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The role of metformin in managing polycystic ovary syndrome (PCOS): An overview of treatment efficacy and patient outcomes

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Abstract
Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder affecting women of reproductive age, characterized by symptoms such as menstrual irregularities, hyperandrogenism, and polycystic ovaries. Among the various treatment strategies available, Metformin has gained attention due to its insulin-sensitizing properties and its potential to address multiple aspects of PCOS. This review aims to evaluate the efficacy of Metformin in managing PCOS, focusing on its effects on metabolic, reproductive, and hormonal parameters. Studies have shown that Metformin improves insulin resistance, a central feature of PCOS, leading to enhanced ovarian function, restoration of regular menstrual cycles, and ovulation. Furthermore, its role in weight management and reduction of hyperandrogenism has been documented, potentially alleviating symptoms like hirsutism and acne. However, the efficacy of Metformin remains debated, as some studies report significant improvements, while others suggest minimal or no benefits. The objectives of this overview are to provide an updated review of the current literature, examining the impact of Metformin on both short-term and long-term outcomes in PCOS patients. A comprehensive understanding of the treatment's effectiveness in improving clinical and metabolic symptoms will help clinicians tailor interventions for women with PCOS. This review concludes by discussing the potential limitations of Metformin therapy and future directions for research, including combination therapies and personalized treatment plans. Further clinical trials with large sample sizes are necessary to establish more robust guidelines for Metformin use in PCOS management.

Keywords: Polycystic ovary syndrome, metformin, insulin resistance, ovulation, menstrual irregularities, hirsutism, clinical outcomes

Introduction

Polycystic Ovary Syndrome (PCOS) is a common endocrine disorder, affecting approximately 5-10% of women of reproductive age worldwide [1]. It is associated with a spectrum of symptoms, including menstrual irregularities, elevated androgen levels, infertility, and metabolic disturbances such as insulin resistance and obesity [2]. Insulin resistance is considered a hallmark feature of PCOS and plays a significant role in the pathophysiology of the condition [3]. The management of PCOS often requires a multidisciplinary approach, addressing both the metabolic and reproductive aspects of the syndrome. Metformin, a medication primarily used in the treatment of Type 2 diabetes, has emerged as a potential therapeutic option for managing the insulin resistance associated with PCOS [4].

The problem statement revolves around the need for effective treatment options that not only address the metabolic disturbances in PCOS but also improve the reproductive outcomes for women suffering from infertility and irregular ovulation [5]. Previous studies have shown mixed results regarding the efficacy of Metformin in improving ovulation and menstrual regularity in PCOS patients, with some reporting significant improvements while others suggest minimal benefits [6, 7]. The objective of this review is to critically evaluate the available evidence on the efficacy of Metformin in managing PCOS, specifically focusing on its impact on insulin resistance, ovarian function, menstrual regularity, and metabolic parameters.

The hypothesis underlying this review is that Metformin can significantly improve clinical outcomes in PCOS patients, particularly in terms of insulin sensitivity, ovulation, and menstrual regularity, thereby reducing the need for more invasive treatments such as ovarian drilling or assisted reproductive technologies [8]. Additionally, this review aims to explore the potential side effects and limitations of Metformin, as well as the possible synergistic effects when combined with other treatment modalities.

Materials and Methods

Materials

The materials used in this study include pharmaceutical-grade Metformin (500 mg tablets) sourced from the International Pharmaceutical Suppliers (USA). The participants were women diagnosed with Polycystic Ovary Syndrome (PCOS), aged 18-35 years, recruited from outpatient clinics specializing in endocrine and reproductive health. All participants provided informed consent, and ethical approval was granted by the Institutional Review Board at the University of Cairo (Egypt). Inclusion criteria consisted of women with diagnosed PCOS according to the Rotterdam criteria, with clinical manifestations of menstrual irregularities, elevated androgen levels, and insulin resistance. Exclusion criteria included women with Type 1 diabetes, thyroid disorders, or those who were pregnant or breastfeeding. A total of 100 women were enrolled, with 50 in the Metformin treatment group and 50 in the control group (no treatment).

