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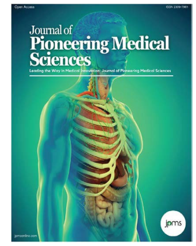

Effectiveness of Curry Leaf Powder and Aerobic Exercise on Physiological and Biochemical Markers and Quality of Life Among Obese Women - A Pilot Study

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Abstract: **Background:** Obesity among women is a growing global health concern, linked to increased risks of metabolic syndrome, cardiovascular diseases, and poor psychological well-being. The rising prevalence of obesity, especially in low- and middle-income countries, calls for effective preventive strategies. Aim of the study: This study aims to evaluate the effectiveness of curry leaf powder and aerobic exercise on physiological and biochemical markers and quality of life among obese women. **Methods:** A quasi-experimental study was conducted with 30 women (aged 25-55) with obesity, randomly assigned to three groups: Experimental Group I (curry leaf powder only), Experimental Group II (curry leaf powder with aerobic exercise), and Control Group (no intervention). Physiological parameters, biochemical markers, and QoL were assessed before and after the intervention. Statistical analysis was performed using repeated measures ANOVA. **Results:** Both experimental groups demonstrated statistically significant improvements ($p<0.05$). Weight, BMI, and waist circumference showed significant reductions in the experimental groups, whereas the control group exhibited only minimal and non-significant changes. Biochemical markers, including triglycerides and blood sugar, also showed significant reductions ($p<0.05$), while blood pressure remained stable across all groups ($p>0.05$). **Conclusion:** This pilot study demonstrates that the combined use of curry leaf supplementation and aerobic exercise effectively reduces weight, BMI, and metabolic risk factors among obese women.

Key Words: Obesity, Aerobic Exercise, Metabolic Health, Biochemical Markers, Quality of Life

INTRODUCTION

Obesity among women is an increasing global health concern, linked to a higher risk of metabolic syndrome, cardiovascular diseases, and compromised psychological well-being [1,2]. The prevalence of obesity has been rising globally, exacerbating the burden on healthcare systems and economies. As obesity continues to increase, particularly in low- and middle-income countries, it becomes imperative to focus on preventive measures and early interventions to reduce the long-term health risks. The condition significantly impacts quality of life (QoL), affecting physical functioning, mental health, and social interactions [3,4].

Women, in particular, may experience unique psychosocial challenges associated with obesity, including body image concerns and social stigma, which can further affect their mental well-being. The intricate connection between obesity and diminished QoL highlights the need for interventions addressing both physical and psychosocial health aspects [5]. This comprehensive approach should incorporate strategies that tackle the underlying causes of obesity, such as poor diet, lack of physical activity, and socio-cultural factors.

Curry leaf (Murraya koenigii), renowned for their medicinal properties, are traditionally used for their antioxidant, anti-inflammatory, and lipid-lowering effects [6,7]. Recent research suggests that curry leaf may have potential benefits in managing obesity-related health complications, including improving lipid profiles and reducing inflammation. Research indicates that curry leaf supplementation can positively impact biochemical markers by lowering LDL cholesterol, triglycerides, and oxidative stress—critical factors in obesity-related metabolic dysfunction [8,9].

Aerobic exercise has been extensively studied for its benefits to obese individuals, including improved cardiovascular health, weight loss, and enhanced insulin sensitivity and lipid profiles [10,11]. Regular aerobic exercise, such as walking, cycling, or swimming, is crucial for improving overall health and reversing many of the metabolic disturbances associated with obesity. The combination of aerobic exercise with dietary interventions, such as curry leaf supplementation, could produce synergistic effects, enhancing both biochemical markers and overall QoL [12,13].

Despite this, there is a paucity of research examining the combined effects of curry leaf powder and aerobic exercise on specific bio-physiological and biochemical markers and QoL among obese women. Filling this gap is crucial for developing comprehensive, culturally appropriate obesity management strategies [1,12].

