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Study of alteration of blood glucose and serum cholesterol of PCOS-Induced *Mus musculus*

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Abstract- Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder affecting females of reproductive age, often associated with metabolic disturbances such as altered blood glucose and lipid profiles. This study examines changes in blood glucose and serum cholesterol levels in PCOS-induced *Mus musculus.* The experiment utilized letrozole to induce PCOS, followed by biochemical analyses to assess metabolic alterations. The findings highlight significant increases in glucose and cholesterol levels, indicating metabolic dysfunctions associated with PCOS.

Keywords: PCOS, *Mus musculus*, blood glucose, serum cholesterol, metabolic disorder

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a multifactorial endocrine disorder that affects approximately 5-10% of women of reproductive age worldwide.[1] It is primarily characterized by hyperandrogenism, ovulatory dysfunction and polycystic ovarian morphology. Beyond reproductive complications, PCOS is frequently associated with metabolic disorders such as insulin resistance, obesity, dyslipidemia, and an increased risk of type 2 diabetes mellitus.[2] The precise etiology of PCOS remains unclear, but genetic, hormonal, and environmental factors play a crucial role in its pathophysiology.[3,4]

One of the major metabolic concerns in PCOS is the disruption of glucose homeostasis and lipid metabolism. Insulin resistance, a hallmark of PCOS, leads to compensatory hyperinsulinemia, which exacerbates androgen excess and metabolic disturbances.[5] Hyperinsulinemia, in turn, affects glucose uptake and utilization, increasing the risk of impaired glucose tolerance and diabetes.[6] Moreover, dyslipidemia, characterized by elevated cholesterol and triglyceride levels, contributes to cardiovascular risks in PCOS patients.[7]

Rodent models, particularly *Mus musculus* (Swiss albino mice), have been extensively used to investigate the pathophysiology of PCOS due to their physiological and genetic similarities to human endocrine function. Letrozole, an aromatase inhibitor, is commonly employed to induce PCOS in mice, as it elevates androgen levels, mimicking the hormonal imbalances seen in human PCOS.[1,8]

This study aims to evaluate the alterations in blood glucose and serum cholesterol levels in PCOS-induced *Mus musculus* to further understand the metabolic implications of PCOS.

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MATERIALS & METHODS

Experimental Animals- Female *Mus musculus* (Swiss albino mice) aged 6-8 weeks were used for this

study. They were housed under controlled environmental conditions with a 12-hour light-dark cycle and provided ad libitum access to food and water.

Induction of PCOS- A single intramuscular injection of 2 mg/kg oestradiol valerate solvated in olive oil at the oestrous stage was used to produce PCOS. Unusual oestrous cycles and persistent vaginal cornification (PVC), which were verified by vaginal smear, are the most significant indicators of PCOS.

On the last 40th day of oestradiol valerate administration, five (5) representative mice were killed in order to prove that the albino mice had PCOS. Following verification, the final 20 albino mice were split into two groups, T1 and T2.

Biochemical Analysis- Blood glucose levels were measured using a glucometer, while serum cholesterol was analyzed using an enzymatic colorimetric method.

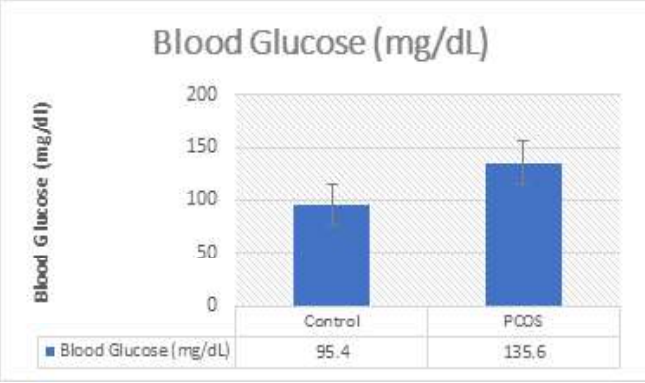
Statistical Analysis- Data were analyzed using SPSS software, and results were expressed as mean ± standard deviation (SD). Statistical significance was determined using an independent t-test ($p < 0.05$ considered significant).

