at the University of the Region of Joinville has been conducting studies on the possibility of increasing this prevalence due to the presence of endocrine interferences in water resources and which may contribute to the emergence of PCOS cases. Currently, the diagnostic criteria of The Rotterdam Consensus are used, which, in 2003, defined that patients with PCOS were considered to have the following characteristics: oligo-o-

Polycystic Ovary Syndrome (PCOS) is a multifactorial disease that is characterized by hyperandrogenic and reproductive changes. Its etiology is complex, influenced by genetic predisposition and environmental factors.

ovulation and/or anovulation, clinical or biochemical hyperandrogenism and the presence of polycystic ovary.²

In most cases, the treatment of polycystic ovary syndrome aims to control the symptoms of hyperandrogenism, restoration of ovulatory cycles, correction of the metabolic syndrome and endometrial protection.³ In addition, the treatment aims to decrease the aesthetic aspects that tend to affect the woman's well-being, such as hirsutism, acne, seborrhea, alopecia are the main ones. Among the main measures taken by women with the syndrome, changes in lifestyle are hormonal treatments, aesthetic treatment and the use of insulin sensitizers are the most indicated. Thus, the treatment of pathogenesis aims to reduce symptoms and improve the well-being of women with the syndrome.⁴

Considering that the syndrome is related both to insulin resistance and to the individual metabolic profile, it then presents itself as a strong predisposing factor for the development of diseases. Such a condition can decrease women's survival, and impair their quality of life as a whole. Insulin resistance can contribute to the development of type 2 diabetes mellitus (DM 2); which can be developed early if there is an

association with inadequate food for pre-diabetics, overweight and physical inactivity. Thus, this work aims to search the recent scientific literature to answer the following question: What is the influence of the modifiable risk factors "overweight" and "sedentary

lifestyle" in the early onset of DM 2 in women with PCOS? Such factors were chosen because they are the most common in the case of pre-diabetes. The knowledge of such influences and even if they act differently or similarly are useful for guiding patients with

PCOS with the intention of delaying the manifestation of DM 2 as much as possible.

METHOD

The research process consisted of five phases, within the PRISMA recommendations as described below in Figure 1.

The keywords chosen in item nae tapa I, of Item B of the method and used in the Boolean scheme were: (polycystic ovary syndrome AND type 2 diabetes mellitus) OR (lifestyle, obesity and sedentary behavior), in view of the question guiding the investigation.

RESULTS

A total of 3611 articles were found in PubMed and 1713 in Scielo, in which 16 met the research selection criteria in order to find proposals that would answer the research question of the work, as shown in Figure 2:

DISCUSSION

Polycystic ovary syndrome (PCOS) affects 4 to 18% of women of reproductive age worldwide (5). This syndrome has metabolic implications such as insulin resistance (IR), impaired glucose tolerance, type 2 diabetes mellitus and cardiovascular risks. Still, it can generate anxiety, depression and a worse quality of life in patients with the syndrome.⁶

IR results in an increase in plasma levels of this hormone, and its frequency varies in relation to the population analyzed. Compared to the normal population, patients with the syndrome have a higher value related to IR. With regard to prevalence by region, American women with PCOS with IR ranged around 64%, while Italian women reached around 79,2%. Considering Brazil, the prevalence of carriers ranged from 33 to 70,5%.⁷

Figure 2 – Word cloud referring to the textual corpus 'health of the field'. Caruaru, Brazil, 2018.

