EFFECTIVENESS OF CINNAMON, EXERCISE AND COUNSELLING ON HYPER ANDROGENIC SYMPTOMS AND LEVEL OF ANXIETY AMONG YOUNG GIRLS WITH POLYCYSTIC OVARIAN SYNDROME

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ABSTRACT:

Background: Polycystic ovarian syndrome (PCOS) is an endocrine metabolic, multifaceted disorder commonly diagnosed among young girls and adult women. Girls with polycystic ovarian syndrome often exhibit hyper androgenic symptoms like hirsutism, acne, alopecia and obesity. Young girls who are overweight & obese are very concerned about their physical appearance, which in turn reflect in their Psychological wellbeing too. So it is very relevant to assess the level of anxiety related to body image disturbance among young girls with polycystic ovarian syndrome. Girls with polycystic ovarian syndrome can modify their lifestyle - including dietary adjustments, exercise, and behavioural alteration, which can ease the metabolic dysfunction. On the other hand, lifestyle modification has now been recognized as the first-line management for PCOS. **Aim:** To determine the effectiveness of cinnamon, exercise and counselling in reducing hyper androgenic symptoms, BMI, waist circumference and anxiety level among young girls with PCOS. **Methods:** Quasi experimental one group pre and posttest design was used in this study. A total of 824 young girls from different colleges in Chennai were screened based on Rotterdam criteria and among that 150 study participants were selected who met the inclusion criteria. self-administered questionnaire was used to collect the baseline data. Modified Ferriman Gallwey scale, Ludwig visual score, Global acne grading scale were used to assess the hyper androgenic symptoms like hirsutism, alopecia and acne respectively. Other markers like BMI, Waist circumference and level of anxiety using Hamilton anxiety scale were also assessed.

Participants were partitioned into three groups, 50 in each group – Non interventional group (only education regarding PCOS), Group A with all three interventions (cinnamon tea, exercise program and anxiety reduction counselling), group B with selected interventions (exercise program and anxiety reduction counselling). Interventions are planned for 6 months. Post-test I, II were conducted after 3rd and 6th month respectively. Non probability Purposive sampling technique was used. Prior permissions were obtained from all institutional heads. consent was acquired from every one of the study participants. **Results:** The present study unveiled the following results. In Modified Ferriman Gallwey scale (Hirsutism), from Pre-test to Post-test 2, the non-interventional group showed no improvement in score, whereas Group A and Group B shown 1 score decrease. In Ludwig visual score (alopecia), the non – interventional group from Pre-test to Post-test 2 had shown no improvement in the score, whereas Group A shown 2 scores decrease and Group B shown 1 score decrease. In Global acne grading scale (acne), from Pre-test to Post-test 2, the non-interventional group showed no improvement in score, whereas Group A and Group B shown 2 scores decrease. This shows that there is reduction in hyper androgenic symptoms like hirsutism, alopecia and acne in experimental groups. In anxiety scale, the non – interventional group from Pre-test to Post-test 2 had no improvement, whereas Group A and Group B shown 2 scores decrease and this shows that there is reduction in the level of anxiety among experimental groups. For all these four scales, Kruskal Wallis one-way ANOVA on ranks shown significance ($P < 0.001$). A multiple comparison test using Tukey's method was carried out, and the results showed a significant reduction in both of the experimental groups. This shows that the Group A and Group B are better than the non – interventional group. This study also revealed that in BMI, the non-interventional group from Pre-test to Post-test 2, shown 1.7% increase in BMI, while in group A and group B, 4.4% and 3.02 % reduction in BMI was observed. This clearly shows that the group A is superior to group B and non-interventional group. In waist circumference the non-interventional group from Pre-test to Post-test 2, 0.3% increase in waist circumference was observed, while in group A and group B, 1.6% and 0.6 % reduction was observed. Hence it revealed that group A and group B are better than the Non interventional group. The Group A is superior to group B. **Conclusion:** This study spotlighted the beneficial role of cinnamon tea, exercise program and anxiety reduction counselling in reducing the hyper androgenic symptoms like hirsutism, acne, alopecia, BMI, waist circumference and also the level of anxiety among young girls with Polycystic ovarian syndrome. As a result, the research recommends this multi-intervention package that is both economical and time efficient.