RESULTS

Blood Glucose Levels The PCOS-induced group showed a significant increase in fasting blood glucose levels compared to the control group.

Group	Blood Glucose (mg/dL)
Control	95.4 ± 5.2
PCOS	135.6 ± 7.8*

(*$p < 0.05$ compared to control)

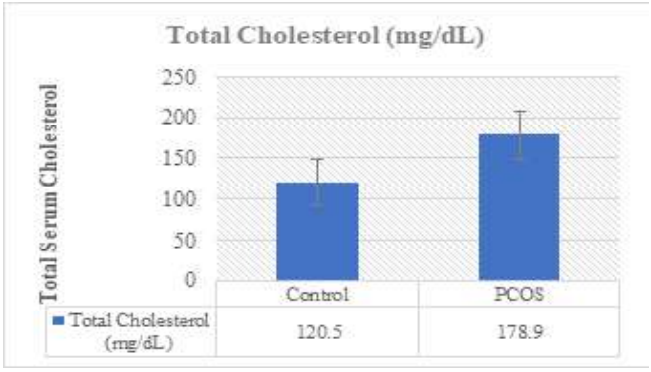


Graph 1: Comparison of Blood Glucose Levels
(A bar graph representing mean blood glucose levels in control and PCOS groups)

3.2 Serum Cholesterol Levels Serum cholesterol levels were significantly elevated in the PCOS group.

Group	Total Cholesterol (mg/dL)
Control	120.5 ± 6.3
PCOS	178.9 ± 8.5*

(*$p < 0.05$ compared to control)



Graph 2: Comparison of Serum Cholesterol Levels
(A bar graph illustrating mean serum cholesterol levels in control and PCOS groups)

DISCUSSION

The results of this study demonstrate that PCOS induction in *Mus musculus* leads to significant metabolic alterations, including hyperglycemia and hyper cholesterolemia. The increase in fasting blood glucose levels in the PCOS group supports existing evidence that PCOS is associated with insulin resistance and impaired glucose metabolism.[2] Hyperglycemia in PCOS may result from defective insulin signalling pathways, leading to decreased glucose uptake in peripheral tissues and increased hepatic glucose production.[6,9]

Similarly, the observed increase in serum cholesterol levels aligns with previous studies reporting dyslipidemia in PCOS models.[5] Elevated cholesterol levels indicate impaired lipid metabolism, which may be linked to altered hepatic lipid synthesis and clearance due to hyper androgenism and insulin resistance.[7] This dyslipidemia contributes to a higher risk of atherosclerosis and cardiovascular complications in PCOS patients.

Several mechanisms have been proposed to explain these metabolic abnormalities. Hyperinsulinemia plays a crucial role in increasing hepatic cholesterol synthesis and reducing lipoprotein lipase activity, leading to elevated serum lipid levels.[1] Furthermore, chronic inflammation

associated with PCOS exacerbates insulin resistance and contributes to metabolic dysregulation.[6]

Given these findings, therapeutic strategies targeting insulin resistance and dyslipidemia in PCOS patients are essential. Lifestyle interventions such as dietary modifications and physical activity have shown promising results in improving insulin sensitivity and lipid profiles in PCOS individuals.[2] Additionally, pharmacological approaches, including metformin and statins, have been explored to manage metabolic disturbances in PCOS.[5]

CONCLUSION

This study highlights the significant metabolic alterations in PCOS-induced *Mus musculus*, emphasizing the need for targeted therapeutic strategies. The results underscore the importance of early metabolic screening and intervention in PCOS patients to mitigate long-term health risks. Future research should explore molecular mechanisms underlying these metabolic disturbances and potential interventions to mitigate PCOS-associated risks.

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