RESEARCH PAPER

Correlation Of Serum Nesfatin-1 With Anthropometric Indices And Dyslipidemia In Women With Polycystic Ovary Syndrome

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is a prevalent multifactorial endocrine-metabolic condition characterized by obesity, insulin resistance and dyslipidemia. Nesfatin-1 is an anorexigenic peptide produced from nucleobindin-2 (NUCB2) and has been proposed as a possible metabolic biomarker implicated in energy balance, appetite regulation and lipid metabolism.

Aim: To evaluate serum Nesfatin-1 levels and determine its correlation with anthropometric indices and lipid profile parameters in women with polycystic ovary syndrome.

Materials and Methods: A hospital-based comparative cross-sectional study was conducted which comprised 60 women between 18 and 35 years of age, 30 diagnosed cases of PCOS and 30 age matched healthy controls. Anthropometric measures including body weight, body mass index (BMI), waist circumference (WC), hip circumference (HC), waist-hip ratio (WHR) and waist-height ratio were recorded. Lipid profile parameters, total cholesterol, triglycerides, low-density lipoprotein (LDL) and high-density lipoprotein (HDL) were measured using established biochemical procedures. Serum Nesfatin-1 levels were measured by enzyme-linked immunosorbent assay (ELISA). The statistical analysis was carried out utilizing independent t-test and Pearson's correlation analysis.

Results: Women with PCOS had significantly increased BMI, waist circumference, waist–height ratio, LDL cholesterol, triglycerides and total cholesterol compared with controls but significantly lower HDL values. Serum Nesfatin-1 levels were decreased in PCOS women compared to healthy controls. Serum Nesfatin-1 was negatively correlated with BMI, waist circumference, LDL cholesterol, triglycerides and total cholesterol, but positively correlated with HDL cholesterol.

Conclusion: Serum Nesfatin-1 levels decreased in women with PCOS and may be connected with obesity-related anthropometric changes and dyslipidemia. Nesfatin-1 could be a useful biomarker for metabolic abnormalities in PCOS.

Keywords: PCOS, Nesfatin-1, Dyslipidemia, Anthropometric indices, BMI, Lipid profile.

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is among the most common endocrine illnesses in women of reproductive age and is characterized by hyperandrogenism, monthly abnormalities, persistent anovulation and polycystic ovarian morphology . Besides reproductive dysfunction, PCOS is significantly related with obesity, insulin resistance, metabolic syndrome and cardiovascular risk

factors.Anthropometric measures, such as body mass index (BMI), waist circumference, waist-hip ratio (WHR) and waist-height ratio, are key markers of obesity and central adiposity in women with PCOS.1,2 Increased adiposity plays a key role in the pathogenesis of insulin resistance and dyslipidemia and consequently worsens the metabolic consequences of the illness.The most common type of dyslipidemia seen in PCOS is increased serum triglycerides, low-density lipoprotein (LDL), total cholesterol levels and decreased high-density lipoprotein (HDL) levels. These metabolic changes increases the risk of cardiovascular disease in affected women.4

Nesfatin-1 is an 82 amino acid peptide that is a product of nucleobindin-2 (NUCB2) and has a role in the control of hunger, glucose metabolism, energy homeostasis and lipid metabolism. Increasing evidence indicates an association of increased serum Nesfatin-1 levels with obesity, insulin resistance and metabolic dysfunction in PCOS.5,6 However, there are few studies on the association of Nesfatin-1 with anthropometric indices and lipid abnormalities in women with PCOS.

Therefore, the present study was designed to assess serum Nesfatin-1 levels and to find out its association with anthropometric indices and dyslipidemia in women with PCOS.

MATERIALS AND METHODS

Study Design and Participants

It was a hospital-based comparative cross-sectional study conducted in the Department of Biochemistry in collaboration with the Department of Obstetrics and Gynecology at Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, Himachal Pradesh.

The study included 60 women aged between 18 and 35 years, comprising:

- 30 women diagnosed with PCOS (cases)
- 30 apparently healthy age-matched women (controls)

Diagnosis of PCOS was based on the Rotterdam criteria.

