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Effect of Wolly Workout in PCOS and PCOD Patients as Part of Management

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ABSTRACT

Background: PCOS is a prevalent endocrine disorder in reproductive-age females (5% to 15% prevalence). Diagnosis requires two criteria among anovulation, hyperandrogenism and polycystic ovaries. Delayed diagnosis increases risks like infertility, metabolic syndrome, obesity, endometrial cancer, depression, and type 2 diabetes. PCOS results from genetic and environmental factors, including insulin resistance and obesity. Lifestyle interventions, exercise, and proper diet are recommended for management.

Methods: A prospective study of 50 Polycystic Ovary Syndrome patients treated with drug therapy, exercise, yoga, or a healthy diet. Divided into Wolly and Control groups, Wolly received a women-centric fitness program with dance movements, strengthening core and pelvic muscles. After three months, biochemical and hormonal parameters were compared. Benefits included hormonal balance, calorie burning, increased fertility, and postnatal use. Inclusion/exclusion criteria applied.

Results: The study compared the effects of a 12-week weight loss program (WOLLY) on 25 participants to a control group of 25 participants. Both groups had similar demographic characteristics, but the WOLLY group had more successful conceptions. The WOLLY group showed significant improvements in waist circumference, weight, BMI, VO_{2max}, testosterone levels, and fasting glucose levels, while the control group did not show significant improvements in these characteristics. The WOLLY group also showed significant improvements in cholesterol and LDL levels. There were no significant changes in triglyceride and HDL levels in either group.

Conclusion: The study has concluded that the Wolly Program effectively alleviates the clinical features of PCOS/PCOD regarding hormonal and biochemical parameters.

Key-words: PCOS, PCOD, Wolly, Exercise, Yoga, Testosterone

INTRODUCTION

Polycystic ovarian syndrome is a prevalent endocrine condition in women of reproductive age (PCOS). Stein & Leventhal first characterized this in 1935. The prevalence varies between 5% and 15%, depending on the diagnostic criteria. According to specialty society recommendations, at least two of the following three situations for determining that you have PCOS, anovulation, clinical, biological hyperandrogenism, and polycystic ovaries are necessary.

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It is considered an exclusionary diagnosis. Thus, conditions resembling PCOS's clinical characteristics should be ruled out. They include non-classical congenital adrenal hyperplasia, hyperprolactinemia, & thyroid illness. If clinical signs point to alternative causes, specific individuals may require a more thorough workup [1].

PCOS was underdiagnosed despite its high occurrence and frequently necessitated numerous visits or diagnoses by various doctors, which generally take over a year to complete. That is a highly frustrating process again for patients. A delay in diagnosis can lead to an increase in comorbidities, causing it to be harder to implement lifestyle modifications, which are crucial for enhancing PCOS characteristics, such as quality of life [2]. Several morbidities, such as infertility, metabolic syndrome, obesity, reduced tolerance to glucose, and

PCOS, has been associated with endometrial cancer, nonalcoholic fatty liver disease/nonalcoholic steatohepatitis (NAFLD/NASH), cardiovascular risk, depression, and type 2 diabetes mellitus (DM-2) [3]. For each of the illnesses above, there are distinct screening recommendations. However, the doctor must meet a low bar for follow-up investigations into PCOS patients who exhibit symptoms. A multifactorial illness, PCOS. Several weak genes have been implicated in the disease's pathophysiology. These genes participate in various androgenic processes, including steroidogenesis, to varying degrees. Twin studies indicate that heritability is about 70%. The environment substantially impacts every single one of these genes' expression and the illness's onset and progression [4].

According to two well-known ideas, PCOS symptoms manifest in individuals with genetic predisposition if exposed to particular environmental circumstances. Insulin resistance & obesity are the two most common environmental factors. Exposure to fetal androgen is another theory that has been put out. No other condition can account for PCOS, a hyperandrogenic state combined with oligo-anovulation. This diagnosis is one of exclusion. Nonetheless, it explains the vast majority of hyperandrogenic appearances [5].