Curry leaf powder, derived from the Murraya koenigii plant, exhibits significant therapeutic properties that can benefit individuals, particularly in promoting metabolic health. Research indicates that curry leaf contains bioactive compounds, such as rutin, which have been shown to possess anti-cancer properties, particularly against certain cancer cell lines [13]. Murraya koenigii has also shown hypolipidemic properties, potentially aiding in the management of obesity-related metabolic conditions [14]. The antioxidants present in curry leaves may help in reducing oxidative stress, thereby enhancing metabolic health.

Moreover, future studies should explore how different dosages and forms of curry leaf (e.g., powder, extract, or fresh leaf) interact with various types of exercise regimens. Understanding the optimal combination could lead to tailored interventions for diverse populations.

Aim of the Study

This study aims to evaluate the effectiveness of curry leaf powder and aerobic exercise on physiological and biochemical markers and quality of life among obese women.

METHODS

Study Design and Sampling

This study employed a quasi-experimental three-group pre-test and post-test design to assess the effectiveness of curry leaf powder supplementation and aerobic exercise on physiological, biochemical, and quality of life parameters among obese women. A total of 30 women aged 25 to 55 years, with BMI indicating class I, II, or III obesity, were selected from a rural community in Thiruvallur District, Tamil Nadu. Participants were randomly assigned through lottery method into three groups: Experimental Group I (curry leaf powder only), Experimental Group II (curry leaf powder + aerobic exercise), and Control Group (no intervention).

Inclusion Criteria

Women aged 25 to 55 years with a BMI of 30.0 or higher, indicating overweight or obesity, were included. Participants had to be willing and available during the data collection period.

Exclusion Criteria

Women with severe medical conditions such as neurological disorders, recent cardiac diseases, malignant hypertension, hypothyroidism, or PCOD were excluded. Additionally, those practicing other weight reduction methods or allergic to curry leaf were not included.

Tools for Data Collection

Data were collected using four main tools: a demographic questionnaire, physiological parameters, biochemical markers, and the WHOQOL-BREF 26-item scale to assess quality of life. These tools were validated for content accuracy by subject experts.

Data Collection Procedure

Baseline data were collected prior to the interventions, followed by the administration of the assigned treatments. Experimental Group I, which received curry leaf powder supplementation alone; Experimental Group II, which received curry leaf powder combined with aerobic exercise; and a Control Group, which received no intervention and continued their routine lifestyle throughout the study period. Post-test 1 and Posttest 2 data were gathered after the intervention period using the same tools to assess changes in physiological, biochemical markers, and quality of life.

Statistical Analysis of Data

The collected data were analyzed using two-way repeated measures analysis of variance (RM ANOVA) for between-group and within-group comparisons. Post hoc multiple comparisons were performed using Bonferroni's 't' test. A p-value of 0.05 or less was considered statistically significant. Sigma Plot 14.5 was used for statistical analysis.

Ethical Clearance

Ethical clearance for the study was obtained from the Institutional Ethics Committee (IEC), Saveetha Medical College Hospital, Chennai. The research proposal was reviewed and approved on 12/03/2024 (IEC Reference No.: 012/03/2024/IEC/SMCH). The study was conducted in accordance with ethical principles, and informed consent was obtained from all participants prior to data collection.

RESULTS

Table 1: Comparison of Weight, Height, and BMI

Table 1 summarizes changes in weight, height, and BMI among the control, experimental 1, and experimental 2 groups at pre-test, post-test 1, and post-test 2. Weight decreased across all groups; the control group declined from 70.2±2.4 kg to 69.6±2.6 kg, experimental 1 from 71.1±6.2 kg to 67.9±6.0 kg, and experimental 2 from 83.8±6.3 kg to

Table 1: Comparison of Control, Experimental 1, and Experimental 2 Groups on Weight, Height, and Body Mass Index (BMI)

