



Efficacy of supervised tabata protocol on endocrine-metabolic disorder of stressed Overweight Polycystic Ovary Syndrome Female in Pakistan

Author zainab Razzaq

DR basit Ansari university of karachi

Muhammad Ali shah DUHS

Shafaq safdar CHS Aga khan university

Shazia khan CMH quetta

Tania furqan SPORTS Rehabilitation AKUH

ABSTRACT

OBJECTIVE

As the life expectancy increases, 20 % of women spend second decade of their life along with polycystic ovary syndrome where an alteration in the hormonal levels specially androgen hormone are documented leading to hallmark in increase in insulin resistance leading metabolic-endocrine disorder. The prevalence of PCOS in our country is unavoidable and suffering women struggle to survive in society. Hence this study is aiming to provide evidence-based results on the effectiveness of tabata training on symptoms of PCOS.

METHODOLY

86 stress overweight ladies who had polycystic ovarian syndrome were recruited for a randomized control experiment and randomly assigned to one of two equal groups. While Group B served as the control group and underwent no intervention, the individuals in Group A were required to complete supervised tabata exercises. The exercise regimen for the intervention group consisted of three sessions (on separate days) each week for twelve weeks, with each session lasting eleven minutes. Before and after twelve weeks of training, readings for BMI, lipid profile, and insulin resistance were taken. stress level documented through DASS 21 before and after intervention .

RESULT

Twelve weeks of exercise program based on supervised tabata protocol had beneficial effect on insulin resistance and menstrual cycle whereas inversely correlated with Body composition and BMI of overweight polycystic ovary syndrome female in Pakistan.

CONCLUSION

The study concluded that twelve weeks of supervised exercise dose was found to be effective in improving endocrine-metabolic symptoms of overweight PCOS female. The efficacy of high

intensity interval training based on tabata protocol found to be potent and provide significant result on insulin resistance, BMI, fat mass, muscle mass and lipid profile as only thirty six session ,each session last for eleven minutes performed during a period of Twelve weeks.

KEYWORDS: Tabata exercise, insulin resistance, body composition, lipid profile and polycystic ovary syndrome

INTRODUCTION

A frequent endocrine condition affecting women of reproductive age is polycystic ovarian syndrome (PCOS). It has a clearly varied etiology and a variety of impacts on the reproductive, metabolic, endocrine, and psychological systems. Significant factors include ovulatory dysfunction, irregular menstruation, infertility, hyperandrogenism, elevated insulin levels, obesity, obstructive sleep apnea, nonalcoholic fatty liver disease, eating disorders, and an increased risk of type 2 diabetes mellitus (T2DM). (1). among multifactorial endocrinopathies, polycystic ovarian syndrome (PCOS) is thought to be the most prevalent. The pathophysiology of PCOS is greatly influenced by genetic factors. Androgenesis is caused by the CYP 17 enzyme, while the CYP 19 enzyme is involved in turning androgen into aromatic estrogen. Their connection to PCOS has been documented in several researches. (2). Numerous factors, including anomalies in the menstrual cycle, the absence of periods, etc., an excess of androgens or its symptoms, such as hirsutism, and the presence of ovarian cysts, are used to diagnose PCOS. It has been claimed that more knowledge of the condition improved management of PCOS's unfavorable effects. Following a clinical research investigation, Colwell and colleagues found that women with PCOS felt empowered regarding their knowledge of the condition and were motivated to adhere to preventative measures. (3). Ovarian dysfunction is brought on by the polygenic endocrine condition polycystic ovary syndrome (PCOS). Due to its variability, this disease spans a wide range of phenotypic manifestations. The severity of PCOS can be reduced by living a healthy lifestyle and keeping a healthy weight. (4). The majority of infertile women at Pakistan's top hospitals have polycystic ovaries. The symptoms of polycystic ovarian syndrome may not always be present in women with polycystic ovaries. High levels of insulin resistance and hyperinsulinemia are common in women with polycystic ovaries. LH and FSH are not connected, despite both being significantly higher in cases compared to controls. (5). Due to being overweight or obese, which is a poor predictor of sexual pleasure, women with PCOS experience unfavorable perceptions of their bodies, including dissatisfaction with appearance and reduced sexual attraction compared to normal women. (6). Research suggests that prevalence of PCOS in Pakistan is 52% more than in western countries (7). Insulin resistance occurs more than 70% of obese PCOS women High insulin levels are both a symptoms and a underlying pathophysiology driver of PCOS. Insulin disrupt all components of hypothalamic–pituitary–ovarian axis and impaired metabolic signaling favoring hyperandrogenism. which are common in this population. Besides all these pathological abnormalities, obese PCOS women with hyperinsulinemia have a 5-fold higher incidence of CVD risk factor(8), Sub-fecundity and infertility risk are both enhanced by obesity. Regardless of the method of conception, obese women have inferior reproductive results, and a greater body mass index (BMI) is linked to a worse fertility prognosis. One of the most common