Functional ovarian hyperandrogenism seems primarily responsible for all PCOS (FOH) forms. Two-thirds of PCOS cases exhibit the typical functional ovarian hyperandrogenism, characterized as dysregulated androgen synthesis and an overabundance of 17-hydroxyprogesterone (17-OHP) in response to gonadotropin stimulation. While testosterone increases can detect residual PCOS with aberrant FOH while adrenal androgen synthesis is reduced, there is no 17-OHP overreaction inside the presence of residual PCOS. Isolated functioning adrenal hyperandrogenism associated with PCOS affects about 3% of patients. The majority of PCOS instances are mild. Most of these individuals were obese, which medical professionals believe explains their atypical PCOS. These patients do not exhibit any signs of steroid secretory abnormalities. The clinical value of specific testing again for the FOH subgroup is still poor [6].

The three main symptoms of PCOS are functional hyperandrogenism of the ovaries, oligo anovulation, and polycystic ovaries. Both heritable & environmental factors influence the complex character of functional ovarian hyperandrogenism. The two primary causes of this dysregulation are excess insulin, which would be known can sensitize the ovary to luteinizing hormone (LH) by preventing homologous desensitization of LH during a normal ovulation cycle, and an inherent imbalance among intraovarian regulatory mechanisms. In PCOS, theca cells overexpress most steroidogenic enzymes, including proteins related to androgen synthesis. This suggests a significant anomaly just at the level & activities for steroidogenic enzymes, especially P450c17, that has been extensively identified. The overproduction of androgen & insulin is the leading cause of early luteinization in granulosa cells [7].

The early enrollment of primordial follicles into the growth pool is facilitated by androgen excess. At the same time, it starts an early luteinization process, which hinders the choice of something like the dominant follicle [8]. This causes the gross anatomical alterations and characteristic PCOS histopathologic symptoms that makeup PCOM. Even when LH is elevated, PCOS also isn't caused by it. Although LH excess is prevalent and required for developing gonadal steroidogenic enzymes and releasing sex hormones, it is less probable that it is the primary factor for ovarian androgen excess due to theca cell desensitization [9].

In both the general population and PCOS-affected women, exercise is a proven treatment for avoiding and managing chronic diseases. Several recent systematic studies and meta-analyses have compiled the positive impacts of physical activity on PCOS-affected women. In addition, to enhance overall health, hormonal results, and satisfaction with life, lifestyle intervention, including fitness training and food, is advised by the international evidence-based recommendations for treating PCOS [10].

Anovulatory cycles and other temporary signs of hyperandrogenism should be restored as part of the PCOS treatment, while the metabolic side effects must be minimized. To do this, you can utilize pharmacological intervention or, better yet, lifestyle change [11]. Lifestyle changes are the most popular and efficient way to cure PCOS. Losing weight is a crucial component of treatment. Almost all PCOS parameters improve with weight loss. Weight loss improves psychological factors, increases ovulation and conception rates, lowers insulin levels, lessens acanthosis nigricans, decreases testosterone production while elevating the level of sex hormone binding globulin (SHBG) stages, as well as minimizes

acanthosis nigricans in obese, anovulatory PCOS women [12].

MATERIALS AND METHODS

Research Design- The study was conducted prospectively on 50 patients who visited the author's clinic with Polycystic Ovary Syndrome or Disease from November 2022 to April 2023. The details of the patients were considered. Age, Basal Metabolic Index (BMI), education, marital status, history of pregnancy, infertility, history of abortion, underlying conditions, Cardiovascular and Respiratory Parameters like heart rate, blood pressure, respiratory rate, and VO_{2max}. The patients were also determined for Physical Activities and a history of any rehabilitation therapy. The patients were also taken initial measurements like Waist Circumference (cm), body weight (kg), Basal Metabolic Index or BMI (kg/m^2), VO_{2max} (ml kg^{-1} min^{-1}), Testosterone (nmol/liter), Lipid profile and Fasting glucose. Then, the patients were divided into 2 groups: the Wolly group and Control group. Both the groups have received drug treatment as appropriate for each PCOS/PCOD patient and also, they did exercise, did yoga, or regularly consumed a healthy diet.

