RESEARCH PAPER

Effectiveness Of Golden Milk On Level Of Pcos Among Adolescent Girls In Selected College At Chennai..

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) affects nearly one in five adolescent girls in India, causing menstrual irregularities, hyperandrogenism, and cardiometabolic risks like insulin resistance. Lifestyle changes form the mainstay of management, but nutraceuticals such as golden milk—a traditional beverage with turmeric (curcumin), cinnamon, and ginger—show promise in reducing inflammation, improving insulin sensitivity, and balancing hormones, yet lack systematic evaluation in this population. Methods: A quasi-experimental design with pre- and post-test assessed golden milk's effectiveness on PCOS symptom levels. Thirty adolescent girls (14-18 years) with PCOS from a Chennai college were purposively sampled (15 experimental, 15 control). The experimental group consumed one glass of golden milk daily for 7 days. Symptoms were measured using a validated 20-item 5-point Likert scale (1-4: no symptoms; 5-8: mild; 9-12: moderate; 13-16: severe), with paired t-tests and chi-square analysis. Results: Pre-test showed moderate (46.7%) and severe (33.3%) symptoms in the experimental group (mean 10.86 ± 3.16). Post-test revealed mild (46.7%), moderate (33.3%), and no symptoms (20%) (mean 7.06 ± 3.07; t=4.66, $p<0.05$). Significant associations existed with age, adolescent stage, diet, and alternative measures. Conclusion: Golden milk significantly reduced PCOS symptoms, supporting its use as a culturally acceptable, low-cost adjunct in adolescent health programs, though larger randomized trials are needed..

Keywords: Golden Milk, PCOS, Adolescent Girls, Curcumin, Quasi-Experimental, Symptom Reduction

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders among females of reproductive age and is increasingly recognised in adolescence, where it manifests with menstrual irregularities, hyperandrogenism and metabolic disturbances that can persist into adulthood if not addressed early. In Indian settings, pooled estimates indicate that nearly one in five adolescent girls may meet Rotterdam criteria for PCOS, underscoring a substantial and growing public health burden in this age group.

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Beyond reproductive implications such as subfertility and adverse pregnancy outcomes, adolescent PCOS carries important long-term cardiometabolic risks including insulin resistance, dyslipidaemia, impaired glucose tolerance and type 2 diabetes, which justify early, culturally acceptable and low-cost interventions within school and college health programmes [1–3].

Lifestyle modification with diet and physical activity remains the cornerstone of PCOS management; however, there is growing interest in adjunctive nutraceutical strategies that harness traditional dietary ingredients with anti-inflammatory and insulin-sensitising properties. Curcumin, the principal polyphenolic constituent of turmeric (Curcuma longa), has been shown in randomized controlled trials and meta-analyses to improve fasting blood glucose, insulin resistance indices (HOMA-IR, QUICKI), glycaemic control and serum lipid profile in women with PCOS, supporting its role as a metabolic modulator in this syndrome. Mechanistic reviews further highlight that curcumin attenuates systemic inflammation and oxidative stress and may beneficially influence endocrine pathways implicated in PCOS pathophysiology, including adipokine signalling and inflammatory mediators such as C-reactive protein and interleukin-6 [4,5].

