

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20263971>

Original Research Article

Prevalence of central obesity/increased waist to hip ratio among women with polycystic ovarian syndrome who attend gynecological clinics in tertiary care hospitals in Sri Lanka

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Received: 22 July 2026

Revised: 08 October 2026

Accepted: 09 October 2026

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) is an endocrine disorder with important reproductive and metabolic consequences, including a recognised association with central obesity. Objectives were to describe prevalence of central obesity (increased waist to hip ratio) among women with polycystic ovarian syndrome who attend to gynecological clinics in tertiary care hospitals in Sri Lanka.

Methods: A descriptive cross-sectional study was conducted at the gynecology clinic of Colombo South Teaching Hospital Sri Lanka, from January to December 2025. Women diagnosed with PCOS by the modified Rotterdam criteria within the preceding three months were recruited by convenience sampling (n=165); those with other causes of hyperandrogenism, current pregnancy, or ongoing dietary or lifestyle modification were excluded. Waist and hip circumferences were measured and the waist-to-hip ratio calculated, with 0.85 taken as the cut-off for central obesity. Data were analyzed using SPSS version 28.0.

Results: For waist circumference, the largest proportion measured <80 cm (n=53; 32.1%). For hip circumference, most measured 101-110 cm (n=74; 44.8%), and the commonest waist-to-hip ratio category was 0.81-0.90 (n=52; 31.5%). The mean age was 28.9 (SD= 5.6 years). Anovulation was present in 90 participants (54.5%) and hyperandrogenism in 143 (86.7%). The commonest phenotype was classic (Frank-A) PCOS (n=71). Central obesity was identified in 93 participants (56.0%; 95% CI 48.4-63.6). Anthropometric measures differed significantly across phenotypes, being highest in classic PCOS (mean waist-to-hip ratio 0.95) and lowest in the ovulatory and non-hyperandrogenic phenotypes (p<0.001).

Conclusions: Central obesity was common among women with PCOS and differed significantly by phenotype, being greatest in classic PCOS. The waist-to-hip ratio may serve as a simple marker to identify women with PCOS at higher metabolic risk who warrant screening and preventive intervention.

Keywords: Central obesity, Hip, Polycystic ovary syndrome, Waist

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine disorder of reproductive-age women, with a reported prevalence of about 5.9% in Sri Lanka and 3-10%

globally.¹ Defined by the modified Rotterdam criteria as a combination of hyperandrogenism, ovulatory dysfunction and polycystic ovarian morphology, it is classified into four phenotypes with differing clinical and metabolic profiles.

Although primarily endocrine, PCOS carries substantial reproductive and metabolic consequences. It is a leading cause of anovulatory infertility and is associated with menstrual irregularity, gestational diabetes, early pregnancy loss, pregnancy-induced hypertension and higher caesarean rates.² Beyond reproduction, PCOS is strongly linked to central obesity, which contributes to insulin resistance, metabolic syndrome and type 2 diabetes and to more severe hyperandrogenism and poorer fertility outcomes.^{3,4}

In a semi-urban Sri Lankan population, obesity was present in 57.1% of women with PCOS, who had a 1.9-fold greater risk of abdominal obesity that frequently clustered with insulin resistance and dyslipidaemia.² More broadly, about 36% of adult Sri Lankan women have central obesity, far exceeding men (about 16%), a pattern attributed to high-carbohydrate diets and low physical activity.⁵

Although body mass index is commonly used to assess obesity, it does not reflect fat distribution, whereas the waist-to-hip ratio (WHR) captures the central adiposity that is more strongly linked to metabolic risk and can act as an early marker in women with PCOS.^{1,6} Women attending tertiary gynecology clinics often represent more severe phenotypes in whom central obesity may carry greater long-term risk, yet local data on WHR-defined central adiposity across Rotterdam phenotypes remain limited.⁷ Given the rising burden of non-communicable disease in Sri Lanka, quantifying central obesity in this group may help identify high-risk women early and guide targeted preventive strategies.