Keywords: *effectiveness, cinnamon, exercise, counselling, hyper androgenic symptoms, anxiety, Polycystic ovarian syndrome, young girls.*

INTRODUCTION:

Polycystic ovarian syndrome (PCOS) is a disorder in which women produces an excess of male hormones. Menstrual abnormalities, infertility, excessive hair growth mostly on face and body, acne, hair loss, and obesity are all caused by increased male hormone levels in the body. Long-term health issues such as diabetes, thyroid dysfunction, and heart disease may also emerge. These difficulties to one's self-image lead to anxiety, despair, and poor self-esteem in women with PCOS. As a result, poor life quality in PCOS may impair women's motivation to adopt good eating habits, capacity to exercise, and follow healthy lifestyle. Hence, it is equally critical to uncover psychological factors that promote self-esteem as well as behavioural change. PCOS affects women between the ages of 15 and 44, when they are in reproductive age. PCOS affects 2.2 to 26.7 percent of women in this age bracket. PCOS was prevalent in 12.18% (23) of Pondicherry residents and 9.8% (24) of Thiruvananthapuram residents. These results raise concerns about the increased prevalence of PCOS in southern India. Although the cause of PCOS is unknown, scientists think that environmental and genetic factors have a significant role. Evidence suggests that lifestyle adjustments combined with organised counselling programmes are currently the first-line treatment for lowering hyper androgenic symptoms and anxiety levels in women with PCOS.

MATERIALS AND METHODS:

Quasi experimental pre and posttest design was used in this study. The Study was conducted in selected colleges at Chennai. A total of 824 young girls were screened based on Rotterdam criteria and recruited. Self-administered questionnaire was used to collect the baseline data. Modified Ferriman Gallwey scale, Ludwig visual score, Global acne grading scale were used to assess the hyper androgenic symptoms like hirsutism, alopecia and acne respectively. Other markers like level of anxiety using Hamilton anxiety scale, BMI and Waist circumference were also assessed. 150 young girls with PCOS were selected who met with the inclusion criteria. Non probability Purposive sampling technique was used. The study was approved by Tagore institutional ethics committee. Written consent was acquired from every one of the study participants. After recruiting the participants, they were partitioned into three groups (50 participants in every group).

Non interventional group (n=50): only education related to PCOS
Group A (n=50): cinnamon tea, exercise program and anxiety reduction counselling
Group B (n=50): exercise program and anxiety reduction counselling

Interventions:

I. Oral cinnamon tea:

1.5 grams of cinnamon powder mixed in 100ml of warm water was given during break time once in a day for 5 days in a week for 6 months. The cinnamon tea was prepared daily by the researcher and provided to the students during the break time.

II. Exercise program:

One-hour exercise program was given once a day in the evening for 5 days in a week for 6 months. Cardio exercise and strength training exercises were practiced in the alternate days.

III. Anxiety reduction Counselling:

Participants whose anxiety level was mild and moderate based on Hamilton anxiety scale were given counselling to reduce their anxiety level. Counselling was given by the researcher. The counselling sessions was planned as follows

Session I: Introduction or Orientation Phase

Session II: Psychoeducation regarding the PCOS. The researcher explains in detail about the signs and symptoms, co morbidities, self-image disturbances and anxiety related to PCOS.

Session III: Specific Concern: After 1 week Jacobson progressive Muscle Relaxation Technique (JPMR) was planned.

Session IV: After 1-week interval - Diaphragmatic breathing technique was planned.

Session V: After a week, behavioural modification session is planned - Counselling on diet, exercise and sleep was given.

Session VI: After a week of time, feedback session was planned. The researcher obtain feedback from the participants.

Session VII: Termination phase.

Ethical consideration:

The present study was approved by Institutional Ethics Committee, Tagore Medical College and Hospital IEC NO: 32/MAR/2021 Dated: 18.03.2021.

