How to Cite:
Yousif, A. W., & Al-Jawadi, Z. A. M. (2022). Magnesium and zinc levels in obese women with PCOS. *International Journal of Health Sciences*, *6*(S5), 10339–10343.
https://doi.org/10.53730/ijhs.v6nS5.12033

Magnesium and zinc levels in obese women with PCOS

Amina W. Yousif
Department of Chemistry, Education College for Girls, University of Mosul, Mosul, Iraq
Email: amina.wisam@uomosul.edu.iq

Zena A.M. Al-Jawadi
Prof. Dr., Department of Chemistry, College of Science, University of Mosul, Mosul, Iraq,
Email: zena_aljawadi@uomosul.edu.iq

***Abstract*---**The study focused on magnesium and zinc and their relationship with insulin resistance in women with Polycystic Ovarian Syndrome (PCOS), where 61 samples were taken from women who had the syndrome and 45 samples from women who weren't affected by the syndrome as a control group. The results showed that there is a significant negative correlation between magnesium and zinc with insulin resistance (IR) at (p = 0.001) and (p = 0.004) respectively, for those with the syndrome, due to the high levels of insulin in their blood and the incapacity of zinc and magnesium to play their respective roles in regulating the insulin and blood sugar level. Their relationship with body mass index (BMI) were strongly significant at (p = 0.009) and (p = 0.01) respectively, and with waist-hip ratio (WHR) were significant at (p = 0.002) and (p = 0.001) respectively. Finally, the study proved that magnesium and zinc are two new markers of increased risk factors for PCOS in women with insulin resistance.

***Keywords*---**Polycystic ovarian syndrome, magnesium, zinc, insulin resistance, BMI.

1 Introduction

In women of childbearing age, PCOS is the most prevalent endocrine disorder. According to estimates of prevalence, because of endocrine conditions, particularly gonad abnormalities and metabolic issues A recent study found that polycystic ovaries and hyperandrogenism in the blood affect (5–10%) of premenopausal women (Abedini, Ghaedi, Hadi, Mohammadi, & Amani, 2019; Hu, Pang, Ma, & Yi, 2020) .In (2012 AD) two of the three criteria for detecting and

diagnosing the disorder known as the Rotterdam criteria: hyperandrogenism, oligo-anovulation, and polycystic ovaries in Ultrasound, were accepted by the National Institutes of Health (NIH) (Lentscher & Decherney, 2021). A condition known as hyperandrogenism results from the insulin resistance that affects up to (70%) of women with the syndrome. Insulin resistance causes an accumulation of insulin in the blood, which in turn stimulates the ovaries to generate more androgens (Moghetti & Tosi, 2021).

The majority of people with abdominal fat have insulin resistance, which is a pre-diabetes condition in which there are cells that reject insulin or prevent it from working. As a result, when there is a drop in insulin levels (starvation), the pancreas is stimulated to produce four to five times as much insulin, which causes insulin levels to rise in some areas of the body (cells, the brain, muscles, blood, etc.) and fall in other areas of the body. As the insulin feedback circuit "can't hear" insulin, the signal returns to the pancreas and instructs it to produce more. This is quite similar to speaking to someone wearing earplugs who cannot hear you until you start yelling (Berg, 2017; Merino, Fernández-Díaz, Cózar-Castellano, & Perdomo, 2019; Ying Lu, 2017).

(BMI) and (WHR) indicate the number of fat cells, and the more fat cells there are, the higher the estrogen, which is responsible for the growth of the endometrium. An increase in hormone levels results in the endometrium thickening, which has an impact on fertility by increasing the length of the menstrual cycle and making it irregular and painful, as well as by preventing the fertilized egg from successfully implanting because of endometrial thickening (Al-taie & Al-jawadi, 2019; Fryar, Kruszon-Moran, Gu, & Ogden, 2018). The study aims to find the effect of magnesium and zinc on women with PCOS who suffer from insulin resistance.

2 Materials and Methods

PCOS Group: 61 PCOS women were included in this study; they were diagnosed by experts in AL-Salaam Hospital/ Al-Mosul, Iraq from October 1, 2021, to April 20, 2022. Their ages range from 20 to 43 years, and clinical data for each patient was collected using a specially designed questionnaire.