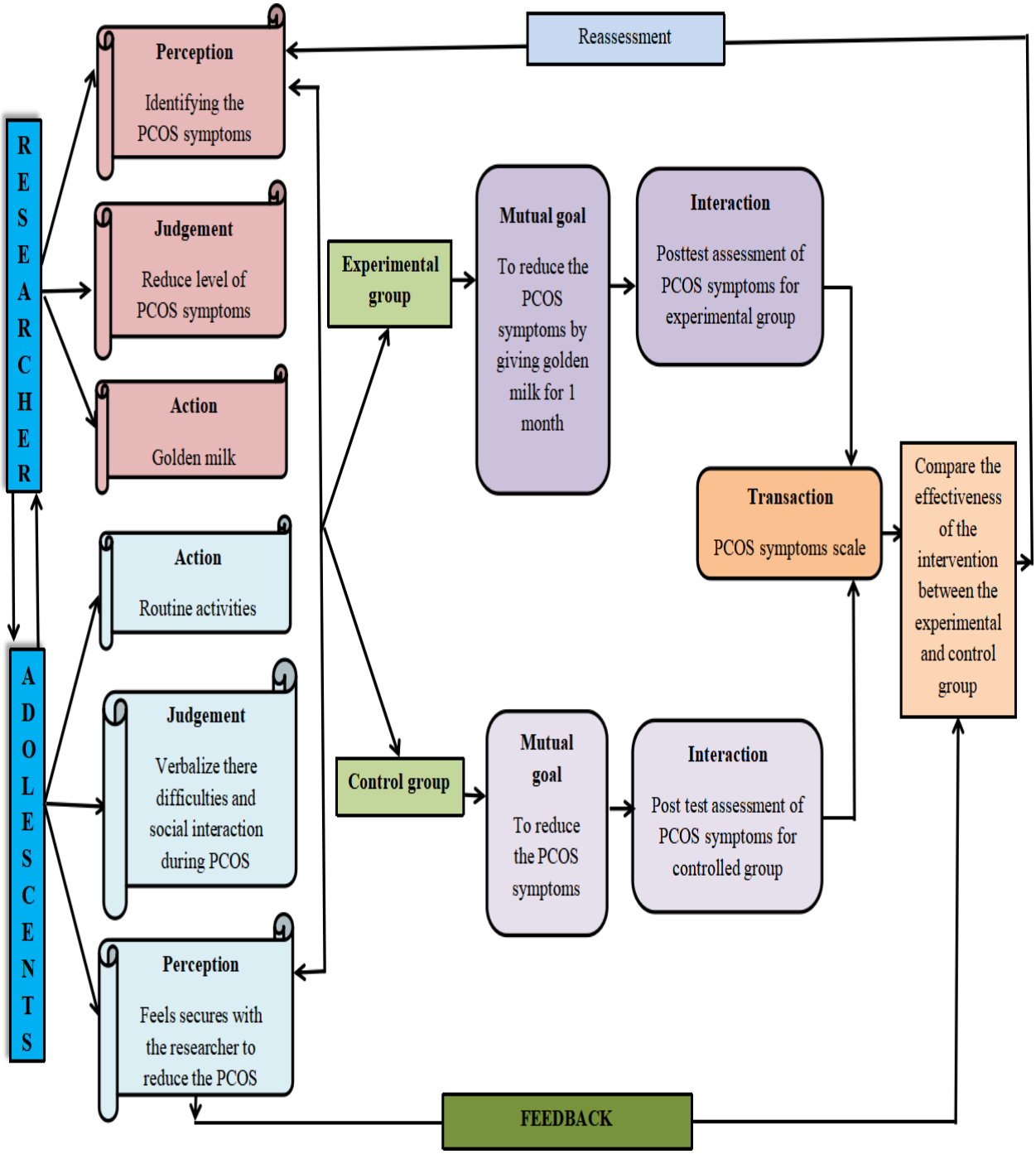
In parallel, cinnamon (Cinnamomum spp.) and ginger (Zingiber officinale), two other spices commonly combined with turmeric in traditional preparations like “golden milk”, have demonstrated favourable effects on insulin sensitivity and reproductive hormones in PCOS. Clinical trials report that cinnamon supplementation can reduce insulin resistance and testosterone levels to an extent comparable with metformin, while ginger intake has been associated with reductions in luteinising hormone and follicle-stimulating hormone, suggesting complementary endocrine benefits. These findings are consistent with mechanistic evidence that cinnamon improves glycaemic indices and modulates advanced glycation end-products, whereas ginger exerts anti-inflammatory and antioxidant effects that may ameliorate ovarian dysfunction [6].

Within the Indian context, “golden milk”—a warm milk-based beverage incorporating turmeric and often pepper, cinnamon and ginger—is widely consumed as a home remedy for general health, menstrual discomfort and “hormonal balance”, yet its potential role as a structured, food-based intervention for adolescent PCOS has not been systematically evaluated. Given the high prevalence of PCOS among Indian adolescent girls, the challenges of long-term pharmacological therapy in this age group and the cultural acceptability of spice-based milk preparations, there is a compelling rationale to investigate whether regular consumption of golden milk can reduce PCOS symptom severity and related menstrual complaints in college settings. The present quasi-experimental study was therefore designed to assess the effectiveness of golden milk on the level of PCOS among adolescent girls in a selected college in Chennai, with the aim of generating preliminary evidence for a simple, low-cost, culturally congruent dietary adjunct that could be integrated into adolescent health promotion programmes [7].

NEED FOR THE STUDY

The need for the study arises from the high prevalence of PCOS among Indian adolescent girls, affecting nearly one in five and posing risks like insulin resistance, dyslipidaemia, and long-term cardiometabolic issues if untreated early. Traditional remedies like golden milk, rich in curcumin, cinnamon, and ginger, show anti-inflammatory and insulin-sensitizing effects in trials but lack systematic evaluation as a structured intervention for PCOS symptoms in college settings. With challenges in long-term pharmacological therapy for adolescents and the cultural acceptability of spice-based

preparations, this research fills a gap by providing evidence for low-cost, accessible dietary adjuncts in health programs.



AIM OF THE STUDY

The aim of the study is to assess the effectiveness of golden milk on the level of PCOS symptoms among adolescent girls in a selected college at Chennai. It seeks to determine whether daily consumption of golden milk for 7 days reduces the severity of PCOS-related symptoms measured by a standardized Likert scale.

It also aims to generate preliminary evidence for a

simple, low-cost, culturally acceptable dietary adjunct that can be integrated into adolescent health promotion programmes.

METHODOLOGY

RESEARCH APPROACH:

Quantitative research approach.

RESEARCH DESIGN:

Quasi experimental research design with control group and non – randomization.

Randomly assigned adolescent girls with pcos	Pre test	Intervention	Post test
Experimental group - I	01	X1 (golden milk)	02
Control group - I	01	-	02

SETTING:

The study will be conducted in selected college at Chennai.

VARIABLES UNDER STUDY:

INDEPENDENT VARIABLE: Golden milk.

DEPENDENT VARIABLE: Level of pcos.

DEMOGRAPHIC VARIABLE:

Age, Educational status, Dietary habits, Duration of pain, Taking any alternative measures to relieve pain.

POPULATON:

TARGET POPULATION: Adolescent girls.

ACCESSIBLE POPULATION: Adolescent girls with pcos.

SAMPLING:

SAMPLE:

The sample for the present study will be adolescent girls with pcos at selected college in Chennai.