METHODS

This descriptive cross-sectional study was conducted in the gynecology clinic of Colombo South Teaching Hospital, Sri Lanka, from January to December 2025, among women attending gynecology units with PCOS. Women diagnosed with PCOS according to the modified Rotterdam criteria within the preceding three months were eligible, while those with congenital or other pathological hyperandrogenism, current pregnancy, or ongoing dietary or lifestyle modification were excluded. The sample size, calculated using the Lwanga and Lemeshow formula with an anticipated prevalence of 10%, 95% confidence and 5% precision and a 10% allowance for non-response, was 165, and participants were recruited by convenience sampling. Each participant was classified into one of the four Rotterdam phenotypes classic/Frank (A), ovulatory (B), normal ovarian morphology (C) and normal androgen (D) according to the criteria fulfilled. Waist and hip circumferences were measured and the waist-to-hip ratio derived, with the WHO cut-off of 0.85 for females used to define central obesity; supporting ultrasound findings and biochemical results (serum testosterone, FSH, LH and the LH/FSH ratio) were recorded on an investigator-administered data extraction sheet. Data were entered in Excel 2021 and analysed with SPSS version 28.0, using

frequencies and percentages for categorical variables and measures of central tendency for continuous variables; associations were assessed using odds ratios, with a 95% confidence interval and a probability threshold of 0.05 defining statistical significance. Written informed consent was obtained from all participants, confidentiality was maintained, and ethical approval was granted by the Ethics Review Committee of Colombo South Teaching Hospital, Kalubowila, with administrative clearance from the hospital. No conflicts of interest are declared.

RESULTS

A total of 165 participants were included, with a mean age of 28.9 ± 5.6 years (range 18-38). The largest age group was 30-34 years ($n=47$; 28.5%). Most participants were unemployed ($n=63$; 38.2%), and the largest proportion had passed A/L examinations ($n=72$; 43.6%).

Table 1: Distribution of sociodemographic characteristics among study participants.

Categories	Frequency	Percentage
Age (years)		
<24	41	24.8
25-29	44	26.7
30-34	47	28.5
>35	33	20.0
Occupation		
Unemployed	63	38.2
Labourer	19	11.5
Non executive	52	31.5
Executive	23	13.9
Professional	8	4.8
Education		
<O/L	17	10.3
Passed O/L	28	17.0
Passed A/L	72	43.6
Graduated	48	29.1
Total	165	100.0

Table 2: Distribution of anovulation and hyperandrogenism.

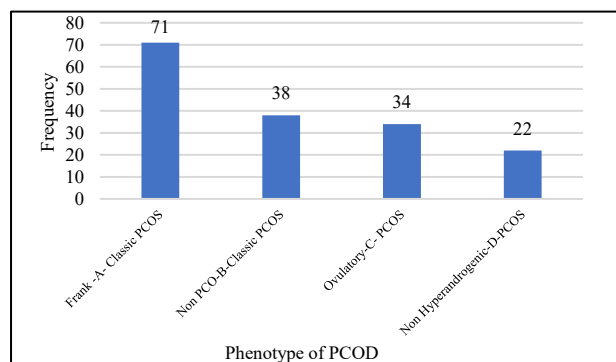
Categories	Frequency	Percentage
Anovulation		
Yes	90	54.5
No	75	45.5
Hyperandrogenism		
Yes	92	55.8
No	73	44.2
Total	165	100.0

More than half of the participants had anovulation ($n=90$, 54.5%). Hyperandrogenism was present in 92 participants (55.8%), whereas 73 participants (44.2%) did not have hyperandrogenism.

Table 3: Distribution of USS findings of the study participants.

Categories	Frequency	Percentage
Ovulatory status		
Ovulatory dysfunctions	131	79.4
Normal	34	20.6
Polycystic ovarian morphology		
Yes	127	77.0
No	38	23.0
Total	165	100.0

Among study participants, 20.6% (n=34) had normal ovulatory status, whereas 131 participants (79.4%) demonstrated ovarian dysfunctions by ultra sound scan. During ultra sound scanning 77.0% (n=127) of the study participants were detected as presence with polycystic ovarian morphology.