Control group: Consisted of 45 Young fertile women ranging in age from 20 to 42 years old.
Blood samples were taken in the morning after 12 hours of fasting, zinc, and magnesium for both groups. (Dere, Djoupo, Menin, Coulibaly, & Tiahou, 2021).
(BMI) was calculated using the following formula:
$BMI(Kg/m^2) = weight(Kg) / length(m^2)$
WHR was calculated, using the following formula:
WHR= W (Waist)/ H (Hip)
Finally, SPSS software was used to analyze the data (Ali & Bhaskar, 2016).

Table 1
The association between insulin resistance with magnesium and zinc in women with PCOS

Biochemical Variables	r correlation value	p-value
Mg (mg/dL)	- 0.489	0.001**
Zn (µg/dL)	- 0.365	0.004**

**Significant differences at P≤0.01

Table 2
Comparison of the body mass index with the level of magnesium and zinc for women with PCOS

BMI / Biochemical Variables	18-24.9 Mean ± SD	25-29.9 Mean ± SD	30-34.9 Mean ± SD	35-39.9 Mean ± SD	P-Value
Mg (mg/dL)	2.11 ± 0.2 a	2.07 ± 0.1 ab	2.01 ± 0.2 b	1.88 ± 0.01 ab	0.009**
Zn (µg/dL)	242 ± 25 a	213.7 ± 43.8 ab	196.7 ± 37.6 b	181.7 ± 44 b	0.02*

* Significant differences at P≤0.05,** Significant differences at P≤0.01,Letters for Duncan test

Table 3
Correlation between magnesium and zinc levels and the effect of the waist: hip ratio in women with PCOS

Biochemical Variables	r correlation value	p-value
Mg (mg/dL)	0.390	0.002**
Zn (µg/dL)	0.424	0.001**

**Significant differences at P≤0.01

3 Results and Discussions

The results included in the table1 indicated the presence of a correlation factor for the syndrome with insulin resistance. This confirms that insulin resistance is a risk factor for PCOS in women. The results of the study showed a significant negative correlation between insulin resistance and each of magnesium and zinc at the level of probability (p = 0.001), (p = 0.004), respectively, where the higher the concentration of the first, the lower the concentration of the second. This association could indicate that insulin resistance could interfere with the metabolism of magnesium and zinc (Dubey, Thakur, & Chattopadhyay, 2020; Luo et al., 2021), When comparing the body mass index with the level of magnesium and zinc for women with the syndrome, The results in this study were given as shown in the table2, The results of the study showed a significant decrease in the level of magnesium and zinc at the level of probability (p=0.009) and (p=0.02) respectively. Obesity is the result of unhealthy diets and high calories, but with a lack of nutrients essential diet As a result, obese people are often deficient in

magnesium and zinc (Gu, Xiang, Zhang, Sun, & Jiang, 2019; Piuri et al., 2021). The results shown in Table 3 demonstrate a relationship between PCOS and the waist-hip ratio as well as the presence of insulin resistance, confirming that abdominal obesity is a risk factor for PCOS. The table also shows a significant positive relationship between WHR and each of zinc, magnesium at the level of probability (p=0.002) and (p=0.001) respectively ,zinc and magnesium play a role in the correct functioning of lipid and glucose metabolism, regulating and forming the expression of insulin (Bhattacharya et al., 2021; van Nieuwpoort, Twisk, Curfs, Lips, & Drent, 2018).

4 Conclusion

This study discovered a link between PCOS and insulin resistance through tracing the levels of magnesium and zinc as new markers for PCOS in women s. Therefore, obesity must be treated before starting the treatment of polycystic ovary syndrome (Cutler, Pride, & Cheung, 2019).

Acknowledgments
The researchers are grateful the Mosul University, the management, and the medical staff of Hospitals for their helping.

References

Abedini, M., Ghaedi, E., Hadi, A., Mohammadi, H., & Amani, R. (2019). Zinc status and polycystic ovarian syndrome: A systematic review and meta-analysis. Journal of Trace Elements in Medicine and Biology, 52(March), 216–221.

Ali, Z., & Bhaskar, S. B. (2016). Basic statistical tools in research and data analysis. Indian Journal of Anaesthesia, 60(9), 662–669.