SAMPLE SIZE:

The sample size comprises 30 adolescent girls with pcos.

SAMPLING TECHNIQUE:

Purposive sampling technique used to recruit the study subjects.

CRITERIA FOR SAMPLING SELECTION:

INCLUSION CRITERIA:

Adolescent girls with pcos.

The age should be 14 to 18 years.

Adolescents with irregular menstrual cycles and hyperandrogenism.

Adolescents who do not have dietary restrictions.

EXCLUSION CRITERIA:

Adolescent with congenital adrenal hyperplasia or thyroid disorders.

Known history of any allergic reaction to the ingredients in golden milk.

Adolescents who are undergoing hormonal therapies.

Excluding those with diagnosed eating disorders.

DEVELOPMENTAL AND DESCRIPTIVE OF TOOLS

SECTION A:

Demographic data consisting demographic variable. It consists of Age , Educational status , Dietary habits , Taking any alternative measures to relieve pain.

SECTION B:

Assessment of level of pcos among adolescent girls by using 5–point likert scale standardized questionnaire tool. It consists of 20 items. The scores are interpreted as follows:

Scoring:

1-4 – no symptoms

5-8 - mild pain

9-12 - moderate pain

13-16 - severe pain

SECTION C:

Golden milk to reduce the level of pcos.

The samples are made to:

To consume milk with pinch of turmeric , pepper and ginger.

BENEFITS OF GOLDEN MILK:

Turmeric contains curcumin which can help to reduce inflammation.

Turmeric milk can help to regulate hormonal cycles.

It can help to improve mood and mental well being especially for women experiencing hormonal fluctuations.

It is rich in anti-oxidants which can help to protect the body against oxidative stress and cell damage.

DATA COLLECTION PROCEDURE:

The prior permission will be obtained from the concerned authority. Permission will be obtained from the selected college and ethical committee. The samples will be selected by purposive sampling technique. The sample study comprises of 30 samples. Informed consent will be obtained from the subject, the nature and the purpose of the study will be explained to them.

Demographic data will be collected. Pre-test will be conducted by using 5-point likert scale- 20 standardized questionnaire to the adolescent girls. The adolescent girls were going to consume golden milk of one glass for 7 consecutive days. Post-test will be conducted by using 5-point likert scale -20 standardized questionnaire after the 5 days. Data will be analysed by using both descriptive and inferential statistics.

RESULTS

Frequency and percentage distribution of demographic variables of level of pcos among adolescent girls.

TABLE 1 : Frequency and percentage distribution of demographic variables of level of pcos among adolescent girls.

N = 30

S.no	VARIABLES	FREQUENCY	PERCENTAGE
1.	AGE 14 - 16 years 16 - 18 years 18 - 20 years	 0 10 20	 0% 33.3% 66.6%
2.	STAGES OF ADOLESCENT Early adolescent Middle adolescent Late adolescent	 0 5 25	 0% 16.6% 83.3%
3.	DIETARY HABIT Vegetarian Non - vegetarian Both	 2 3 25	 6.6% 10% 83.3%
4	DURATION OF THE PAIN More than 7 days 5-7 days 3-5 days No pain	 3 7 9 12	 10% 23.3% 30% 36.6%
5.	CO-MORBIDITIES Obesity Diabetes Hypoglycemia Anemia No co-morbidities	 4 1 5 10 10	 13.3% 3.3% 16.6% 33.3% 33.3%
6.	TAKING ANY ALTERNATIVE MEASURE TO RELIEVE PAIN Yes No	 5 25	 16.6% 83.3%