Wolly group received Wolly Workout, formulated by the author, a fitness and therapeutic program designed dedicatedly for females that incorporates various forms of dance movements and exercises to achieve a blend of cardiovascular conditioning, strength training and flexibility. There are a lot of exercises that mainly focus on core and pelvic floor muscle strengthening. It consists of 'easy to follow' steps and is appropriate for anyone of all ages. The control group did not receive the Wolly workout program. After three months of the Wolly Program, the patients were again determined for their biochemical and hormonal parameters. The parameter change was statistically analyzed to evaluate the Wolly group with that of the controls.

Wolly Program- Wolly is a fitness and therapeutic program designed for women that incorporates various forms of dance movements and exercises to achieve a blend of cardiovascular conditioning, strength training, and flexibility. The program focuses on strengthening core and pelvic floor muscles, making it ideal for women of all ages and levels, from beginners to advanced. Wolly combines cardio, strengthening, and stretching; any song can be played during the workout. Its objective is to promote hormonal harmony, physical and mental wellness, calorie burning, core, and pelvic floor muscle strengthening, increased chances of fertility, and postnatal workouts. Wolly is unique because it focuses on women's complete health and is suitable for all ages and genders. The Wolly program is structured into four groups according to age and exercise type, and it covers upper back muscles, posterior group of muscles, core muscles, the connection of core and pelvic muscles, and the connection between the uterus, bladder, pubic bone, urethra, pelvic floor muscles, coccyx, bowel, and anus. The benefits of Wolly include hormonal harmony, the best postnatal workout, calorie burning, core and pelvic floor strengthening, and increased chances of fertility.

Inclusion and Exclusion Criteria- The patients diagnosed with PCOS/PCOD (according to Rotterdam criteria) were enrolled in this study and visited the clinic. The patients who followed the study protocol and cooperated with the process were only included. The patients whose information was complete and did not miss out, those who had given the measurements of their biochemical and hormonal variables, were included. The patients who were later found to have underlying conditions were excluded. Those who opted out from the middle of the study were also excluded. The patients whose information regarding baseline characteristics was inconsistent were also excluded to prevent bias.

Statistical Analysis- The study used SPSS 25 statistical software for effective analysis. The continuous data were expressed as mean±standard deviation, while the discrete data were expressed as frequency and its respective percentage. The study employed one-way ANOVA as a statistical tool for analyzing the measurements between the two groups. The level of significance considered was $p<0.05$.

Ethical Approval- The author obtained consent from all the patients during their treatment schedules. The study used the patients' data, maintaining the privacy of the patient's details.

RESULTS

Table 1 presents the baseline characteristics of patients who received the WOLLY workout and those who did not.

The study involved 25 participants in the WOLLY group and 25 in the control group. The age and BMI of both groups were similar, with the WOLLY group having an average age of 26.32±5.31 years and an average BMI of 26.94±3.85 kg/m^2, while the control group had an average age of 26.14±5.19 years and an average BMI of 26.89±3.47 kg/m^2. Most participants in both groups had completed at least school-level education, with 48% of participants in the WOLLY group and 52% in the control group having graduate or higher education. Most participants in both groups were married (92% in the WOLLY group and 88% in the control group). The WOLLY group had more successful conceptions than the control group, with 20% of participants in the WOLLY group having successful conceptions compared to 4% in the control group. Both groups had similar cardiovascular and respiratory parameters, with comparable heart and blood pressure and respiratory rates. The WOLLY and control groups also had similar VO_{2max} levels of 25.2±1.4 ml kg^{-1} min^{-1} and 25.2±0.9 ml kg^{-1} min^{-1}, respectively.