Al-taie, F. K., & Al-jawadi, Z. A. (2019). The Impact of Obesity on Infertile Women with Polycystic Ovaries in Iraq, 28(2), 1–9.

Berg, E. (2017). The new body type guide. Alexandria,USA.

Bhattacharya, K., Sengupta, P., Dutta, S., Chaudhuri, P., Das Mukhopadhyay, L., & Syamal, A. K. (2021). Waist-to-height ratio and BMI as predictive markers for insulin resistance in women with PCOS in Kolkata, India. Endocrine, 72(1), 86–95.

Cutler, D. A., Pride, S. M., & Cheung, A. P. (2019). Low intakes of dietary fiber and magnesium are associated with insulin resistance and hyperandrogenism in polycystic ovary syndrome: A cohort study. Food Science and Nutrition, 7(4), 1426–1437.

Dere, K. A. L., Djoupo, A. P., Menin, M. M., Coulibaly, D., & Tiahou, G. G. (2021). Insulin resistance and dysglycaemia in polycystic ovary syndrome patients. International Journal of Clinical Biochemistry and Research, 7(4), 478–483.

Dubey, P., Thakur, V., & Chattopadhyay, M. (2020). Role of minerals and trace elements in diabetes and insulin resistance. Nutrients, 12(6), 1–17.

Fryar, C. D., Kruszon-Moran, D., Gu, Q., & Ogden, C. L. (2018). Mean body weight, height, waist circumference, and body mass index among adults: United States, 1999-2000 through 2015-2016. National Health Statistics Reports, 2018(122), 1999–2000.

Gu, K., Xiang, W., Zhang, Y., Sun, K., & Jiang, X. (2019). The association between serum zinc level and overweight/obesity: a meta-analysis. European Journal of Nutrition, 58(8), 2971–2982.

Hu, C., Pang, B., Ma, Z., & Yi, H. (2020). Immunophenotypic profiles in polycystic ovary syndrome. Mediators of Inflammation, 2020, 10.

Lentscher, J. A., & Decherney, A. H. (2021). Clinical Presentation and Diagnosis of Polycystic Ovarian Syndrome. Clinical Obstetrics and Gynecology, 64(1), 3–11.

Luo, X., Cai, W. Y., Ma, H. L., Cong, J., Chang, H., Gao, J. S., … Wu, X. K. (2021). Associations of Serum Magnesium With Insulin Resistance and Testosterone in Women With Polycystic Ovary Syndrome. Frontiers in Endocrinology, 12(June), 1–7.

Merino, B., Fernández-Díaz, C. M., Cózar-Castellano, I., & Perdomo, G. (2019). Intestinal fructose and glucose metabolism in health and disease. Nutrients, 12(94), 1–35.

Moghetti, P., & Tosi, F. (2021). Insulin resistance and PCOS: chicken or egg? Journal of Endocrinological Investigation, 44(2), 233–244.

Nugraha, I. S., & Udi, W. W. (2022). The corelation of pharmaceutical services with the incidence of side effects of phase III COVID vaccination participants in RS Tingkat II Udayana. International Journal of Health & Medical Sciences, 5(4). https://doi.org/10.21744/ijhms.v5n4.1944

Piuri, G., Zocchi, M., Porta Della, M., Ficara, V., Manoni, M., Zuccotti, G. V., Cazzola, R. (2021). Magnesium in Obesity, Metabolic Syndrome, and Type 2 Diabetes Gabriele. Nutrients, 13(320), 160–195.

Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. International Journal of Health Sciences, 5(3), x-xv. https://doi.org/10.53730/ijhs.v5n3.2938

Van Nieuwpoort, I. C., Twisk, J. W. R., Curfs, L. M. G., Lips, P., & Drent, M. L. (2018). Body composition, adipokines, bone mineral density and bone remodeling markers in relation to IGF-1 levels in adults with Prader-Willi syndrome. International Journal of Pediatric Endocrinology, 2018(1), 1–10.

Ying Lu, J. (2017). Insulin Autoantibody-Related Hypoglycemic Coma in a Pregnant Woman with Type 1 Diabetes Mellitus. MOJ Clinical & Medical Case Reports, 6(2), 30–33.