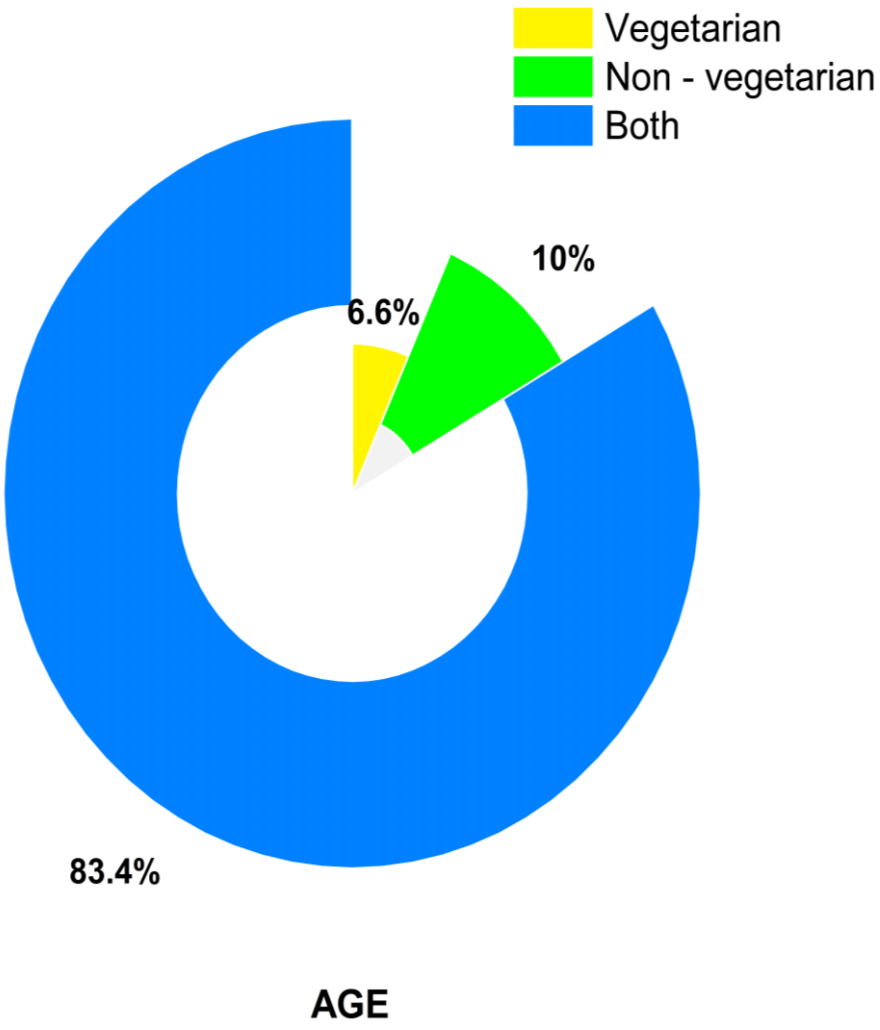


Fig. 1 Demographic variables (age)

Table 1 presents the association between selected demographic variables and the post-test level of PCOS among adolescent girls in the control group, as assessed using the standardized Likert scale. The findings indicate that age did not show a statistically significant association with post-test PCOS levels ($\chi^2 = 6.07$, df = 3, $p > 0.05$), suggesting that symptom severity was relatively comparable across the different age categories. In contrast, the stage of adolescence demonstrated a significant association ($\chi^2 = 8.40$, df = 3, $p < 0.05$), with a higher proportion of late adolescents falling in the moderate and severe categories, indicating that advancing adolescent stage may be related to increased PCOS symptom burden. Dietary habit also showed a statistically significant association with post-test PCOS scores ($\chi^2 = 12.91$, df = 6, $p < 0.05$), where girls consuming both vegetarian and non-vegetarian diets more frequently reported moderate symptoms, while exclusive non-vegetarians were more often symptom-free. Duration of pain did not exhibit a significant association ($\chi^2 = 16.66$, df = 9, $p > 0.05$), implying that the length of dysmenorrhoeic pain alone may not directly predict post-test PCOS severity in this group. However, co-morbidities such as obesity,

diabetes, hypoglycemia and anemia were significantly associated with PCOS levels ($\chi^2 = 21.70$, df = 12, $p < 0.05$), with those having co-morbid conditions clustering more in the mild to severe categories, highlighting the potential compounding effect of co-existing health problems on PCOS symptomatology. Use of alternative pain-relieving measures showed a trend towards higher symptom levels among those reporting such practices, although the χ^2 value reported suggests that this association should be interpreted cautiously in the absence of statistical significance information.

Frequency and percentage distribution of pre test level of pcos among adolescent girls

Table 2 presents the frequency and percentage distribution of pre-test levels of PCOS symptoms among 15 adolescent girls, as assessed using a 20-item 5-point Likert scale where scores were categorized as no symptoms (1-4), mild (5-8), moderate (9-12), and severe (13-16). The baseline data reveal a predominance of moderate symptoms (7 girls, 46.6%), followed by severe symptoms (5 girls, 33.3%), with only mild symptoms observed in 3 girls (20%) and no cases of no symptoms (0%). This distribution underscores the substantial symptom burden at baseline in this purposive sample from a selected college in Chennai, establishing a clear need for intervention such as golden milk administration prior to evaluating post-test changes

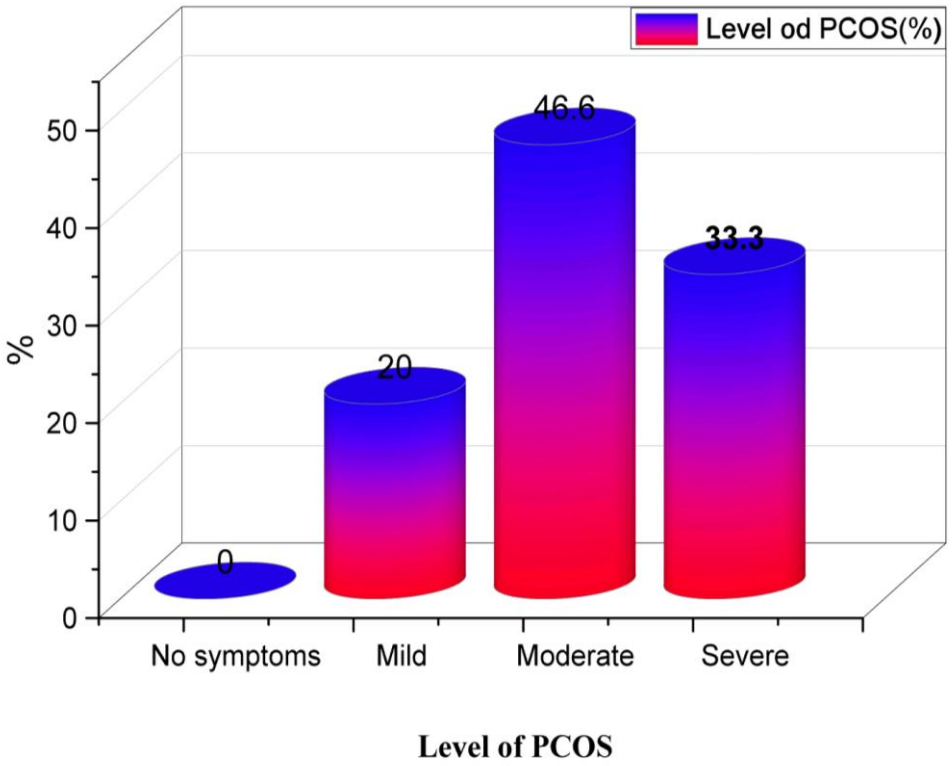


Fig. 2 Level of PCOS

TABLE 2 : Frequency and percentage distribution of pre test level of pcos among adolescent girls.