Data analysis:

For groups, tests, and group X test interaction comparisons, the methods were compared (parametric data) using two-way appropriate statistical variance analysis (2-way RM ANOVA). When a significant difference was discovered, multiple comparisons were performed using the Bonferroni 't' test for both between and within subsequent analyses. Friedman replicated measurements ANOVA on rankings with Dunnett's multiple comparison test as well as Kruskall Wallis testing with Dunnett's multiple

comparison test were used to evaluate the medians (nonparametric data). Statistical significance was defined as a chance of 0.05 or less. For statistical analysis and graph charting, the Sigma Plot 14.5 versions (Systat Software Inc., USA) was utilised.

Results:

Table 1 - Comparison of Non interventional, group A and B of pre-test, post-test 1 and post-test 2 on hyper androgenic symptoms (hirsutism, acne and alopecia) and anxiety level in young girls with polycystic ovarian syndrome.

S.No.	Variable	Groups	Test	Median	Percentile	Statistical analysis
1	Modified Ferriman Gallwey scale	Non - interventional	Pre-test	3	2 – 3	H = 248.794 P < 0.001
		Group A		2	2 – 3	
		Group B		3	2 – 3	
		Non - interventional	Post-test 1	3	3 – 3	
		Group A		2	2 – 2	
		Group B		3	2 – 3	
		Non - interventional	Post-test 2	3	3 – 3	
		Group A		1	1 – 1	
		Group B		2	2 – 2	
2	Ludwig visual score	Non - interventional	Pre test	2	1 - 2	H = 222.258 P < 0.001
		Group A		2	1 - 2	
		Group B		2	2 - 2	
		Non - interventional	Post-test 1	2	1 - 2	
		Group A		1	1 - 1	
		Group B		1	1 - 2	
		Non - interventional	Post-test 2	2	2 - 2	
		Group A		0	0 - 1	
		Group B		1	1 - 1	
3	Global acne grading scale	Non - interventional	Pre test	2	2 - 3	H = 287.511 P < 0.001
		Group A		3	2 - 3	
		Group B		3	3 - 3	
		Non - interventional	Post-test 1	3	2 - 3	
		Group A		2	1 - 2	
		Group B		2	2 - 2	
		Non - interventional	Post-test 2	3	3 - 3	
		Group A		1	0 - 1	
		Group B		1	1 - 2	

4	Anxiety scale	Non - interventional	Pre test	2	2 - 2	H = 308.921
		Group A		2	2 - 2	P < 0.001
		Group B		2	1 - 2	
		Non - interventional	Post-test 1	2	2 - 2	
		Group A		1	1 - 1	
		Group B		1	0 - 1	
		Non - interventional	Post-test 2	2	1 - 2	
		Group A		0	0 - 0	
		Group B		0	0 - 0	
Non –interventional group = Control; Group A = Experimental 1; Group B = Experimental 2 n = 50 each The 'H' and 'P' values are by Kruskal Wallis ANOVA on ranks with Tukey's multiple comparison test						

Table 2 - Comparison of Non interventional, group A and group B of pretest, posttest 1 and posttest 2 on BMI and Waist circumference in young girls with polycystic ovarian syndrome.

S.No	Group comparison	Test comparison	BMI	WAIST CIRCUMFERENCE
1	Non Interventional Group	Pre-test	28.79 ± 0.19	88.70 ± 0.18
	Group A		29.52 ± 0.13	89.41 ± 0.12
	Group B		29.83 ± 0.14	88.19 ± 0.37
	Non Interventional Group	Post-test 1	29.08 ± 0.19	88.96 ± 0.19
	Group A		28.87 ± 0.13	88.67± 0.12
	Group B		29.44 ± 0.15	87.66 ± 0.41
	Non Interventional Group	Post-test 2	29.27 ± 0.18	89.07 ± 0.18
	Group A		28.22 ± 0.12	87.94 ± 0.12
	Group B		28.98 ± 0.15	87.50 ± 0.37
2.	Significance within group A (Pre and Post-test 1)		t = 12.903 P < 0.001	t = 9.513 P < 0.001
	Significance within group A (Pre and Post-test 2)		t = 25.805 P < 0.001	t = 18.871 P < 0.001
	Significance within group A (Post-test 1 and Post-test 2)		t = 12.903 P < 0.001	t = 9.358 P < 0.001
	Significance within group B (Pre and Post-test 1)		t = 7.797 P < 0.001	t = 6.883 P < 0.001

