

Effect of Ceylon Cinnamon on Anthropometric Parameters and Insulin Resistance Profile in Women with Polycystic Ovary Syndrome: A Pilot Study and Literature Review

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Introduction

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age, with a prevalence ranging from 6% to 20% depending on the diagnostic criteria used (1). Insulin resistance (IR) is considered a major pathogenic factor in PCOS and contributes to hyperandrogenism, infertility, obesity, metabolic syndrome, and type 2 diabetes mellitus (1). Recent evidence suggests that nutraceutical interventions may improve both metabolic and reproductive outcomes in women with PCOS (2,3).

Ceylon cinnamon (*Cinnamomum verum*) has attracted increasing scientific interest because of its insulin-sensitizing, antioxidant, anti-inflammatory, and anti-obesity properties (4,5). Experimental studies suggest that cinnamon enhances insulin receptor phosphorylation, stimulates GLUT4 translocation, modulates PPAR γ signaling pathways,

and reduces oxidative stress (4,5). Several clinical studies have reported beneficial effects of cinnamon supplementation on insulin resistance, body weight, waist circumference, and menstrual cyclicity in women with PCOS (6–9).

However, data remain limited, especially in North African populations, and few studies have specifically investigated Ceylon cinnamon. Therefore, the aim of this study was to evaluate the effects of Ceylon cinnamon supplementation on anthropometric parameters and insulin resistance profile in Tunisian women with PCOS.

Methods

We conducted a prospective interventional pilot study in the endocrinology department of the National Institute of Nutrition and Food Technology (INNTA). PCOS diagnosis was established according to the Rotterdam 2003 criteria (1). Exclusion criteria included diabetes mellitus, pregnancy, lactation, renal or hepatic disease, corticosteroid use, and antidiabetic treatment.

Anthropometric measurements included body weight, height, body mass index (BMI), waist circumference (WC), and waist-to-height ratio (WHtR). WHtR is considered one of the most reliable anthropometric indicators for predicting insulin resistance and cardiometabolic risk in women with PCOS (10). Body composition was assessed using bioelectrical impedance analysis.

Participants received 500 mg capsules of Ceylon cinnamon three times daily (total daily dose: 1500 mg/day) for eight weeks without changing dietary habits or physical activity. Biological analyses were performed after a 12-hour fast. Insulin resistance was assessed using the HOMA-IR index calculated as $\text{fasting insulin} \times \text{fasting glucose} / 22.5$.

All measurements were performed at baseline (T0) and after intervention (T1). Statistical significance was set at $p < 0.05$.

Results

A total of 15 patients were initially enrolled, and two were excluded because of poor compliance. The mean age of participants was 25.38 ± 5.12 years. At the end of the intervention, a significant reduction was observed in waist circumference and waist-to-height ratio ($p = 0.02$ for both). No statistically significant changes were observed for body weight, BMI, fasting glucose, fasting insulin, or HOMA-IR.

The HOMA-IR index decreased from 4.96 ± 3.22 at baseline to 2.75 ± 1.88 after intervention, although this reduction did not reach statistical significance. Similar trends were observed for fasting insulin and fasting glucose levels. (table 1)

Discussion

The present pilot study demonstrated that short-term supplementation with Ceylon cinnamon was associated with significant reductions in waist circumference and waist-to-height ratio in women with PCOS. Since abdominal obesity and visceral adiposity are strongly associated with insulin resistance and cardiometabolic complications in PCOS, these findings may have clinical relevance (1).

Although reductions in fasting glucose, fasting insulin, and HOMA-IR were not statistically significant, the downward trend observed suggests a potential beneficial metabolic effect. Similar findings were reported by Wang et al. and Kort et al., who described improvements in insulin resistance parameters and menstrual cyclicity following cinnamon supplementation (6,7).

The mechanisms underlying these effects may involve enhanced insulin signaling, stimulation of GLUT4 translocation, activation of PPAR γ pathways, delayed gastric emptying, and reduction of inflammatory mediators (4,5). Recent systematic reviews and meta-analyses also support the beneficial effects of cinnamon on metabolic and anthropometric outcomes in women with PCOS (2,3,11).

Our findings are also consistent with studies by Borzoei et al., who reported improvements in metabolic parameters and antioxidant status after cinnamon supplementation (8,9). However, the absence of statistically significant changes in some metabolic variables may be explained by the small sample size, relatively short intervention duration, and near-normal baseline glycemic values.

This study has several limitations, including the small number of participants, the absence of a control group, and the short duration of intervention. Nevertheless, this is one of the first Tunisian studies evaluating the metabolic effects of Ceylon cinnamon in women with PCOS. Larger randomized controlled trials are needed to confirm these preliminary findings.

Conclusion

Short-term supplementation with Ceylon cinnamon showed favorable effects on abdominal anthropometric parameters in women with PCOS and may represent a promising adjunctive therapeutic approach targeting metabolic dysfunction. Further randomized controlled studies with larger sample sizes and longer follow-up periods are needed to confirm these results.

Table 1. Anthropometric, biochemical and insulin resistance parameters before and after intervention

Parameter	T0	T1	Delta	P value
Weight (kg)	79.37 $\pm$ 20.32	78.52 $\pm$ 18.74	-0.85 $\pm$ 3.91	NS

BMI (kg/m ²)	29.00 ± 6.00	28.26 ± 5.33	-0.32 ± 1.34	NS
Waist circumference (cm)	91.00 ± 16.00	87.15 ± 13.82	-3.40 ± 4.74	0.02
Total fat mass (kg)	30.98 ± 14.22	30.68 ± 12.85	-0.31 ± 3.16	NS
Truncal fat mass (kg)	15.95 ± 8.30	15.82 ± 7.59	-0.13 ± 1.89	NS
Fasting blood glucose (mmol/L)	5.35 ± 0.54	5.26 ± 0.40	-0.09 ± 0.37	NS
Fasting insulin (μIU/mL)	20.25 ± 11.93	18.91 ± 10.54	-1.34 ± 10.89	NS
Waist-to-height ratio	0.54 ± 0.08	0.52 ± 0.07	-0.022 ± 0.03	0.02
HOMA-IR	4.96 ± 3.22	2.75 ± 1.88	-2.21 ± 2.85	NS

Table 2. Summary of narrative literature review on cinnamon supplementation in PCOS

Author	Year	Design	Population	Intervention	Main findings
Wang et al.	2007	Pilot study	15 women with PCOS	Cinnamon extract	Reduced HOMA-IR
Kort et al.	2014	RCT	Women with PCOS	1.5 g/day cinnamon	Improved menstrual cyclicity
Borzoei et al.	2018	RCT	Women with PCOS	Cinnamon supplementation	Improved metabolic profile
Maleki et al.	2021	Review	PCOS patients	Cinnamon	Insulin-sensitizing effects
Wahyuningtyas et al.	2021	Meta-analysis	Women with PCOS	Cinnamon supplementation	Improved insulin resistance
Xiaomei et al.	2024	Meta-analysis	Women with PCOS	Cinnamon herbal medicine	Improved cardiometabolic markers

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