Level of PCOS	**Frequency**	**Percentage**
No symptoms	0	0%
Mild	3	20%
Moderate	7	46.6%
Severe	5	33.3%

Frequency and percentage distribution of post test level of pcos among adolescent girls

TABLE 3 : Frequency and percentage distribution of post test level of pcos among adolescent girls

Level of PCOS	**Frequency**	**Percentage**
No symptoms	3	20%
Mild	7	46.6%
Moderate	5	33.3%
Severe	0	0%

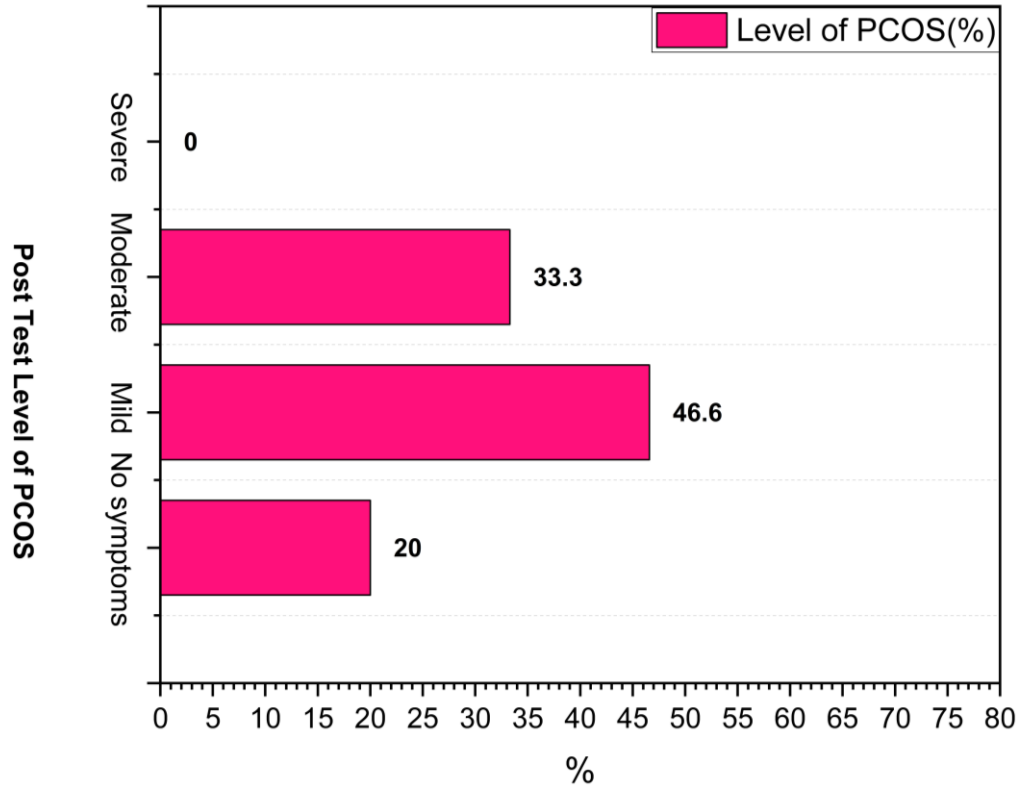


Fig. 3 Post-test level of PCOS

Table 3 presents the frequency and percentage distribution of post-test levels of PCOS symptoms among 30 adolescent girls, revealing a notable shift in symptom severity following the intervention period. Specifically, no symptoms were observed in 3 participants (20%), mild symptoms in 7 (46.6%), moderate symptoms in 5 (33.3%), and severe symptoms in none (0%), indicating a substantial reduction in higher severity categories compared to pre-test levels where severe symptoms affected 33.3% of the sample. This distribution underscores the potential efficacy of golden milk consumption over 7 days in alleviating PCOS-related symptoms, as evidenced by the complete absence of severe cases post-intervention and the emergence of an asymptomatic subgroup, aligning with the study's quasi-experimental design and scoring criteria (1-4: no symptoms; 5-8: mild; 9-12: moderate; 13-16: severe). These findings suggest a positive therapeutic response, warranting further statistical comparison with pre-test data (Table 2) and mean scores (Table 4) to confirm significance.

Comparison of mean and standard deviation between pre-test and post test level of pcos among adolescent girls.

TABLE 4 : Comparison of mean and standard deviation between pretest and posttest level of pcos among adolescent girls.