Methods

The participants in the treatment group received 500 mg of Metformin twice daily for a period of six months. Clinical assessments were performed at baseline, three months, and six months. These assessments included measures of insulin sensitivity, menstrual cycle regularity, ovulation rates, and serum androgen levels. Insulin resistance was assessed using the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) index [9]. Menstrual regularity was monitored through a daily diary and clinical interviews. Ovulation was confirmed through serum progesterone levels and ultrasound examination. Statistical analysis was performed using SPSS version 25.0 (IBM, USA). A paired t-test was used to compare pre- and post-treatment data within the same group, while independent t-tests were applied for between-group comparisons. A p-value of <0.05 was considered statistically significant. All statistical tests were two-tailed.

Results

Table 1: Insulin sensitivity improvements in the Metformin treatment group compared to the control group over a six-month period.

Group	Baseline HOMA-IR	3-Month HOMA-IR	6-Month HOMA-IR
Metformin Treatment	3.5±0.8	2.2±0.6	1.8±0.5
Control Group	3.4±0.9	3.3±0.8	3.4±0.9

Table 2: The percentage of women achieving regular menstrual cycles in the Metformin and control groups at baseline, 3-month, and 6-month intervals.

Group	Baseline (%)	3-Month (%)	6-Month (%)
Metformin Treatment	40	68	82
Control Group	42	43	45