Inclusion Criteria

1. Age ≥15 years and ≤45 years.
2. Female patients suffering from PCOS as diagnosed by Rotterdam Criteria with any of the three features including oligo/anovulation, clinical and biochemical signs of hyperandrogenism, polycystic ovaries on ultra sound defined as the presence of ≥ 12 follicles, of 2-9 mm size or having the unilateral ovarian volume of ≥ 103.
3. BMI & Age matched controls.
4. Subjects willing to participate.

Exclusion Criteria

1. Patients taking medical treatment for diabetes, insulin resistance, hypertension or any other chronic medical disorders.
2. Females above the age of 45 years and below 15 years.
3. Known cardiovascular disease, renal or liver impairment.
4. Patients taking medication for PCOS.

Ethical Approval

Institutional ethical committee approval was obtained prior to commencement of the study.

Anthropometric Assessment

A. Parameters which are calculated by formula:

Anthropometric measurements including height, weight, waist circumference, and hip circumference were recorded using standard methods. BMI was calculated using the formula:

Anthropometric measurements:

1. Body mass index (BMI):

Body weight and height were measured without shoe by using a pre- calibrated height and weight scale.

$$M = \frac{egh\,n\,g}{(hegh\,n)^2}$$

2. Waist hip ratio:

Waist circumference were measured midpoint between the lower rib margin and the superior iliac spine using a stretch resistant tape. Hip circumference was measured around widest portion of the buttocks, with the tape. Both circumference were measured in a standing position at the end of gentle expiration.

Biochemical Analysis

Venous blood samples were collected after overnight fasting under aseptic conditions. Lipid profile parameters including total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol were analyzed by running samples on Roche cobas c 311, a fully autoanalyzer.

Serum Nesfatin-1 levels were estimated using commercially available ELISA kits according to manufacturer instructions.

Statistical Analysis

Data were analyzed using SPSS software version 26.0. Results were expressed as Mean ± Standard Deviation (SD). Independent t-test was used for comparison between groups. Pearson's correlation coefficient was applied to assess correlation between serum Nesfatin-1

and anthropometric/lipid parameters. A p-value <0.05 was considered statistically significant.

RESULTS

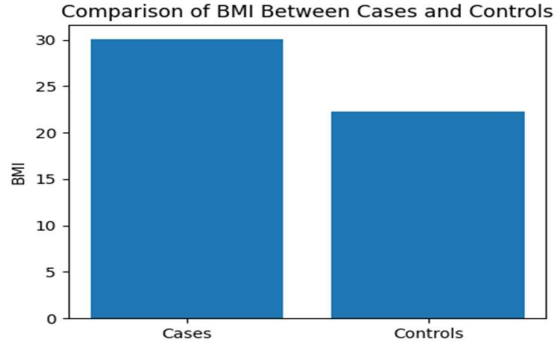
Comparative analysis of anthropometric and biochemical parameters revealed significant metabolic alterations in women with PCOS.

Table 1: Comparison of Anthropometric and Biochemical Parameters Between Women with PCOS and Healthy Controls

Parameter	Cases Mean	Controls Mean
BMI	30.06	22.25
LDL	147.25	88.33
TG	189.1	111.37
Total Cholesterol	223.07	166
HDL	38	55.4
Nesfatin-1	748.33	895.5

Women with PCOS demonstrated significantly higher body mass index (BMI) compared to controls (30.06 vs 22.25 kg/m²), indicating increased prevalence of obesity and adiposity among affected individuals.

Figure 1: Comparison of Body Mass Index (BMI) Between Women with PCOS and Healthy Controls



Serum Nesfatin-1 levels were found to be lower in women with PCOS as compared to healthy controls (748.33 pg/mL vs 895.50 pg/mL), suggesting a possible association between altered Nesfatin-1 levels and metabolic dysfunction in PCOS.

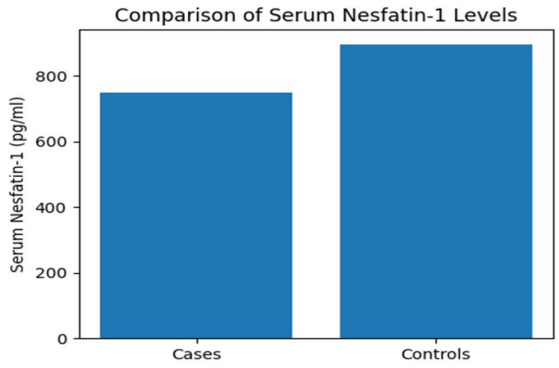


Figure 2: Comparison of Serum Nesfatin-1 Levels Between Women with PCOS and Healthy Controls

Significant dyslipidemia was observed among women with PCOS. Mean LDL cholesterol, triglycerides, and total cholesterol levels were elevated in cases compared to controls, whereas HDL cholesterol levels were reduced.