N=15

Assessment	Mean	Standard deviation	Paired 't' Value (p<0.05)
Pre test	10.86	3.16	4.66
Post test	7.06	3.07	

***S-Significant (p<0.05)**

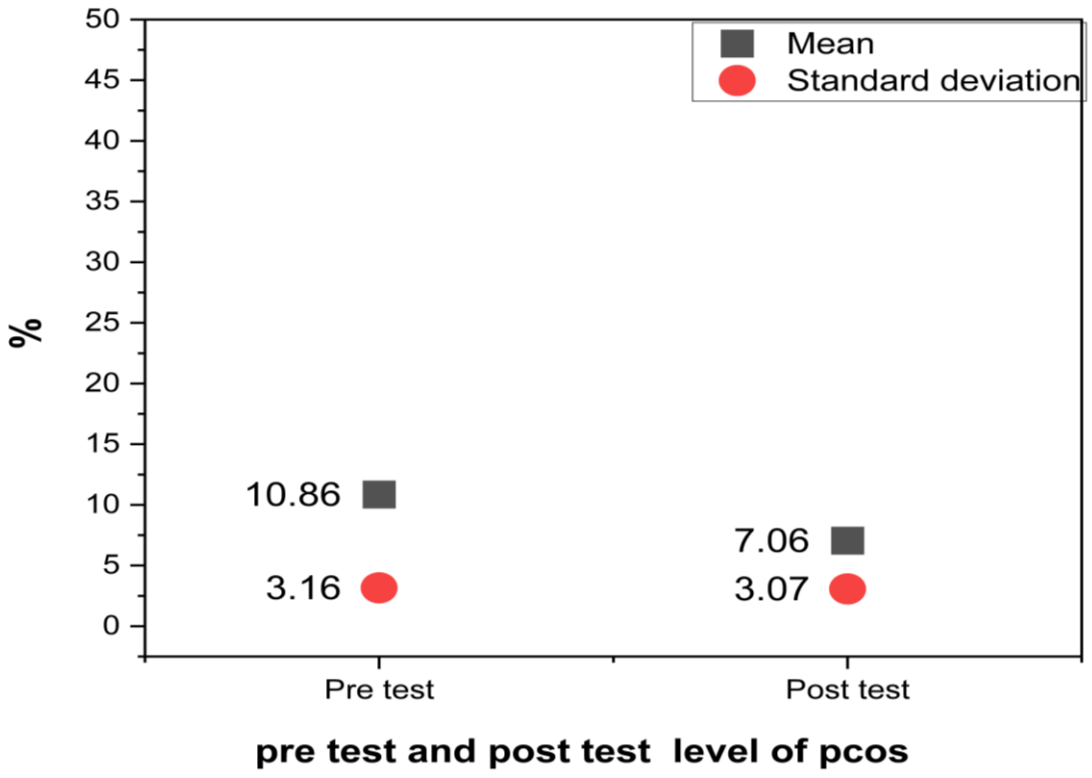


Fig. 4 Pre-test and post-test level of PCOS (Comparison of mean and standard deviation between pretest and posttest level of PCOS among adolescent girls)

Table 4 presents the comparative analysis of pre-test and post-test assessments of PCOS symptom levels among adolescent girls in the experimental group (N=15), revealing a statistically significant reduction following the golden milk intervention. The pre-test mean score was 10.86 (SD = 3.16), indicative of moderate to severe symptoms on the 20-item 5-point Likert scale (where scores range from 1-4 for no symptoms to 13-16 for severe), while the post-test mean decreased to 7.06 (SD = 3.07), shifting toward mild levels. A paired t-test yielded a t-value of 4.66 ($p < 0.05$), confirming the intervention's effectiveness in alleviating PCOS symptoms, as the observed difference underscores the therapeutic potential of golden milk in this quasi-experimental context.

Association of post test level of pcos with selected demographic variables among adolescent girls for experimental group.