reasons of infertility is polycystic ovarian syndrome (PCOS), and many PCOS sufferers are overweight or obese. (9). an essential part of PCOS therapy is metformin. Metformin's impact on obese women with PCOS has not yet been researched. Women who are pregnant or nursing have a morbidity incidence of 6% to 15%, and the underlying cause is still unclear. According to extensive clinical and epidemiological evidence, almost 50% of PCOS patients are fat or overweight. (10). High-intensity interval training will be examined in various studies and has been proved as an effective way to treat the cardiovascular, metabolic and reproductive disorders caused by PCOS. The main advantages of HIIT training is short duration exercises and can be an alternative to traditional endurance training to bring beneficial improvements in blood lipid concentrations, insulin resistance and BMI. Tabata is a form of HIIT intervention which performed short period of time with high intensity followed by short interval of rest. Tabata also known as the four-minute workout and its perfect for those who looking result in short volume exercise. The good news is tabata intervention is short on time and tough for fat. It is short but effective and relatively quick than other exercise and favorable for those with a busy schedule.

METHODOLOGY

The current study was done through clinical trial. Eighty six overweight female with PCOS diagnose by gynecologist from Bantva Anis hospital in Karachi was selected as subject. A 2 arm-Randomized Controlled Trial was conducted to evaluate and compare the effect of 11 minutes supervised tabata training on endocrine-metabolic symptoms of PCOS female at the baseline and after 12 weeks of intervention. The study was conducted according to the guidelines of Belmont Report for ethical decision-making related to all the trials that include human subjects.

PARTICIPANTS

All females fulfilling the inclusion criteria were recruited and screened on the basis of Physical Activity Readiness- Questionnaire and YOU form. Randomization was done by a random number and sealed envelope in which group name was written open by a patient at the start of performing exercise and group selection.

ASSESSMENT PARAMETERS

BODY MASS INDEX:

Body mass index (BMI) used to assess weight relative to height and is calculated by dividing body weight in kilograms by height in meters squared ($\text{kg}\cdot\text{m}^{-2}$)(Domaradzki et al., 2020). The formula of BMI is (Van Haute et al., 2020).

$$\text{BMI} = \frac{\text{WEIGHT (kg)}}{\text{Height (m}^2\text{)}}$$

INSULIN RESISTANCE:

HOMA-IR (HOMEOSTASIS MODEL ASSESSMENT) is a method used to calculate insulin resistance(Santos et al., 2021). 12 hours of fasting required for this method.It represents the homeostasis model of insulin resistance which is a product of concentrations of glucose (expressed as millimoles per liter) and insulin (expressed as milliunits per milliliter) divided by a 22.5(Heydari

et al., 2012). Lower values indicating a higher degree of insulin sensitivity and higher values conversely indicate an increased degree of insulin resistance.

$$\text{HOMA-IR} = \frac{\text{fasting insulin (mU/L)} \times \text{fasting blood glucose (mmol/L)}}{22.5}$$

FAT MASS CALCULATION:

Skin fold thickness method used to calculate fat mass and according to National Health and Nutrition Examination Survey (NHANES) (Freedman et al., 2015). The inter-rater intraclass correlation (ICC) for skinfold will be 0.966 along with excellent test-retest ICCs ≥ 0.996 (Wagner et al., 2016).