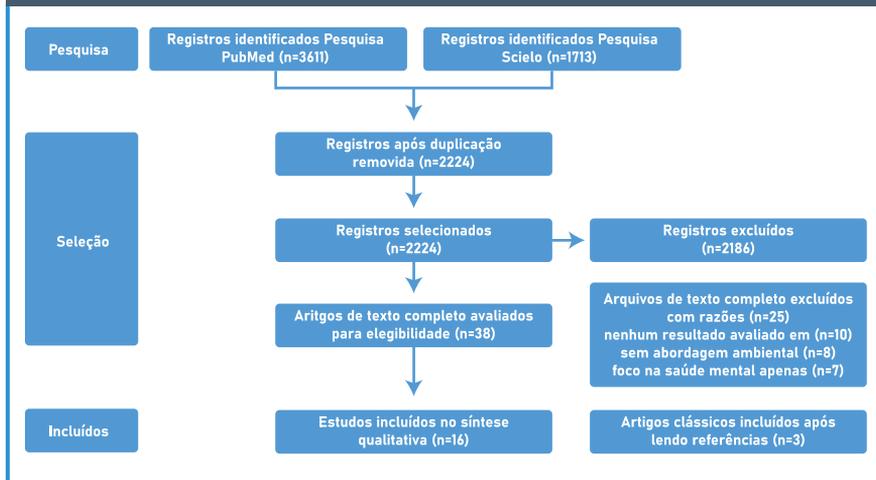
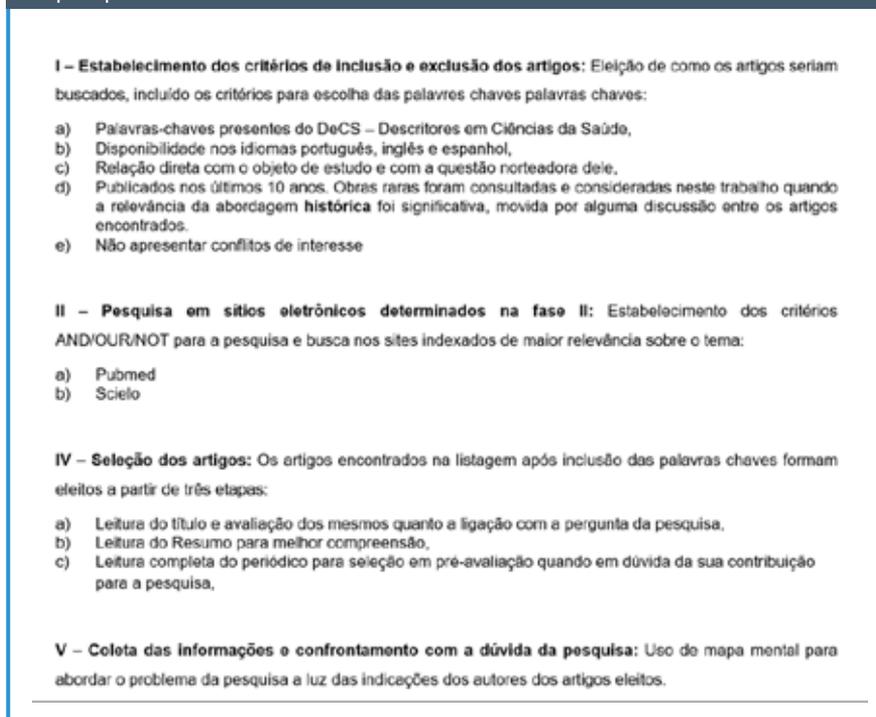


FIGURA 1 – Processo de pesquisa bibliográfica utilizado, contendo as fases de busca e seleção, a fim de encontrar artigos que respondam à questão de pesquisa



Obesity and the development of DM 2: factors linked to PCOS that contribute to obesity and DM2

Obesity is currently a major international health concern. It is estimated that overweight in patients with the syndrome can vary with age, race and environmental factors.⁷ Obesity aggravates the hormonal and clinical characteristics of PCOS and women with PCOS appear to be at higher risk for obesity, with several underlying mechanisms that link conditions. Insulin resistance and hyperandrogenism are identified as the link between polycystic ovary syndrome and obesity as exposure to excess androgens stimulates the increase in the expression of genes related to the synthesis of fatty acids, favoring the accumulation of fat in the cavity abdominal. Thus, women with PCOS have higher rates of obesity and central adiposity compared to women without PCOS. In particular, visceral fat plays a key role in generating the insulin-resistant state, which leads to impaired glucose tolerance.⁵

IR is intrinsic to the syndrome, since most women with polycystic ovary syndrome have this characteristic, however, overweight and obesity can exacerbate it. Although women with PCOS can temporarily compensate for IR with hyperinsulinemia, it appears that overweight and obesity, as well as family history of diabetes, accelerate the process of progression to glucose intolerance and type 2 diabetes mellitus.⁶ In addition, there is some heterogeneity regarding the ethnicity of patients with polycystic ovary syndrome and the development of diabetes. Ethnicity was different in terms of impaired glucose tolerance. Data show that women on the Asian continent are five times more likely to develop impaired glucose tolerance while American women are four times more likely and European women three times more likely to develop impaired glucose tolerance.