Regarding physical activities, more than half of the participants in both groups reported no activity, while the rest engaged in mild to moderate activities. Only one participant in the WOLLY group and one in the control group reported exercising before the study. The study results suggest that the two groups' baseline characteristics were similar, indicating that any differences observed in the outcome measures can be attributed to the WOLLY workout intervention rather than pre-existing differences between the groups.

Table 1: Baseline characteristics of patients who received the WOLLY workout and those who did not receive

Characteristic	Wolly group (N=25)	Control group (N=25)
Age (yr)	26.32 ± 5.31	26.14 ±5.19
BMI (kg/m^2)	26.94 ±3.85	26.89 ±3.47
Education		
Graduate and more	12(48)	13(52)
School level	12(48)	10(40)
Illiterate	1(4)	2(8)
Marital Status		
Married	23(92)	22(88)
Unmarried	2(8)	3(12)
History of Pregnancies		
Not applied	2(8)	3(12)
Never expected	2(8)	2(8)
Expected but failed to conceive	18(72)	19(76)
Successful conception	5(20)	1(4)
Type of Infertilities		
Primary	12(48)	14(56)
Secondary	6(24)	5(20)
History of Abortion		
Yes	4(16)	3(12)
No	21(84)	22(88)
Underlying chronic conditions		

Type-2 Diabetes	6(24)	7(28)
Hypothyroidism	1(4)	2(8)
Fatty Liver	4(16)	6(24)
Hypertension	3(12)	1(4)
Cardiovascular and Respiratory Parameters		
Heart Rate	86.54±9.47	88.49±8.15
Blood Pressure (Systolic)	129.85±15.45	128.47±12.95
Blood Pressure (Diastolic)	88.41±7.44	85.39±9.36
Respiratory Rate	16.21±6.11	15.94±5.47
VO_{2max} (ml kg^{-1} min^{-1})	25.2±1.4	25.2±0.9
Physical Activities		
No Activity	14(56)	15(60)
Mild Activity	6(24)	6(24)
Moderate Activity	4(16)	4(16)
Heavy Activity	1(4)	0
Patients underwent any rehabilitation in the past		
Yoga	2(8)	3(12)
Physiotherapy	0	
Exercise	1(4)	1(4)

Table 2 shows the outcome assessments in patients who received the WOLLY workout and those who did not. The Wolly group consisted of 25 patients, while the control group had 25. The table presents the before and after results of several characteristics, such as waist circumference, weight, BMI, VO_{2max}, testosterone levels, and lipid profile. The results showed that the Wolly group significantly improved waist circumference, weight, BMI, VO_{2max}, testosterone levels, and fasting glucose levels, with p-values less than 0.05. The control group, on the other hand, did not show any significant improvements in these characteristics. Specifically, the waist circumference of the Wolly group decreased from 103.6 cm to 91.45 cm, while the control group's waist circumference decreased from 103.1 cm to 98.47 cm. Similarly, the weight and BMI of the Wolly group decreased significantly from 96.9 kg and 35.6 kg/m^2 to 68.77 kg and 29.14 kg/m^2, respectively. The control group only decreased in weight from 95.3 kg to 82.69 kg and BMI from 35.0 kg/m^2 to 32.44 kg/m^2.

The VO_{2max} of the Wolly group also showed a significant increase from 25.9 ml kg^{-1} min^{-1} to 36.4 ml kg^{-1} min^{-1}, while the control group's VO_{2max} only increased from 31.4 ml kg^{-1} min^{-1} to 35.3 ml kg^{-1} min^{-1}. Additionally, testosterone levels decreased significantly in the Wolly group from 2.8 nmol/liter to 2.1 nmol/liter, whereas the control group only showed a slight decrease from 2.8 nmol/liter to 2.5 nmol/liter. Regarding the lipid profile, the Wolly group showed significant improvements in cholesterol and LDL levels, with p-values of 0.044 and 0.047, respectively. In contrast, the control group showed only slightly decreased LDL levels. However, neither group had significant changes in triglyceride and HDL levels.

The study has found that the WOLLY workout was found to be effective in improving several health-related characteristics, such as weight, BMI, VO_{2max}, testosterone levels, lipid profile, and fasting glucose levels, compared to the control group, who did not receive the WOLLY workout.