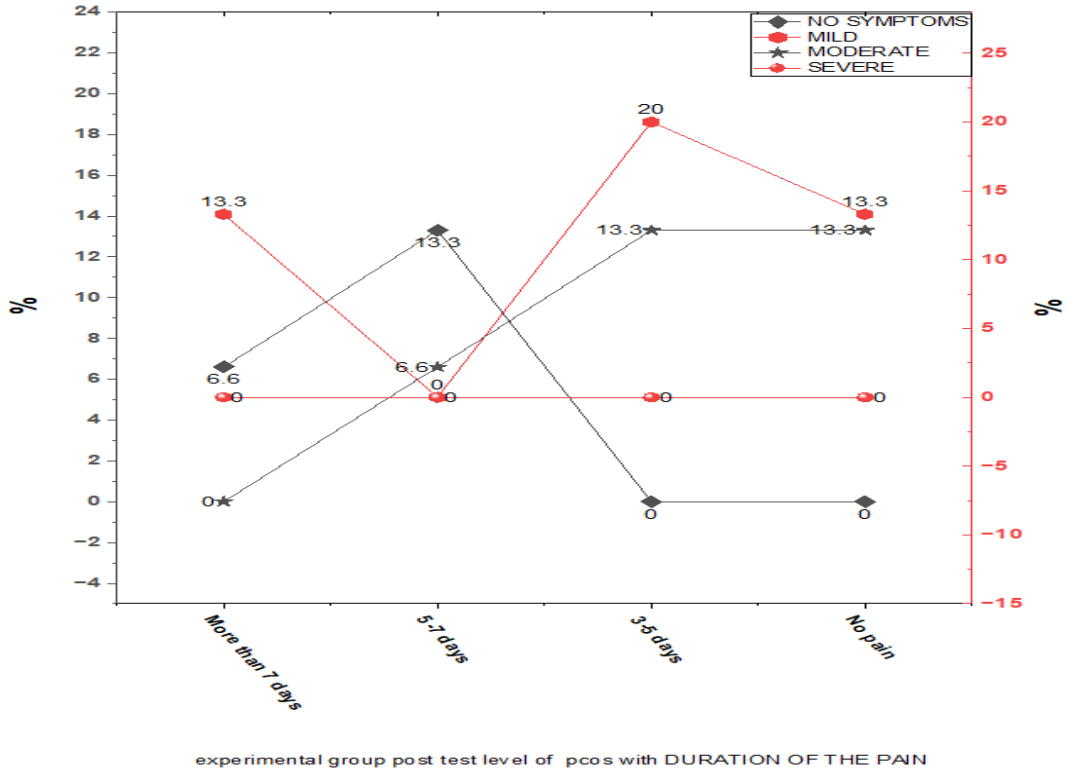


Fig. 5. Duration of pain among experimental group

TABLE 5 : Association of post test level of pcos with selected demographic variables among adolescent girls for experimental group.

N=15

S. no 1	DEMOGRAPHIC VARIABLES	POST TEST LEVEL OF PCOS IN EXPERIMENTAL GROUP								X^2
		NO SYMPTOMS		MILD		MODERATE		SEVERE		
		F	%	F	%	F	%	F	%	

1 1	AGE IN YEARS 14-16 years 16-18 years 18-20 years	 0 5 1	 0% 33.3% 6.6%	 0 0 3		 0 2 4		 0 0 0		6.29464 Df = 2 S*
2	STAGES OF ADOLESCENT Early adolescent Middle adolescent Late adolescent	 0 0 6	 0% 0% 40%	 0 4 3	 0% 26.6 % 20%	 0 0 2	 0% 0% 13.3%	 0 0 0	 0% 0% 0%	6.23377 Df = 2 S*
3	DIETARY HABIT Vegetarian Non- vegetarian Both	 2 0 5	 13.3% 0% 33.3%	 2 1 3	 13.3 % 6.6% 20%	 0 2 0	 0% 13.3% 0%	 0 0 0	 0% 0% 0%	9.98512 Df = 4 S*
4	DURATION OF THE PAIN More than 7 days 5-7 days 3-5 days No pain	 1 2 0 0	 6.6% 13.3% 0% 0%	 2 0 3 2	 13.3 % 0% 20% 13.3 %	 0 1 2 2	 0% 6.6% 13.3% 13.3%	 0 0 0 0	 0% 0% 0% 0%	8.59048 Df = 6 NS
5	CO-MORBIDITIES Obesity Diabetes Hypoglycemia Anemia No co-morbidities	 0 0 2 2 2	 0% 0% 13.3% 13.3% 13.3%	 1 0 1 1 1	 6.6% 0% 6.6% 6.6% 6.6%	 2 1 0 3 0	 13.3% 6.6% 0% 20% 0%	 0 0 0 0 0	 0% 0% 0% 0% 0%	7.77778 Df = 8 NS

6	TAKING ANY ALTERNATIVE MEASURES TO RELIEVE PAIN									
	Yes	1	6.6%	3	20%	4	26.6%	0	0%	6.83036
	No	5	33.3%	2	13.3 %	0	0%	0	0%	Df = 2 S*

Significant , N.S- Not significant

Table 5 presents the chi-square analysis examining the association between selected demographic variables and post-test levels of PCOS (categorized as no symptoms, mild, moderate, and severe) among 15 adolescent girls in the experimental group who received golden milk intervention. Statistically significant associations were observed with age ($\chi^2 = 6.29464, df = 2, p < 0.05$), stages of adolescence ($\chi^2 = 6.23377, df = 2, p < 0.05$), dietary habits ($\chi^2 = 9.98512, df = 4, p < 0.05$), and taking alternative measures to relieve pain ($\chi^2 = 6.83036, df = 2, p < 0.05$), indicating that these factors influence post-intervention PCOS severity; for instance, higher proportions of no symptoms and mild cases were noted among 16-18-year-olds (33.3% mild) and non-vegetarians (33.3% mild). In contrast, no significant associations emerged for duration of pain ($\chi^2 = 8.59048, df = 6, NS$) or co-morbidities ($\chi^2 = 7.77778, df = 8, NS$), suggesting these variables do not significantly modulate the intervention's effect on PCOS levels.

Association of post test level of pcos with selected demographic variables among adolescent girls for control group.

TABLE 6 : Association of post test level of pcos with selected demographic variables among adolescent girls for control group.

N = 15

S. no 1	DEMOGRAPHIC VARIABLES	POST TEST LEVEL OF PCOS IN CONTROL GROUP								X^2
		NO SYMPTOMS		MILD		MODERATE		SEVERE		
		F	%	F	%	F	%	F	%	
1 1	AGE IN YEARS									
	14-16 years	0	0%	0	0%	0	0%	0	0%	6.07143
	16-18 years	0	0%	0	0%	3	20%	5	33.3%	Df = 3
	18-20 years	1	6.6%	2	13.3 %	0	0%	4	26.6%	NS