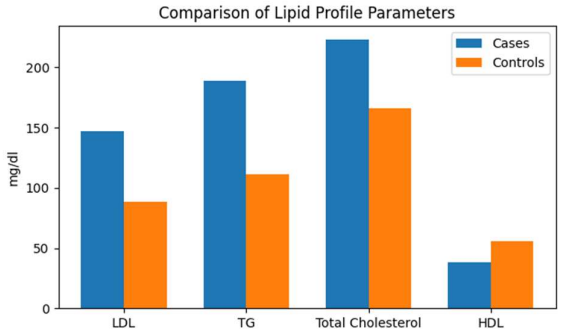


Figure 3: Comparison of Lipid Profile Parameters Between Women with PCOS and Healthy Controls

The overall findings indicate that women with PCOS exhibit significant anthropometric abnormalities, dyslipidemia, and altered serum Nesfatin-1 levels, supporting the association between Nesfatin-1 and metabolic disturbances in PCOS.

Baseline Anthropometric and Biochemical Characteristics

Mean serum Nesfatin-1 levels were lower in the PCOS group compared to healthy controls.

Table 2: Comparison of Anthropometric Parameters Between Cases and Controls

Parameter	Cases (Mean ± SD)	Controls (Mean ± SD)	p-value
Age (years)	25.0 ± 3.35	23.43 ± 2.62	>0.05
Weight (kg)	77.47 ± 6.00	57.20 ± 3.22	<0.001
BMI (kg/m²)	30.06 ± 2.27	22.25 ± 1.84	<0.001
Waist Circumference (inch)	37.60 ± 1.71	29.16 ± 1.34	<0.001
Waist–Hip Ratio	0.88 ± 0.05	0.75 ± 0.04	<0.001
Waist–Height Ratio	0.59 ± 0.03	0.46 ± 0.02	<0.001

Table 3: Comparison of Lipid Profile and Serum Nesfatin-1 Levels Between Cases and Controls

Parameter	Cases (Mean ± SD)	Controls (Mean ± SD)	p-value
LDL (mg/dL)	147.24 ± 11.67	88.32 ± 6.43	<0.001
Triglycerides (mg/dL)	189.10 ± 11.56	111.36 ± 4.37	<0.001
Total Cholesterol (mg/dL)	223.06 ± 10.69	166.00 ± 5.77	<0.001
HDL (mg/dL)	38.00 ± 2.82	55.40 ± 2.71	<0.001
Nesfatin-1 (pg/mL)	748.33 ± 77.38	895.50 ± 47.51	<0.001

Correlation Analysis

Serum Nesfatin-1 demonstrated negative correlation with BMI, waist circumference, LDL cholesterol, triglycerides, and total cholesterol. A positive correlation

was observed between serum Nesfatin-1 and HDL cholesterol levels.

Table 4: Correlation of Serum Nesfatin-1 with Anthropometric and Lipid Parameters in PCOS Cases

Parameter	Correlation Coefficient (r)
BMI	Negative correlation
Waist Circumference	Negative correlation
LDL Cholesterol	Negative correlation
Triglycerides	Negative correlation
Total Cholesterol	Negative correlation
HDL Cholesterol	Positive correlation