Table 2: Outcome assessments in patients who received WOLLY workout and those who did not receive

Characteristic	Wolly group (N=25)		Control group (N=25)		p-value
	Before	After	Before	After	
Waist (cm)	103.6±4.0	91.45±2.11	103.1±4.0	98.47±1.23	0.02
Weight (kg)	96.9±4.8	68.77±5.1	95.3±4.8	82.69±3.6	0.01
BMI (kg/m²)	35.6±1.6	29.14±2.1	35.0±1.6	32.44±1.8	0.01
VO_{2max} (ml kg^{-1} min^{-1})	25.9±1.8	36.4±1.3	31.4±1.9	35.3±1.4	0.036
Testosterone (nmol/liter)	2.8±0.2	2.1±0.4	2.8±0.3	2.5±0.2	0.025
			Lipids		
Cholesterol (mmol/liter)	4.5±0.3	3.9±0.6	4.4±0.2	4.2±0.4	0.044
Triglycerides (mmol/liter)	1.1±0.2	0.9±0.21	0.9±0.1	0.9±0.2	0.067
HDL (mmol/liter)	1.0±0.1	1.1±0.1	1.0±0.1	1.0±0.2	0.085
LDL (mmol/liter)	3.0±0.3	2.5±0.1	3.0±0.2	2.9±0.1	0.047
Fasting glucose (mmol/liter)	5.0±0.1	4.2±0.2	4.9±0.1	4.8±0.2	0.039

DISCUSSION

According to some research's, infertility is a catastrophic life crisis for many couples and has a significantly negative psychological impact on women, leading to worry and sadness. Approximately 30% of female infertility is caused by abnormal ovulation. While lifestyle changes like physical exercise are significant, there are currently no clear guidelines for exercise regimens because the relationship between exercise & ovulation is multifactorial and complex. There are some glaring gaps in the body of literature currently available [13]. The topic of the functions of long-term training and chronic energy deficit is raised by the fact that short-term investigations of overtraining have occasionally resulted in the interruption to ovulation reported in the observational research. This justifies additional research in particular groups, like professional athletes. Another flaw is the lack of exercise-based therapies for anovulatory women with a moderate BMI. There is not much research comparing various kinds of physical activity, their intensities, and settings since there is a probably inappropriate emphasis on losing weight rather than an exercise program. These deficiencies prevent exercise from being used effectively and efficiently as a treatment strategy for managing anovulatory infertility [14].

Studies were conducted on PCOS, diabetes, and heart disease with associative risk factors and symptoms. PCOS management typically focuses on lifestyle modifications (diet and exercise) [15]. Many studies analyzed the data regarding the efficacy of workouts within the management of PCOS in comparison to standard care, (ii) diet on its own, (iii) exercise blended with diet, and (iv) exercise combined with diet, in addition to (v) exercise combined to diet, in comparison to (v) control as well as usual care and (v) (v) diet alone. Many outcomes linked to metabolic, anthropometric, & cardiorespiratory fitness showed statistically positive impacts of exercise. Although many outcomes have minor effects and large CIs, caution should be exercised when interpreting such results because many statistical effects are sensitive to adding or removing specific trials. Future research should concentrate on carefully planned, well-reported trials comparing food and activity [16].

PCOS ailment is not an actual illness. Many studies on polycystic ovarian syndrome have revealed no known reason; instead, it may be brought on by hormone imbalance, stress, or a sedentary lifestyle. Among Indian women, the prevalence of polycystic ovarian syndrome has already been sharply rising. Acne, excess weight, hirsutism, difficulties conceiving, irregular or sparse periods, undeveloped ovarian eggs that fail to produce ovulation, and numerous ovarian cysts are some of the symptoms [17]. If untreated, it could lead to cancer, infertility, diabetes, heart disease, and other conditions. Numerous medicinal treatments can treat polycystic

ovarian syndrome; however, they only work temporarily, and if used for an extended period, they can have significant adverse effects. Together with medication, yoga has been shown to have benefits in lowering & managing polycystic ovarian syndrome symptoms. A research study has been conducted to determine whether yoga helps treat polycystic ovarian syndrome [18].