	Significance within group B (Pre and Post-test 2)	t = 16.861 P < 0.001	t = 8.946 P < 0.001
	Significance within group B (Post-test 1 and Post-test 2)	t = 9.064 P < 0.001	t = 2.062 P = 0.120

Non –interventional group = Control; Group A = Experimental 1; Group B = Experimental 2

n = 50 each.The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni 't' test.

FIGURE – 1

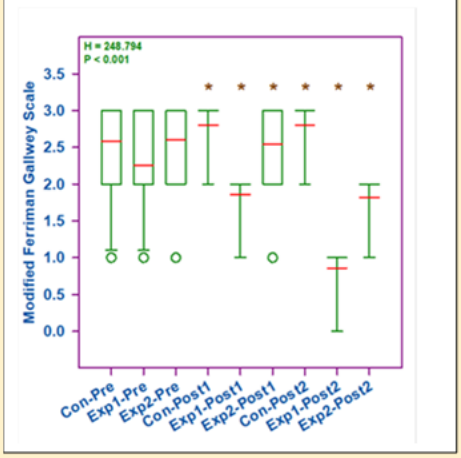

FIGURE 2

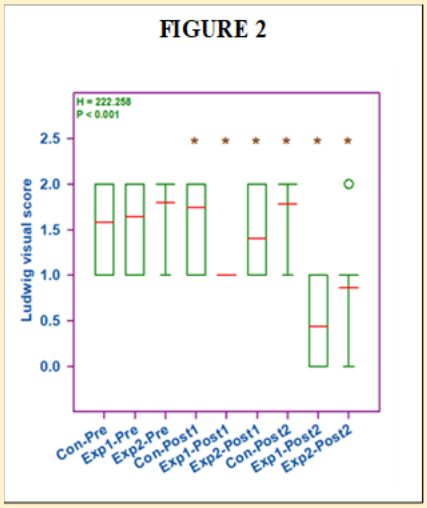

FIGURE 3

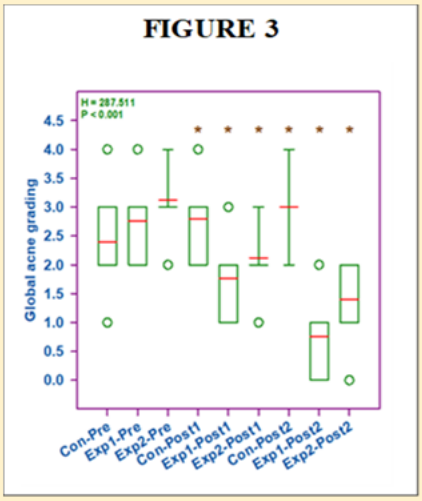

FIGURE 4

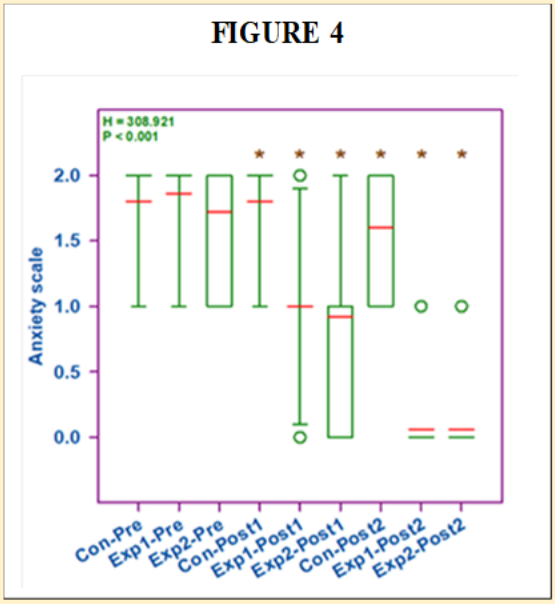

FIGURE 5

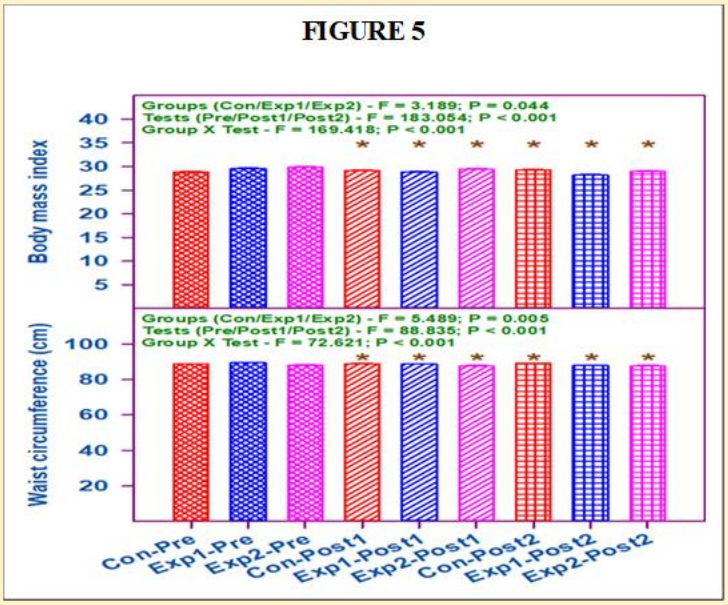

Figure 1,2,3 and 4 shows the Comparison of Non – interventional group (Control), Group A (Experimental 1) and Group B (Experimental 2) groups of pre-test (pre), post-test 1 (Post1) and post-test 2 (Post2) on modified Ferriman Gallwey scale, Ludwig visual score, Global acne grading scale and Anxiety scale among young girls with polycystic ovarian syndrome. The 'H' and 'P' values are by Kruskal Wallis one-way ANOVA with Tukey's multiple comparison test. *Significantly different from the respective pre-test.

Figure 5: Comparison of control (Con), experimental 1 (Exp1) and experimental 2 (Exp2) groups of pre-test (pre), post-test 1 (Post1) and post-test 2 (Post2) on BMI and Waist circumference in women with polycystic ovary syndrome. The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni 't' test. *Significantly different from the respective pre-test.