DISCUSSION

This study investigated the association between serum Nesfatin-1 concentrations and anthropometric measurements and lipid profile abnormalities in women with PCOS and observed significant metabolic modifications in the diseased group.In this study, the body mass index (BMI) of women with PCOS was considerably higher than the healthy controls, indicating a higher prevalence of obesity and central adiposity in affected women. Obesity is one of the key contributing factors to the pathophysiology of PCOS and is closely related with insulin resistance, chronic low-grade inflammation and endocrine dysfunction. Increased adiposity exacerbates metabolic and reproductive problems in PCOS. Women with PCOS have been shown to have increased BMI and obesity-related anthropometric indices in prior research.8,9 The present study also showed substantial dyslipidemia in women with PCOS. LDL cholesterol, triglycerides and total cholesterol levels were considerably higher while HDL cholesterol levels were lower compared with controls. Dyslipidemia is a common metabolic abnormality in PCOS and plays an important role in the increased cardiovascular risk in women with PCOS. Insulin resistance and increased visceral adiposity, both of which predispose to aberrant lipoprotein metabolism, appear to be the main contributors to the altered lipid metabolism associated with PCOS. Such lipid abnormalities were observed by Wild et al.4 and other investigators of metabolic problems in PCOS.[5,6]

Another important finding of this study was the lower serum Nesfatin-1 levels in women with PCOS compared to healthy controls. Nesfatin-1 is an anorexigenic peptide produced from nucleobindin-2 (NUCB2) and is known to have a significant role in appetite regulation, glucose homeostasis, energy balance and lipid metabolism. Changes in circulation Nesfatin-1 levels have been linked to obesity, diabetes mellitus, and metabolic syndrome. Therefore, low serum Nesfatin-1 levels in the present study may indicate a defect in the metabolic regulation of PCOS. Equivalent findings have been reported in previous investigations in which Nesfatin-1 levels were measured in women with PCOS.6,7

Correlation analysis in the present study showed a negative correlation between serum Nesfatin-1 levels and BMI, waist circumference, LDL cholesterol, triglycerides and total cholesterol levels whereas HDL cholesterol exhibited a favorable correlation. These data imply that decreased serum Nesfatin-1 levels may be associated with the exacerbation of obesity-related metabolic abnormalities in PCOS. Although certain relationships were not significant statistically, the general trend supports a putative involvement of Nesfatin-1 in metabolic control and lipid homeostasis.

The negative association of serum Nesfatin-1 with anthropometric indices revealed in the present study may suggest that diminished Nesfatin-1 causes dysregulated appetite and abnormal energy metabolism, resulting in obesity and metabolic dysfunction. Similarly, altered associations with lipid markers imply that Nesfatin-1 may be involved in pathways affecting lipid metabolism and cardiovascular risk in women with PCOS.7

The results of the present study indicate the usefulness of metabolic biomarkers assessment in women with PCOS. Serum Nesfatin-1 may be a possible biomarker for metabolic abnormalities related to obesity and dyslipidemia in these subjects. Early diagnosis of such metabolic changes may enhance clinical surveillance and treatment intervention in women with PCOS.

However, there were limitations of the present investigation. The study had single center and rather limited sample size. Not all subjects were assessed for indicators of insulin resistance and inflammatory cytokines. Multicentric studies with a bigger sample size and comprehensive hormonal and metabolic evaluation are needed to better define the function of Nesfatin-1 in the pathophysiology and metabolic consequences of PCOS.

LIMITATIONS

The study had a relatively small sample size and was conducted at a single center. Larger multicentric studies are required to further validate the role of Nesfatin-1 in PCOS.

CONCLUSION

The present investigation showed substantial differences in anthropometric parameters, lipid profile and serum

Nesfatin-1 levels in women with polycystic ovarian syndrome in comparison to healthy controls. The women with PCOS were shown to have increased body mass index, central obesity indices, increased LDL cholesterol, triglycerides and total cholesterol levels and decreased HDL cholesterol levels, showing the existence of a significant metabolic dysregulation related to the condition.

Serum Nesfatin-1 levels in women with PCOS were decreased and correlated with several obesity-related anthropometric indices and lipid profile parameters. These data show that Nesfatin-1 could have a significant function in the complicated cross talk between energy homeostasis, obesity and lipid metabolism in PCOS. The link found between changed Nesfatin-1 levels and deleterious metabolic changes supports the probable involvement of Nesfatin-1 in the etiology of metabolic dysfunction in afflicted women.

In conclusion, the present investigation draws attention to the need for the assessment of anthropometric and biochemical abnormalities in women with PCOS and suggests that serum Nesfatin-1 could be a valuable marker reflecting metabolic derangements associated with the disease. Larger multicentric studies with a wider metabolic and hormonal assessment are necessary to better establish the diagnostic and clinical importance of Nesfatin-1 in PCOS.

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