Obesity, aberrant lipid profiles, poor glucose tolerance, insulin resistance, and hypertension are all common cardiovascular risk factors in women having polycystic ovarian syndrome (PCOS). According to reports, exercise reduces the frequency of cardiac episodes [19]. Among women with PCOS, there has not been any prior research on the impact of exercising on plasma homocysteine concentration, a risk factor for cardiovascular disease. Young, overweight, or obese PCOS women with body mass indexes of 35.49 +/- 7.57 kg/m (2) and age (mean +/-SD) of 30.6 +/- 6.6 years were studied to see how exercise affected plasma total homocysteine concentrations. In studies done on young overweight, and obese women having PCOS, who are at higher risk of early atherosclerosis, it was found that regular exercise dramatically lowers plasma homocysteine levels. Activity is linked to a decrease in homocysteine, but the exact process is still unknown [20]. Studies were conducted involving dietary consumption and physical exercise influences obesity in PCOS-affected women. Weight disparities between women who have and do not have PCOS cannot be explained by food and physical activity variables alone. The percentage contribution of lifestyle variables and metabolic to overweight in PCOS must be further investigated [21].

PCOS is a common endocrine condition that affects women of reproductive age worldwide. In addition to PCOS's harmful consequences on fertility, obese and diabetic women are more likely to develop cardiovascular disease, depression, diabetes, and certain malignancies. Dietary consumption & physical activity levels may be impacted by hormonal and metabolic abnormalities in PCOS. There is growing evidence worldwide that women with PCOS exhibit differing baseline dietary energy consumption than those without the condition. These dietary changes may increase patients' clinical symptoms and raise their chance of developing a chronic illness. There isn't much research that compares women who have and do not have PCOS's baseline physical activity levels. The data show no differences between groups with and without PCOS regarding activity levels, although several factors complicated comparisons among studies. This review evaluates the most recent research on the baseline food consumption & levels of physical activity in PCOS-affected women. Given these implications for aiding in developing successful nutrition-focused therapies for PCOS, future recommendations to increase studies in this field are proposed [22].

Although elevated plasma concentrations of aromatic amino acids (AAA) and branched-chain amino acids (BCAA) have been connected to insulin resistance and obesity, it is unknown how these amino acids may influence insulin resistance that is triggered in PCOS and in response to exercise [23]. It is unclear whether modifications to the metabolome have a role within IR in PCOS. The initial amino acid profile with PCOS was different from controls and mirrored that of obese people. There were no variations within the amino acid profile among PCOS and controls during exercise, despite there being no changes in weight either in the group. This demonstrates that exercise, regardless of weight, may normalize amino acid metabolism [24]. Many studies have shown similar results regarding the relationships between fitness, BMI, and IR before and after exercise intervention. Also, studies were conducted to determine the causes of insulin resistance (IR) amongst overweight and obese women who have or do not have PCOS [25]. Although PCOS women's IR is improved by intense exercise, there is no direct link between IR improvement and increased fitness. Instead, PCOS women's IR remains greater after exercise. Although IR remains higher in PCOS than in non-PCOS controls, alternative mechanisms and treatments for IR must be investigated [26].

CONCLUSIONS

The study has concluded that the Wolly Program effectively alleviates the clinical features of PCOS/PCOD regarding hormonal and biochemical parameters. There was a significant improvement in the biochemical and hormonal profiles of the patients. The author also suggested carrying out more similar studies with Wolly Program and brought attention to the fact that more studies are required to validate the Wolly Program.

This program has already been applied to many patients with proven results. Hence, the Wolly Program can be

considered one of the most effective programs for PCOS/PCOD patients for the alleviation of clinical features significantly.

CONTRIBUTION OF AUTHORS

One author is only contributed in this article.

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