S. No	Groups Comparisons	Test Comparisons	Weight (kg)	Height (cm)	BMI (kg/m²)
1	Control	Pre-test	70.2±2.4	155.4±6.58	29.24±3.37
		Post-test 1	70.2±2.6	155.4±6.58	29.22±3.43
		Post-test 2	69.6±2.6	155.4±6.58	28.96±3.36
2	Experimental 1	Pre-test	71.1±6.2	152.4±10.71	30.53±3.92
		Post-test 1	70.0±6.0	152.4±10.71	29.98±3.72
		Post-test 2	67.9±6.0	152.4±10.71	28.98±3.60
3	Experimental 2	Pre-test	83.8±6.3	153.4±6.47	35.44±5.18
		Post-test 1	82.2±6.4	153.4±6.47	34.58±5.21
		Post-test 2	79.3±6.3	153.4±6.47	33.44±5.31
4	Significance	Among Tests	F = 87.088	F = 0	F = 65.280
			p<0.001	p = 1.0	p<0.001

Table 2: Comparison of Control, Experimental 1, and Experimental 2 Groups on Waist Circumference (WC), Systolic and Diastolic Blood Pressure (SBP, DBP)

S. No	Groups Comparisons	Test Comparisons	WC (cm)	SBP (mmHg)	DBP (mmHg)
1	Control	Pre-test	89.0±1.3	122.0±8.37	80.0±7.07
		Post-test 1	88.2±2.1	122.0±8.37	80.0±7.07
		Post-test 2	87.2±1.5	122.0±8.37	80.0±7.07
2	Experimental 1	Pre-test	96.0±5.1	124.0±5.48	84.0±5.48
		Post-test 1	94.0±4.8	122.0±4.47	84.0±5.48
		Post-test 2	92.0±4.8	122.0±4.47	84.0±5.48
3	Experimental 2	Pre-test	106.0±5.6	124.0±5.48	82.0±4.47
		Post-test 1	104.0±5.7	122.0±4.47	82.0±4.47
		Post-test 2	100.6±5.7	122.0±4.47	82.0±4.47
4	Significance	Among Tests	F = 61.110	F = 1.231	F = 0
			p<0.001	p = 0.310	p = 1.0

Table 3: Comparison of Control, Experimental 1, and Experimental 2 Groups on Triglycerides (TG), Total Cholesterol (TC), and Random Blood Sugar (RBS)

S.No	Groups Comparisons	Test Comparisons	TG (mg/dL)	TC (mg/dL)	RBS (mg/dL)
1	Control	Pre-test	164.0±4.0	164.5±13.44	117.5±10.61
		Post-test 1	164.5±2.5	163.0±9.90	117.0±9.90
		Post-test 2	162.5±2.5	161.5±4.95	117.5±9.19
2	Experimental 1	Pre-test	167.0±37.0	199.5±55.86	158.5±43.13
		Post-test 1	160.5±35.5	187.5±45.96	153.0±38.18
		Post-test 2	155.5±32.5	180.0±45.26	142.5±38.89
3	Experimental 2	Pre-test	207.5±11.5	214.0±39.60	169.0±41.01
		Post-test 1	200.5±10.5	191.0±26.87	159.0±38.18
		Post-test 2	194.5±12.5	181.5±23.34	147.5±31.82
4	Significance	Among Tests	F = 24.143	F = 12.383	F = 23.737
			p<0.001	p = 0.007	p<0.001

79.3±6.3 kg. Height remained stable, with the control group showing the highest average (155.4±6.58 cm), followed by experimental 2 (153.4±6.47 cm) and experimental 1 (152.4±10.71 cm). BMI values showed a consistent reduction across all groups control (29.24±3.37 to 28.96±3.36 kg/m²), experimental 1 (30.53±3.92 to 28.98±3.60 kg/m²), and experimental 2 (35.44±5.18 to 33.44±5.31kg/m²). Overall, participants in both experimental groups achieved greater reductions in body weight and BMI compared to the control, indicating positive intervention effects on body composition.