Table 1 shows the median values of Modified Ferriman Gallwey scale on non – interventional group Pre-test, Group A Pre-test, Group B Pre-test, non – interventional group Post-test 1, Group A Post-test 1, Group B Post-test 1, non – interventional group Post-test 2, Group A Post-test 2 and Group B Post-test 2 are 3, 2, 3, 3, 2, 3, 3, 1 and 2 respectively. Kruskal Wallis one-way ANOVA on ranks shown significance at ($P < 0.001$) level. In the non – interventional group from Pre-test to Post-test 2 there was no improvement in the score, whereas Group A and Group B shown 1 score decrease. Tukey's multiple comparison test was carried out and both the experimental groups shown significant decrease. This shows that the Group A and Group B are better than the non – interventional group.

The median values of Ludwig visual score of non-interventional group Pre-test, Group A Pre-test, Group B Pre-test, and non-interventional group Post-test 1, Group A Post-test 1, Group B Post-test 1, non-interventional group Post-test 2, Group A Post-test 2 and Group B Post-test 2 had scores of 2,2,2,2,1,1,2,0 and 1, respectively. Kruskal Wallis one-way ANOVA on rankings revealed statistical significance ($P < 0.001$). From Pre-test to Post-test 2, no improvement in score was detected in the non-interventional group, while Group A shown 2 scores drop and Group B shown 1 score decrease. Tukey's multiple comparison test was used, and both experimental groups showed a significant reduction. This demonstrates that Group A is superior than Group B and the non-interventional group, and Group B is better than non-interventional group.