**Figure 1: Distribution of different phenotypes of polycystic ovary syndrome among study participants.**

The distribution of different phenotypes of polycystic ovary syndrome is presented in Figure 1. The most common phenotype was type A; classic PCOS, seen in 71 participants. This was followed by non PCO-B classic PCOS in 38 participants and ovulatory-C PCOS in 34 participants. The least common phenotype was non-hypeandrogenic-D PCOS, which was observed in 22 participants.

Table 4: Number of antral follicle count and ovarian volume.

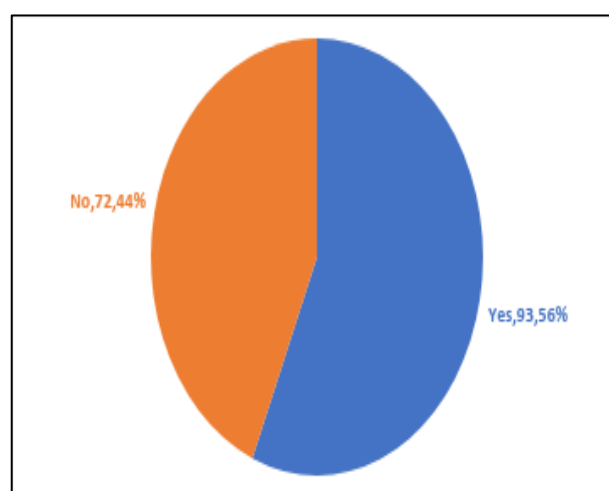
Categories	Frequency	Percentage
Antral follicle count		
<10	43	26.1
11-20	37	22.4
21-30	61	37.0
>31	24	14.5
Ovarian volume		
<8	51	30.9
8.1-12.9	52	31.5
13-16.9	47	28.5
>17	15	9.1
Total	165	100.0

The distribution of antral follicle count per ovary among the participants showed that the largest group had 21-30 follicles (n=61; 37.0%). The mean antral follicle count per ovary was 19.1 ± 9.3 , with a range between 6 and 35 follicles. For ovarian volume, data were available for 117 participants. Among these, 52 participants (31.5%) had an ovarian volume $8.1-12.9 \text{ cm}^3$. The mean ovarian volume was $11.17 \pm 3.94 \text{ cm}^3$.

Table 5: Distribution of anthropometric characteristics.

Categories	Frequency	Percentage
Waist circumference		
<80	53	32.1
81-90	24	14.5
91-100	40	24.2
>101	48	29.1
Hip circumference		
<100	63	38.2
101-110	74	44.8
>111	28	17.0
Waist to hip ratio		
<0.8	46	27.9
0.81-0.9	52	31.5
0.91-1.0	47	28.5
>1.1	2	1.2
Total	165	100.0

For waist circumference, the largest proportion of participants had measurements <80 cm (n=53; 32.1%). 29.1% of participant (n=48) had waist measurements >101 cm. For hip circumference, 74 participants (44.8%) had measurements between 101-110 cm, which made the highest proportion. Among them, the largest proportion had WHR between 0.81-0.90 (n=52; 31.5%). For waist circumference the mean value was of 2.50 ± 1.22 . The mean hip circumference was 1.79 ± 0.71 . The mean WHR was 2.03 ± 0.83 .

**Figure 2: Distribution of central obesity.**

Central obesity was identified in 93 participants (56%), while 72 participants (44%) did not demonstrate central obesity (95% CI=63.6-48.4).

Anthropometric measurements differed significantly across phenotypes (Table 6). Classic (Frank-A) PCOS showed the highest mean values waist circumference 101.06 cm, hip circumference 106.82 cm and waist-to-hip

ratio 0.95 with progressively lower values in the Non PCO-B, ovulatory-C and non-hyperandrogenic-D groups, whose mean waist-to-hip ratios fell to 0.79. The differences in waist circumference, hip circumference and waist-to-hip ratio were all statistically significant ($p<0.001$).

Table 6: Distribution of anthropometric measurements related to central obesity in different phenotypes in polycystic ovarian disease.