Still, a woman with polycystic ovary syndrome in general (8), has 3,26 times more chance of having impaired glucose tolerance and 2,87 of developing

gestational diabetes when compared to the normal population (Figure 5):

When analyzing PCOS in a group of obese and a group of non-obese; it was found that the prevalence of metabolic disorders was high in both groups, showing that the presence of the syndrome favors the development of comorbidity independent of BMI. However, obese women showed a prevalence of three metabolic alterations: insulin resistance, impaired glucose intolerance and metabolic syndrome showing a greater risk of developing type II diabetes mellitus. Thus, when correlating IR according to BMI, it was observed that the frequency of IR increases progressively with BMI.⁹

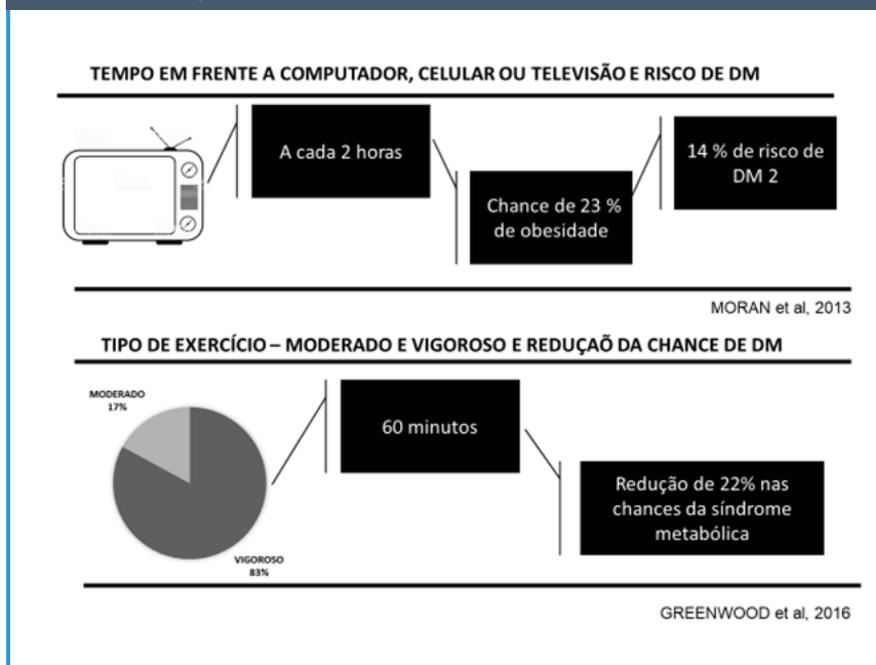
Although most publications show that being overweight can exacerbate some metabolic disorders, some studies suggest that obesity has a slight impact without showing such an impact on the syndrome.⁵ Insulin sensitivity and resistance, resulting from an intrinsic defect in the insulin receptor in which serine phosphorylation occurs, is present, regardless of the woman's body weight. However, the adipose tissue, an endocrine organ capable of secreting various substances that interfere with the metabolism of carbohydrates and lipids, when in excess, ends up worsening insulin resistance. Thus, obesity and the distribution of abdominal fat play an important role in the maintenance of PCOS, which can aggravate the manifestations of the syndrome and increase the risk for the formation of diabetes mellitus.^{2,10}

Sedentary lifestyle and type 2 diabetes mellitus: assessment of the risks of developing DM2

Women with PCOS may have a more unfavorable lifestyle when compared to healthy women. When analyzing the lifestyle, changes must be made, especially in women who are obese, for the sake of well-being for the patient.¹¹

The combination of aerobic exercises interspersed with high intensity

FIGURA 7 – Tempo gasto com televisão, celulares e afins: a cada duas horas têm maior chance de obter obesidade e aumento do risco de DM 2 em até 14%. Entretanto, 1 hora de atividade física intensa reduz em até 22% o risco.



exercises performed weekly around 150 to 175 min contributes against IR, impaired glucose tolerance and type 2 diabetes mellitus.¹² However, studies claim that the incorporation of physical activity must be moderate and simple, of 30 minutes a day, in which the goal should be the general health benefit and not the weight loss itself. 6

Every 60 minutes spent on the activity a 22% reduction in the chances of the metabolic syndrome is observed 13 as shown in Figure 7:

CONCLUSION

Considering that the central issue of this study was related to the influence

of the modifiable risk factors "overweight" and "sedentary lifestyle" in the early onset of DM 2 in women with PCOS, even if they are not diagnosed as diabetic, the fact that they are women in a situation of risk for this clinical condition or being already pre-diabetic requires special attention.