The median values of the Global acne grading scale for the non-interventional group Pre-test, Group A Pre-test, Group B Pre-test, non-interventional group Post-test 1, Group A Post-test 1, Group B Post-test 1, non-interventional group Post-test 2, Group A Post-test 2, Group B Post-test 2, and Group B Post-test 2 are 2,3,3,3,2,2,3,1 and 1, respectively. Kruskal Wallis one-way ANOVA on rankings revealed statistical significance ($P < 0.001$). From Pre-test to Post-test 2, the non-interventional group shown one score rise, but Group A and Group B shown two score decreases. Tukey's multiple comparison test was used, and both experimental groups shown a significant reduction. This demonstrates that Groups A and B are better than non-interventional group.

The anxiety scale median values for the non-interventional group Pre-test, Group A Pre-test, Group B Pre-test, non-interventional group Post-test 1, Group A Post-test 1, Group B Post-test 1, non-interventional group Post-test 2, Group A Post-test 2, and Group B Post-test 2 are 2,2,2,2,1,1,2,0 and

0, respectively. Kruskal Wallis one-way ANOVA on rankings revealed statistical significance ($P < 0.001$). From Pre-test to Post-test 2, no improvement in score was detected in the non-interventional group, while Group A and Group B showed 2 score decreases. Tukey's multiple comparison test was used, and both experimental groups showed a significant reduction. This demonstrates that Groups A and B are better than the non-interventional group.

Table-2 shows the BMI as well as waist circumference of the non-interventional group, group A and B. Non interventional Pretest, group A Pre-test, group B Pretest, Non interventional Posttest 1, group A Posttest 1, group B Posttest 1, Non interventional Posttest 2, group A Posttest 2, and group B Posttest 2 had mean values of 28.7,29.5,29.8,29.0,28.8,29.4,29.2,28.2 and 28.9, respectively. A comparison within Group A revealed significance ($P < 0.001$). A comparison within Group B revealed significance ($P < 0.001$). It demonstrates that groups A and B are better than the noninterventional group.

Non interventional Pretest, group A Pretest, group B Pretest, Non interventional Posttest 1, group A Posttest 1, group B Posttest 1, Non interventional Posttest 2, group A Posttest 2, and group B Posttest 2 had mean values of of 88.7,89.4,88.1,88.9,88.6,87.6,89.0,87.9, and 87.5, respectively. A comparison within Group A revealed significance ($P < 0.001$). A comparison of Pretest and Posttest 1 within Group B revealed significance ($P = 0.001$), but Posttest 1 and Posttest 2 revealed no significance ($P = 0.120$). It demonstrates that groups A and B are better than the noninterventional group. Group A is better than Group B.

Discussion:

PCOS is complex which includes reproductive, metabolic, and mental health issues. Women with PCOS have endocrine and ovarian impairment, as well as a high range of metabolic dysfunction, such as overweight and glucose intolerance. In women with PCOS, hyperinsulinemia as compensatory mechanism induces overproduction of ovarian androgens, leading to hyperandrogenism. Hyperandrogenism often exhibit symptoms like hirsutism, alopecia, acne and body weight issues. Cinnamon, a well-known spice for centuries has countless health benefits in it. The recent in-vitro and in-vivo research has discovered new healing properties of cinnamon. Various research evidences show that cinnamon supplementation improves menstrual cyclicity, reduces glucose, triglycerides, low-density lipoprotein (LDL), total cholesterol and also improved insulin sensitivity in women with Polycystic Ovarian Syndrome(PCOS). The other benefits of cinnamon, includes anti-inflammatory, antibacterial, antifungal, and antioxidant properties. Evidences shown that cinnamon can diminish insulin resistance by expanding activation of the IRS/PI-3 kinase insulin signalling pathway. The cinnamon also stimulates auto phosphorylation of the insulin receptor and inhibit protein tyrosine phosphatase I. Through these two components cinnamon make adipocytes to build the glucose take-

up and glycogen synthesis. Cinnamon is also the well-known anti-oxidant which reduces the oxidative stress in the body and thus reducing the symptoms of polycystic ovarian syndrome. The present study shown that consuming cinnamon tea weekly 5 days for 6 months reduced symptoms like hirsutism, alopecia, acne problems, BMI and waist circumference in experimental groups at significant level of $P<0.001$.