	Weist	Hip	WHR
Frank -classic PCOS (A)			
Mean	101.0563	106.8169	0.9477
SD	6.32204	6.09288	0.07257
Non PCO-classic PCOS (B)			
Mean	88.3158	102.3158	0.8621
SD	12.97629	6.74278	0.10057
Ovulatory-PCOS (C)			
Mean	77.8235	98.5000	0.7918
SD	4.17916	5.45366	0.05820
Hyperandrogenic (D)			
Mean	76.3182	97.1364	0.7882
SD	4.17916	5.45366	0.05820
Significance			
f	96.1	23.5	44.7
P value	<0.001	<0.001	<0.001

DISCUSSION

Bahadur and colleagues noted that the prevalence of metabolic syndrome among women with PCOS phenotype A was 36.7%. Phenotype A (classic PCOS) had a significantly larger waist circumference and more lipid abnormalities than phenotype D, about 60% of these women had an increased waist circumference, and the hyperandrogenic phenotypes A and B were more strongly linked to metabolic syndrome and central obesity than the other phenotypes.⁷

Similarly, another study showed that the waist circumference of women with phenotypes A and B was significantly higher than in phenotypes C and D; women with phenotype A had the highest median waist circumference (113 cm), followed by phenotype B (110 cm), whereas phenotypes C and D had lower median values of about 92 cm. About 85% of participants had a waist circumference greater than 80 cm, and these findings reinforce that the classic hyperandrogenic phenotypes, particularly A and B, may carry a higher risk of metabolic disturbance and abdominal fat accumulation.⁸

Mehra et al observed that phenotype A was the most common form of PCOS, accounting for about 41% of cases, and that body mass index and waist circumference were closely associated with metabolic abnormalities,

especially in phenotype A; the hyperandrogenic phenotypes (A, B and C) were more often linked with abnormal glucose and lipid levels than phenotype D, and phenotype A showed the highest risk of cardiovascular disease and diabetes.⁹

Together these findings suggest that different PCOS phenotypes carry different levels of metabolic risk, especially in relation to central obesity, and are consistent with the present study, which also found a stronger association between phenotype A and central obesity, although some studies have reported different patterns that may reflect variation across populations.

Mu et al highlighted the importance of looking beyond body mass index when assessing metabolic risk in PCOS. Some women with a normal body mass index still showed central obesity, with higher insulin resistance and triglycerides and lower HDL cholesterol than women without central obesity, indicating that central obesity can occur in women who are not generally overweight and may still be associated with important metabolic abnormalities.⁶

Evidence from adolescents with PCOS also supports metabolic differences between phenotypes, the hyperandrogenic phenotypes A and B showing a less favourable profile and phenotype D a lower metabolic risk;

although adolescents with phenotype A had a higher body mass index, insulin resistance was similar across phenotypes and the commonest lipid abnormality was low HDL cholesterol.¹⁰

Pazderska et al found that waist circumference was a better indicator of metabolic abnormality than the diagnosis of PCOS alone, and that cardiometabolic risk may be underestimated in obese women without PCOS and overestimated in lean women with PCOS, suggesting that central obesity is an important and independent contributor to metabolic risk regardless of phenotype.⁵

In summary, the relationship between PCOS phenotypes and central obesity is complex. Many studies report that the hyperandrogenic phenotypes, particularly A and B, have a higher waist circumference and greater central fat accumulation and are more frequently associated with insulin resistance and metabolic syndrome, whereas phenotype D often shows lower metabolic risk; even lean women with PCOS, however, can develop central obesity despite a normal body mass index. Central obesity therefore plays an important role in the metabolic risk associated with PCOS, although its frequency and severity vary across phenotypes.

These observations support the routine measurement of central adiposity, alongside body mass index, when assessing metabolic risk in women with PCOS, since a raised waist-to-hip ratio may identify clinically important central obesity even in women whose body mass index appears normal.

Several limitations should be considered. Anthropometric and ultrasound assessments were performed by different personnel who were not specifically trained for the study, using equipment that was not formally calibrated and without independent second-observer review, so a degree of measurement variability and information bias cannot be excluded. As a single-centre descriptive study without an age-matched control group, it could not compare measurements between women with and without PCOS or adjust for confounders such as coexisting metabolic disease, and the analysis was largely descriptive rather than inferential.