The costs attributed to the care of diabetics and pre-diabetics are high worldwide. In the United States of America, there are currently about 21 million adults under 30 with diabetes.^{15,16}

In a brief survey on Municipal Health Plans of capitals in the southern region of Brazil, no specific action was found for the care of women with PCOS. Considering the 3,26 chance of

developing decreased glucose tolerance, IR and DM2 in relation to women who do not have PCOS, the question arises of the need to have a more specific action for women with this syndrome in order to avoid the early manifestation of DM 2. This includes stimulating and promoting physical activities and more effective tracking of DM 2 at younger ages in this group of women. ■

THANKS

The researchers are grateful to Univalle and the Research Support Fund that enables the development of the Integrated Environmental and Health Impacts Project - ECOSAM

REFERÊNCIAS

1. Do Carmo Silva R, Pardini DP, Kater CE. Síndrome dos ovários policísticos, síndrome metabólica, risco cardiovascular e o papel dos agentes sensibilizadores da insulina. Vol. 50, Arquivos Brasileiros de Endocrinologia e Metabologia. 2006. p. 281–90.
2. Antonio J, Marcondes M, Roberto C, Barcellos G, Rocha MP. Dificuldades e armadilhas no diagnóstico da síndrome dos ovários policísticos Difficulties and pitfalls in the diagnosis of polycystic ovary syndrome. Vol. 55, Arq Bras Endocrinol Metab. 2011.
3. Anagnostis P, Tarlatzis BC, Kauffman RP. Polycystic ovarian syndrome (PCOS): Long-term metabolic consequences. *Metabolism*. 2018 Sep 1;86:33–43.
4. de Moura HHG, Costa DLM, Bagatin E, Sodr e CT, Manela-Azulay M. Síndrome do ov rio policístico: Abordagem dermatológica. Vol. 86, Anais Brasileiros de Dermatologia. 2011. p. 111–9.
5. Leão LM. Obesidade e síndrome dos ovários policísticos: vínculo fisiopatológico e impacto no fenótipo das pacientes. *Rev Hosp Univ Pedro Ernesto*. 2014 Mar 17;13(1).
6. Teede H, Deeks A, Moran L. Polycystic ovary syndrome: a complex condition with psychological, reproductive and metabolic manifestations that impacts on health across the lifespan. *BMC Med* [Internet]. 2010 Dec 30 [cited 2019 Dec 3];8(1):41. Available from: <http://bmcmedicine.biomedcentral.com/articles/10.1186/1741-7015-8-41>
7. Lamarca A, Orvieto R, Giulini S, et al. Mllerian-inhibiting substance in women with polycystic ovary syndrome: Relationship with hormonal and metabolic characteristics. *Fertility and Sterility* 2004; 82: 970–972.
8. Kakoly NS, Khomami MB, Joham AE, Cooray SD, Misso ML, Norman RJ, et al. Ethnicity, obesity and the prevalence of impaired glucose tolerance and type 2 diabetes in PCOS: A systematic review and meta-regression. *Hum Reprod Update*. 2018 Jul 1;24(4):455–67.
9. Melo AS, Macedo CSV, Ferriani RA, Navarro PA de AS, Romano LGM. Women with polycystic ovary syndrome have a higher frequency of metabolic syndrome regardless of body mass index. *Rev Bras Ginecol e Obstet*. 2012;34(1):4–10.
10. Romano LGM, Bedoschi G, Melo AS, de Albuquerque FO, Rosa e Silva ACJ de S, Ferriani RA, et al. Anormalidades metabólicas em mulheres com síndrome dos ovários policísticos: Obesas e não obesas. *Rev Bras Ginecol e Obstet*. 2011 Jun;33(6):310–6.
11. Moran LJ, Ranasinha S, Zoungas S, McNaughton SA, Brown WJ, Teede HJ. The contribution of diet, physical activity and sedentary behaviour to body mass index in women with and without polycystic ovary syndrome. *Hum Reprod*. 2013;28(8):2276–83.
12. Anwar S, Shikalgar N. Prevention of type 2 diabetes mellitus in polycystic ovary syndrome: A review. Vol. 11, *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*. Elsevier Ltd; 2017. p. S913–7.
13. Greenwood EA, Noel MW, Kao CN, Shinkai K, Pasch LA, Cedars MI, et al. Vigorous exercise is associated with superior metabolic profiles in polycystic ovary syndrome independent of total exercise expenditure. *Fertil Steril*. 2016 Feb 1;105(2):486–93.
14. Brennan L, Teede H, Skouteris H, Linardon J, Hill B, Moran L. Lifestyle and Behavioral Management of Polycystic Ovary Syndrome. *J Women’s Heal*. 2017 Aug 1;26(8):836–48.
15. Mcevoy JW, Windham BG, Ballantyne CM, Selvin E. Mortality Implications of Prediabetes and Diabetes in Older Adults. 2019;1–7.
16. Schneider ALC, Kalyani RR, Golden S, Stearns SC, Wruck L, Yeh HC, et al. Diabetes and prediabetes and risk of hospitalization: The atherosclerosis risk in communities (ARIC) study. *Diabetes Care*. 2016;39(5):772–9.