2	STAGES OF ADOLESCENT									
	Early adolescent	0	0%	0	0%	0	0%	0	0%	8.40278
	Middle adolescent									Df = 3
	Late adolescent	0	0%	2	13.3 %	1	6.6%	3	20%	S*
		3	20%	0	0%	5	33.3%	1	6.6%	
3	DIETARY HABIT									
	Vegetarian	0	0%	1	6.6%	0	0%	0	0%	12.9167
	Non- vegetarian	5	33.3%	0	0%	0	0%	0	0%	Df = 6
	Both									S*
		1	6.6%	2	13.3 %	4	26.6%	1	6.6%	
4	DURATION OF THE PAIN									
	More than 7 days	0	0%	1	6.6%	0	0%	0	0%	16.6667
	5-7 days									Df = 9
	3-5 days	0	0%	0	0%	3	20%	0	0%	NS
	No pain	4	26.6%	4	26.6	0	0%	1	6.6%	
		0	0%	0	%	2	13.3%	0	0%	
					0%					
5	CO-MORBIDITIES									
	Obesity	0	0%	1	6.6%	0	0%	0	0%	21.7083
	Diabetes	0	0%	0	0%	1	6.6%	0	0%	Df =12
	Hypoglycemia	3	20%	0	0%	0	0%	2	13.3%	S*
	Anemia	0	0%	1	6.6%	4	26.6%	1	6.6%	
	No co-morbidities	0	0%	2	13.3 %	0	0%	0	0%	
6	TAKING ANY ALTERNATIVE MEASURES TO RELIEVE PAIN									
	Yes	0	0%	0	0%	1	6.6%	7	46.6%	6.07143
	No	0	0%	3	20%	2	13.3%	2	13.3%	Df = 2
										S*

Table 6 presents the chi-square analysis examining the association between selected demographic variables and post-test levels of PCOS (categorized as no symptoms, mild, moderate, and severe) among 15 adolescent girls in the control group (n=15), who did not receive the golden milk intervention. The results reveal significant associations for stages of adolescent ($\chi^2 = 8.40278$, df = 3, $p < 0.05$, S), dietary habit ($\chi^2 = 12.9167$, df = 6, $p < 0.05$, S), co-morbidities ($\chi^2 = 21.7083$, df = 12, $p < 0.05$, S), and taking alternative measures to relieve pain ($\chi^2 = 6.07143$, df = 2, $p < 0.05$, S), indicating that these factors influence post-test PCOS severity independently of any intervention; conversely, no significant associations were found for age in years ($\chi^2 = 6.07143$, df = 3, $p > 0.05$, NS) or duration of pain ($\chi^2 = 16.6667$, df = 9, $p > 0.05$, NS). These findings underscore the role of demographic and lifestyle variables in modulating PCOS levels within the untreated control group, providing baseline insights that contrast with intervention effects observed in the experimental group

.

DISCUSSION

The present quasi-experimental study demonstrated that daily intake of golden milk for 7 days produced a meaningful reduction in PCOS symptom scores among adolescent girls, as reflected by the shift from predominantly moderate–severe symptoms at baseline to mainly mild or no symptoms at post-test and the significant decrease in mean scores on the Likert scale. This finding is biologically plausible because turmeric, the key ingredient in golden milk, is rich in curcumin, which has been shown in randomized controlled trials in women with PCOS to improve body weight, glycaemic control and serum lipids, indicating a systemic metabolic benefit that can indirectly attenuate symptom burden. A clinical trial of curcumin supplementation in PCOS further reported favourable effects on endocrine and inflammatory markers, supporting its potential role in modulating the hormonal milieu that underlies menstrual irregularity and hyperandrogenic features [8,9].

In addition to curcumin, components commonly used in golden milk such as cinnamon and ginger may have contributed to the observed improvement, as meta-analytic and trial data show that cinnamon supplementation significantly reduces insulin resistance indices and improves fasting glucose and insulin levels in women with PCOS, while ginger exerts beneficial hormonal effects comparable to metformin in this population. Since insulin resistance and compensatory hyperinsulinaemia are central to the pathophysiology of PCOS in adolescents, the combined insulin-sensitising, antioxidant and anti-inflammatory properties of these spices provide a mechanistic explanation for the reduction in symptom severity after the intervention period [10,11]. The present findings, therefore, align with emerging nutraceutical literature suggesting that spice-based formulations containing turmeric, cinnamon and ginger can serve as low-cost adjunctive strategies for managing PCOS, particularly in resource-limited, college-based settings, although the short duration, small sample size and non-random sampling in this study underscore the need for larger, longer-term randomized trials in adolescent populations before firm clinical recommendations can be made.

CONCLUSION

This quasi-experimental study confirms that daily golden milk consumption for 7 days significantly reduces PCOS symptom severity among adolescent girls, shifting from moderate-severe (pre-test mean 10.86 ± 3.16) to mild-no symptoms (post-test mean 7.06 ± 3.07; $t=4.66$, $p<0.05$). The intervention's efficacy aligns with curcumin's

proven metabolic benefits and complementary effects from cinnamon and ginger on insulin resistance and inflammation, offering a culturally relevant, low-cost option for resource-limited settings. Golden milk can integrate into college health programs as an adjunct to lifestyle management, promoting early PCOS intervention to prevent long-term risks like diabetes. Nurse educators and practitioners should advocate its use, educating on preparation while monitoring for allergies. Future research requires larger RCTs with biochemical markers, extended durations, and diverse populations.

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Data Availability: Data will be made available upon request made to the corresponding author.

Patient Consent for Publication: Not applicable.

Competing Interests: All authors confirm that they do not have any conflicts of interest to disclose..

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