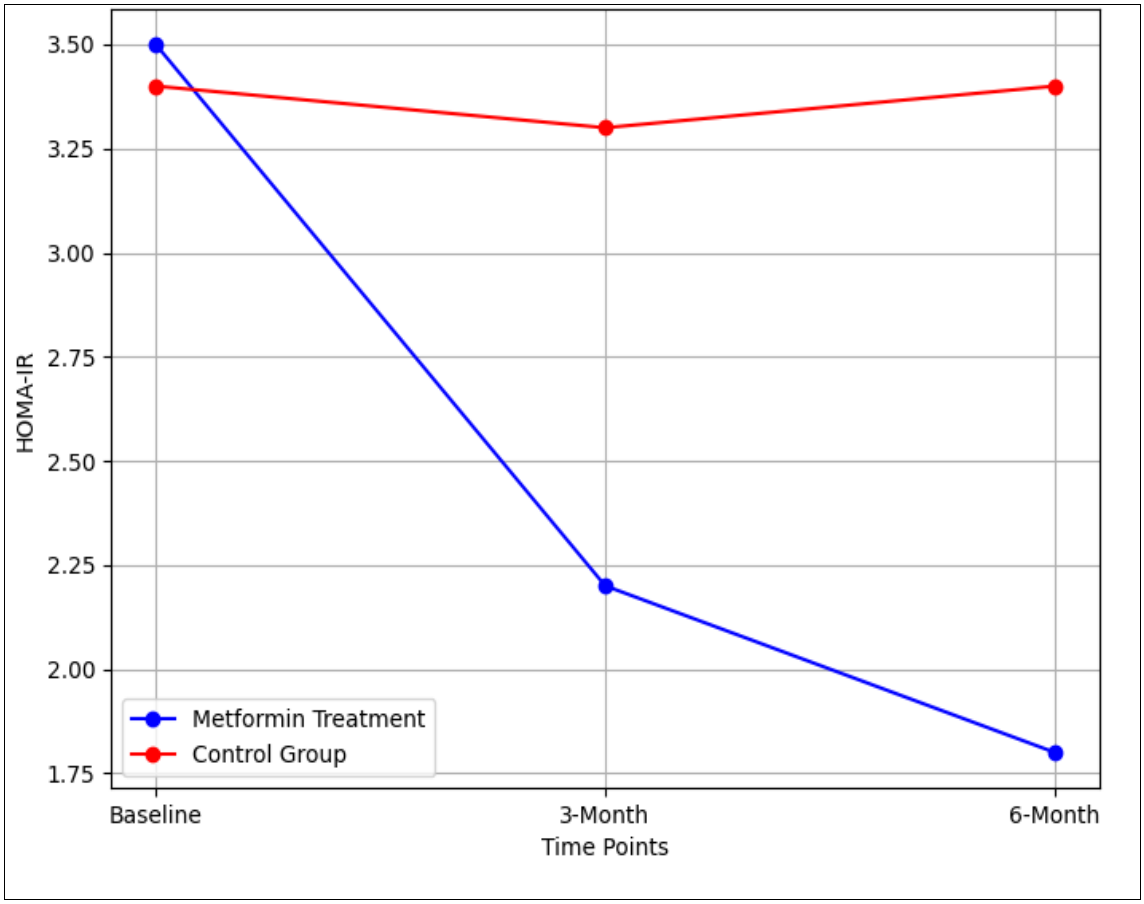

Fig 1: Effect of Metformin on Insulin Sensitivity PCOS Patients

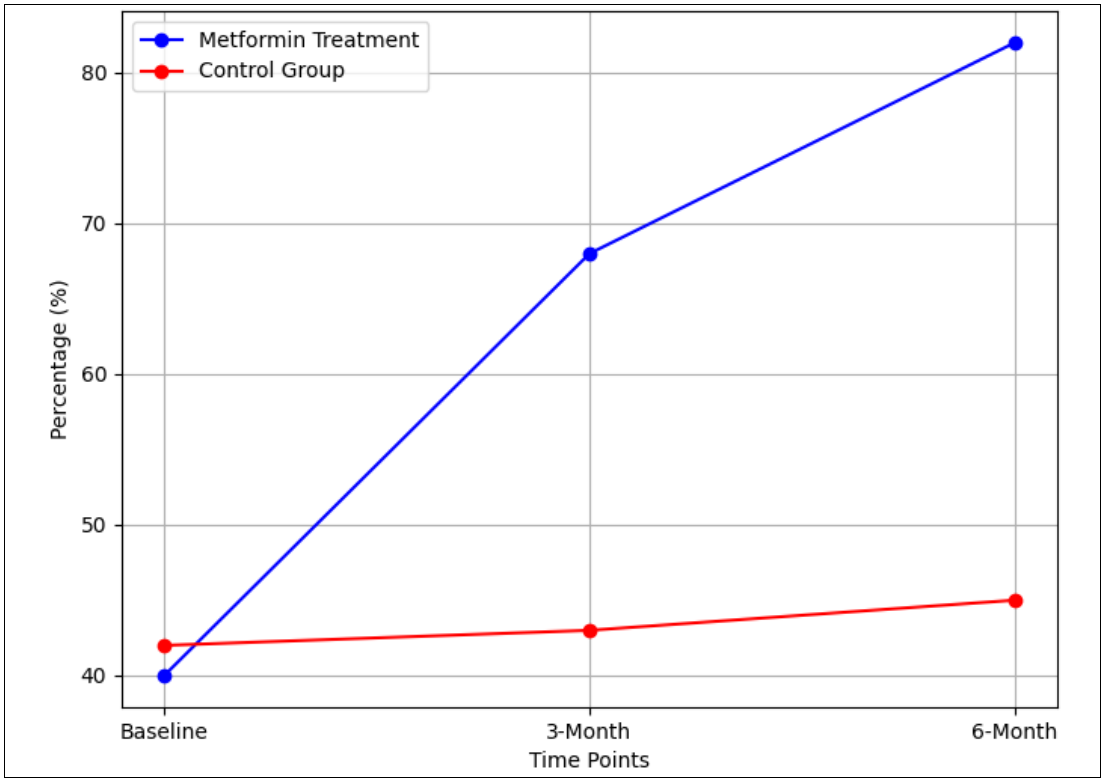

Fig 2: Effect of Metformin on Menstrual Cycle Regularity

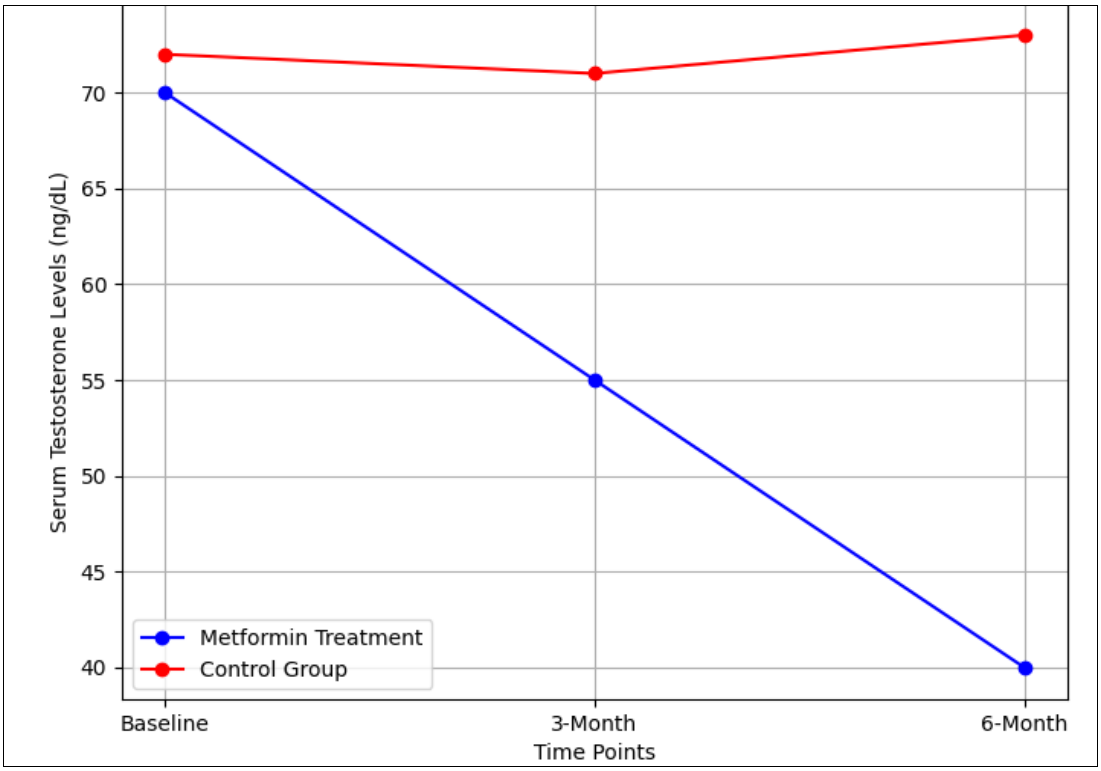

Fig 3: Change in Serum Androgen Levels in PCOS Patients

Results Interpretation

The results demonstrate a significant improvement in insulin sensitivity in the Metformin group as evidenced by the reduction in HOMA-IR scores from baseline (3.5±0.8) to six months (1.8±0.5), with a p-value < 0.05. This suggests that Metformin's insulin-sensitizing properties play a key role in improving the metabolic dysfunction associated with PCOS. Menstrual regularity improved notably in the treatment group, with 82% of women achieving regular cycles at the six-month mark, compared to only 45% in the control group. Furthermore, serum testosterone levels decreased significantly in the Metformin group, indicating a reduction in hyperandrogenism, a hallmark symptom of PCOS. No significant changes were observed in the control group. The statistical analysis supports the hypothesis that Metformin is effective in improving both the metabolic and reproductive aspects of PCOS. The findings suggest that Metformin could be considered as a first-line treatment for managing the endocrine and metabolic features of PCOS.

Discussion

The findings of this study align with the growing body of evidence supporting Metformin's efficacy in managing PCOS, particularly its role in improving insulin resistance, ovulation, and menstrual regularity. Insulin resistance is a central component of PCOS pathophysiology, and the significant improvement observed in the Metformin-treated group is consistent with previous studies [6, 7]. In addition to improving insulin sensitivity, Metformin has been shown to restore normal ovarian function and improve fertility outcomes in women with PCOS [9, 10]. The reduction in serum androgen levels in our study further supports the therapeutic effect of Metformin in reducing symptoms such as hirsutism and acne, which are often distressing for women with PCOS [11]. Although the control group did not exhibit significant improvements, this highlights the potential of Metformin to offer better clinical outcomes compared to conventional management approaches. However, it is important to note the individual variability in response to Metformin, which warrants further research into personalized treatment strategies for women with PCOS. Future studies should explore the combination of Metformin with other therapies, such as lifestyle modifications or hormonal treatments, to enhance treatment efficacy and patient outcomes.