Due to the scientific advancements, the common lifestyle exercises are being replaced with modern inventions and technologies. Most of the young girls follow sedentary lifestyle like watching TV, playing video games, spending too much of time in social media, and other gadgets. Thus, the opportunity for physical exercises is limited. Lifestyle alterations such as proper diet, exercise, stress free life, a good rest and sleep are associated with less risk, least cost and do not cause any ill effects on the reproductive system of adolescent girls. Thus, it is beneficial considering lifestyle modifications as a propitious approach for reducing the risk of PCOS. Weight loss is considered as an important treatment modality for PCOS. Weight loss improves physiological, biochemical and psychological parameters of PCOS. weight loss can restore ovulation and pregnancy rates, decreases insulin levels, diminishes hyperandrogenic symptoms, lowers testosterone levels and improves psychological considerations. This study shown that planned exercise program, which includes cardio and strength training exercises practiced in alternate days for 5 days in a week shown the favourable result in reducing PCOS symptoms.

Women with PCOS have both clinical and biochemical signs of hyperandrogenism. Evidences shown a relationship between anxiety and hyperandrogenic symptoms. It has been suggested that women with PCOS have a poor self-esteem, a more negative self-image, and have higher levels of anxiety, depression and psychological distress owing to their body image disturbance. Barry et al. shown that girls with PCOS were significantly had difficulty coping with stress, anxiety and depression than the control group (20). The planned counselling sessions and reduction in the hyperandrogenic symptoms together can help the women with PCOS in reducing their anxiety level.

This study revealed that consuming cinnamon tea, 1 hour of exercise program and anxiety reduction counselling for 6 months shown significant reduction in the Hyper androgenic symptoms and anxiety at the level of $P < 0.001$ which was in concordance with the study of Seyed Mohammad Mousavi et al (2020) illustrated that cinnamon administration significantly decreased Body Weight and Waist Circumference. Greater effects on Body Weight were observed in subjects with a baseline BMI of ≥ 30 kg/m2. (25)

The present study was undertaken to observe the effectiveness of cinnamon, exercise and counselling in reducing hyperandrogenic symptoms and anxiety level of young girls with polycystic ovarian

syndrome. There was a significant reduction (P<0.001) in the PCOS symptoms like hirsutism, alopecia, acne, BMI, waist circumference and anxiety level in group A with all three interventions (cinnamon tea, exercise and anxiety reduction counselling). There was also better reduction in group B with interventions like exercise program and anxiety reduction counselling. Whereas there is no reduction either in the hyperandrogenic symptoms or anxiety level among Non interventional group.

Conclusion:

As the aetiology of PCOS is not- clear, poor lifestyle habits, stress, anxiety and lack of physical activity as considered to be the pre- disposing factors. Evidences shown that by modifying once lifestyle and consuming anti-oxidants will gradually reduce the symptoms of PCOS. The present study results support the beneficial effects of cinnamon, exercise and counselling in reducing the hyper androgenic symptoms like hirsutism, acne, alopecia, BMI, waist circumference and also the level of anxiety among young girls with Polycystic ovarian syndrome. These interventions are cost-effective, less time consuming and it is effective in decreasing the hyper androgenic symptoms, certain physiological symptoms and psychological parameters. Hence, the study recommends cinnamon, exercise and counselling for young girls with Polycystic ovarian syndrome. However, we want further investigations with larger participants to research the impact of cinnamon, exercise program and counselling in reducing the different factors like blood glucose, lipid profile and total testosterone levels among young girls with Polycystic ovarian syndrome.

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