The study was conducted in a single urban tertiary setting with a relatively small sample, which may limit generalizability to rural, private-sector or non-care-seeking women, and some anthropometric findings may partly reflect wider population trends in obesity rather than PCOS alone. Despite these limitations, the study offers useful preliminary insight into the relationship between PCOS phenotypes and central obesity and provides a basis for larger, multicenter, controlled studies.

CONCLUSION

In conclusion, central obesity, defined by an increased waist-to-hip ratio, was common among women with PCOS

and differed significantly across phenotypes, being greatest in classic (Frank-A) PCOS and lowest in the non-hyperandrogenic phenotype. These findings indicate that the waist-to-hip ratio is a simple, inexpensive marker that can help identify women with PCOS at higher metabolic risk, and support incorporating central-obesity assessment into routine PCOS care and directing high-risk women towards screening and health-promotion programmes. Larger controlled studies are warranted to determine whether monitoring central obesity can serve as a screening or preventive tool for PCOS and its metabolic complications.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Wolf WM, Wattick RA, Kinkade ON, Olfert MD. Geographical prevalence of polycystic ovary syndrome as determined by region and race/ethnicity. *Int J Environ Res Public Health*. 2018;15(11).
2. Pasquali R, Gambineri A, Pagotto U. The impact of obesity on reproduction in women with polycystic ovary syndrome. *BJOG*. 2006;113(10):1148-59.
3. Glueck CJ, Goldenberg N, Wang P, Loftspring M, Sherman A. Metformin during pregnancy reduces insulin, insulin resistance, insulin secretion, weight, testosterone and development of gestational diabetes: prospective longitudinal assessment of women with polycystic ovary syndrome from preconception throughout pre. *Hum Reprod*. 2004;19(3):510-21.
4. Altintas KZ, Dilbaz B, Cirik DA, Ozelci R, Zengin T, Erginay ON, et al. The incidence of metabolic syndrome in adolescents with different phenotypes of PCOS. *Ginekol Pol*. 2017;88(6):289-95.
5. Pazderska A, Kyaw Tun T, Phelan N, McGowan A, Sherlock M, Behan L, et al. In women with PCOS, waist circumference is a better surrogate of glucose and lipid metabolism than disease status per se. *Clin Endocrinol*. 2018;88(4):565-74.
6. Mu L, Zhao Y, Li R, Lai Y, Qiao J. Metabolic characteristics of normal weight central obesity phenotype polycystic ovary syndrome women: a large-scale national epidemiological survey. *Reprod Biomed Online*. 2018;37(4):498-504.
7. Bahadur A, Mundhra R, Kashibhatla J, Rajput R, Verma N, Kumawat M. Prevalence of metabolic syndrome among women with different PCOS phenotypes- a prospective study. *Gynecol Endocrinol*. 2021;37(1):21-5.
8. Moran C, Arriaga M, Rodriguez G, Moran S. Obesity differentially affects phenotypes of polycystic ovary syndrome. *Int J Endocrinol*. 2012;2012:317241.
9. Mehra T, Sharma S, Zahra T, Jangir S, Gupta B. Correlation of body mass index with anthropometric and biochemical parameters among polycystic ovary

syndrome phenotypes. Indian J Clin Biochem. 2023;38(2):231-41.

10. Fruzzetti F, Perini D, Lazzarini V, Parrini D, Genazzani AR. Adolescent girls with polycystic ovary syndrome showing different phenotypes have a different metabolic profile associated with increasing androgen levels. Fertil Steril. 2009;92(2):626-34.

Cite this article as: Ilukpitiya IGDC, Ilukpitiya IGKR, Madhubhashini GGP. Prevalence of central obesity/increased waist to hip ratio among women with polycystic ovarian syndrome who attend gynecological clinics in tertiary care hospitals in Sri Lanka. Int J Reprod Contracept Obstet Gynecol 2026;15:4300-5.