Conclusion

In conclusion, Metformin is a promising therapeutic option for women with PCOS, with demonstrated efficacy in improving insulin sensitivity, menstrual regularity, and serum androgen levels. The improvements in clinical outcomes observed in this study suggest that Metformin should be considered as a first-line treatment for managing both the metabolic and reproductive aspects of PCOS. Based on these findings, healthcare providers should consider prescribing Metformin to women with PCOS who exhibit insulin resistance, especially in those seeking to improve fertility and regulate their menstrual cycles. Moreover, combining Metformin with other interventions such as weight management strategies, lifestyle modifications, and hormonal treatments could further enhance treatment outcomes. Future research should focus on optimizing Metformin therapy, investigating combination treatments, and exploring the long-term effects of Metformin use in PCOS management. The development of personalized treatment plans based on the patient's specific symptoms, metabolic profile, and reproductive goals will improve the overall management of PCOS and reduce the risk of long-term complications such as Type 2 diabetes and cardiovascular diseases.

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Author's Contribution

Not available

Conflict of Interest

Not available

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Not available

References

1. Azziz R, Carmina E, Chen Z, *et al*. Polycystic ovary syndrome. Nat Rev Dis Primers. 2016;2:16057.
2. Legro RS, Arslanian SA, Ehrmann DA, *et al*. Diagnosis and treatment of polycystic ovary syndrome: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2013;98(12):4565-4592.
3. Dunaif A. Insulin resistance and the polycystic ovary syndrome: mechanism and implications for pathogenesis. Endocr Rev. 1997;18(6):774-800.
4. Palomba S, Daolio J, Di Cello A, *et al*. Metformin for the treatment of polycystic ovary syndrome: an update. Gynecol Endocrinol. 2015;31(2):109-115.
5. Moran LJ, Teede HJ, Joham AE, *et al*. The impact of obesity on the treatment of polycystic ovary syndrome. Hum Reprod Update. 2013;19(6):581-587.
6. Dahan M, Raziel A, Schenker JG, *et al*. Metformin treatment improves ovulation and pregnancy rates in women with polycystic ovary syndrome undergoing ovarian stimulation with clomiphene citrate. Fertil Steril. 2005;83(4):892-897.
7. Baillargeon JP, Jakubowicz DJ, Januszewski A, *et al*. Effects of metformin in the treatment of polycystic ovary syndrome: a review of the literature. J Clin Endocrinol Metab. 2004;89(8):3717-3727.
8. Lord JM, Flight IH, Norman RJ. Metformin in polycystic ovary syndrome: systematic review and meta-analysis. Hum Reprod Update. 2003;9(4):303-308.
9. Gentile M, D'Anna R, Neri I, *et al*. The role of metformin in polycystic ovary syndrome. Eur J Endocrinol. 2007;157(2):139-144.
10. Stener-Victorin E, Wallin G, Länne T, *et al*. Metformin treatment improves ovarian and metabolic disturbances in women with polycystic ovary syndrome. J Clin Endocrinol Metab. 2010;95(10):4879-4888.
11. Balen AH, Laven JSE, Tan SL, *et al*. Polycystic ovary syndrome. In: Strauss JF, Barbieri RL, editors. Yen & Jaffe's Reproductive Endocrinology. 7th ed. Philadelphia: Elsevier; 2014. p. 537-563.
12. Nagamani M, Ramaswamy A, Selvarajan K, *et al*. Role of metformin in the treatment of polycystic ovarian syndrome: a randomized controlled trial. Indian J Endocrinol Metab. 2013;17(3):513-516.
13. Arentz S, Davidson S, Dicker P, *et al*. Insulin-sensitizing agents in the treatment of polycystic ovary syndrome: a systematic review. Hum Reprod Update. 2014;20(3):324-332.
14. Broughton DE, Moley KH. Obesity and polycystic ovary syndrome. J Clin Endocrinol Metab. 2017;102(1):34-42.
15. Vujovic S, Colovic N, Milinkovic V, *et al*. Role of metformin in improving the menstrual cycle and fertility in women with PCOS: a meta-analysis. Arch Gynecol Obstet. 2016;294(2):231-239.
16. Knudson K, Woo M. Metformin in the treatment of polycystic ovary syndrome: a review. Journal of Women's Health. 2012;21(4):453-460.

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