Table 2: Comparison of Waist Circumference and Blood Pressure

As presented in Table 2, waist circumference decreased across all groups: control (89.0±1.3 cm to 87.2±1.5 cm), experimental 1 (96.0±5.1 cm to 92.0±4.8 cm), and experimental 2 (106.0±5.6 cm to 100.6±5.7 cm). Systolic blood pressure remained stable across groups (control 122.0±8.37 mmHg, experimental 1 and 2 both 124.0±5.48 mmHg), as did diastolic pressure (control 80.0±7.07 mmHg, experimental 1 84.0±5.48 mmHg, experimental 2 82.0±4.47 mmHg). Statistical analysis indicated no significant differences in blood pressure across time points or groups. The intervention led to notable waist circumference reduction, particularly in experimental 2, while blood pressure levels remained unaffected across all groups.

Table 3: Comparison of Triglycerides, Total Cholesterol, and Random Blood Sugar

Table 3 indicates reductions in triglycerides, total cholesterol, and random blood sugar, particularly in the experimental groups. Triglycerides decreased marginally in the control group (164.0±4.0 to 162.5±2.5 mg/dL) and more notably in experimental 1 (167.0±37.0 to 155.5±32.5 mg/dL) and experimental 2 (207.5±11.5 to 194.5±12.5 mg/dL). Total cholesterol declined slightly in the control group (164.5±13.44 to 161.5±4.95 mg/dL) and markedly in experimental 1 (199.5±55.86 to 180.0±45.26 mg/dL) and experimental 2 (214.0±39.60 to 181.5±23.34 mg/dL). Random blood sugar remained stable in the control group (117.5±10.61 to 117.0±9.90 mg/dL) but decreased significantly in experimental 1 (158.5±43.13 to 142.5±38.89 mg/dL) and experimental 2 (169.0±41.01 to 147.5±31.82 mg/dL). Experimental groups exhibited greater improvements in lipid profile and glucose control, reflecting the positive metabolic impact of the intervention.

DISCUSSION

The study revealed that both experimental groups experienced statistically significant reductions in body weight ($p<0.05$) and BMI ($p<0.05$) compared to the control group, with waist circumference also significantly reduced ($p<0.01$). Moreover, significant improvements were observed in triglycerides, total cholesterol, and random blood sugar levels ($p<0.05$), while blood pressure remained stable ($p>0.05$). These findings are consistent with prior research demonstrating the effectiveness of combined dietary, behavioral, and physical activity interventions in obesity management and metabolic improvement. Specifically, Gariballa *et al.* reported reductions in body weight and fat mass in intervention groups, aligning with the results observed in this study [15]. Additionally, Davies *et al.* found substantial reductions in waist circumference, particularly in those undergoing weight loss interventions, further corroborating the current findings [16]. Improvements in triglycerides and blood sugar were also consistent with studies by Jafarirad *et al.* and Kannan *et al.*, who demonstrated the positive effects of dietary interventions on lipid profiles and glycemic control [17-18]. However, blood pressure remained unchanged in this study, which aligns with the findings of Sutton *et al.* who observed stable blood pressure in interventions focused on dietary changes without substantial weight loss [19]. Horne *et al.* showed that interventions lead to substantial changes in weight and BMI, while Emrani *et al.* highlighted the role of dietary strategies, like egg consumption, in promoting weight control and reducing BMI [20,21].

CONCLUSION

This pilot study demonstrates that the combined use of curry leaf supplementation and aerobic exercise effectively reduces weight, BMI, and metabolic risk factors among obese women. The findings support the feasibility and benefit of a multi-faceted approach in obesity management and provide a basis for larger, controlled studies.

LIMITATIONS

A limitation of the study is the lack of long-term follow-up to assess the sustainability of results. Additionally, the intervention showed no effect on blood pressure, and individual adherence may have influenced outcomes. The sample size and demographic diversity may also limit the generalizability of the findings.

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