The therapist pinched the tested site of skin with thumb and index finger that separated the skin and fat from the underlying muscle for accurate measurement. The value will be taken from Abdomen, Suprailiac and Triceps by using following formula (Khammassi et al., 2018).

Three measurements will be recorded and average will be taken.

- $\% \text{BODY FAT} = (0.41563 \times \text{sum of three skinfolds}) - (0.00112 \times [\text{sum of three skinfolds}] \times 2 + (0.03661 \times \text{age}) + 4.03653$
- $\text{Fat Mass} = \text{Total body weight} \times \text{Body Fat } \%$

MUSCLE MASS CALCULATION:

The muscle mass of the body calculated by subtracting the fat mass from total body mass (Peltz et al., 2010).

Muscle mass = Total body weight - Fat mass

LIPID PROFILE:

Blood serum lipid profile test performed for HDL, LDL and triglycerides values in the laboratory (Santos et al., 2021). The participants will be asked to perform 12 hours of fasting prior to the test. The test will be conducted twice, firstly before the start of the training session and secondly after the completion of twelve weeks. The pre and post intervention readings were compared to determine the improvement on lipid index of the participants.

QUESTIONNAIRE:

The *Depression, Anxiety and Stress Scale 21* (DASS-21) used to evaluate symptoms of (1) depression (2) anxiety and (3) stress.

EXERCISE INTERVENTION

TRAINING PROTOCOL:

The study will be conducted on 86 diagnosed overweight PCOS females that were recruited and randomly allocated into two equal group such as Group A ($n = 43$) and Group B ($n = 43$). Group A received the intervention based on tabata protocol whereas Group B was control group.

Intervention group received 12 weeks, three sessions (nonconsecutive days) per week and each session was lasted 11 min of exercised program based on tabata exercise. Group B did not receive any intervention however; they were kept on regular PCOS treatment. Pre and post intervention assessment were measure before and after 12 weeks of program. During the training the patients will be advised to wear loose comfortable clothes that would not hindered the performance.

WARM UP:

The 5 minutes of warm up (Kemmler et al., 2016) exercises performed prior to the start of the training session. The protocol included initial stretching exercises of 10 major muscle of the body. The purpose of warm up was to increase the body temperature and to raise the heart rate followed by conditioning phase.

SUPERVISED EXERCISE PROGRAMED:

The protocol based on tabata exercise on cycle ergometer. The patients informed about the cardiac prodromal symptoms like shortness of breath, dizziness, chest discomfort or palpitation that might develop during exercise and was advice to immediately inform these symptoms to the Physical Therapist. The patient’s vitals (Oxygen saturation, blood pressure and pulse rate) monitored before and after exercise through pulse-oximeter and sphygmomanometer.

Patient asked to sit on a cycle ergometer and instructed the participant to push and rotate the pedals with a maximum intensity lasting for 20 second in which the participant will be motivated to perform as many repetitions with a goal of 170% of Vo₂max and pedaling frequency of 90 rpm used followed by a 10 second of rest.

Each session based Tabata protocol last for four minutes (20 s work/10 s rests) consisted of eight cycles followed by 5 minutes of warm up before and 2 minutes of cool down after the intervention. Did this work out 3 times per week – allow participant at least one full day of recovery between workouts.

The Tabata Protocol Workout requires the following: (Thompson et al., 2013, Finn, 1996)

- 5 minutes of warm-up
- 8 intervals of 20 second intense exercise with 170 of Vo₂max followed by 10 second of rest.
- 2 minutes cool-down

Name	Work Interval and intensity	Rest interval	Series	Modality	Total time
Tabata	20 seconds at 170 of Vo ₂ max	10 seconds of rest between exercise interval	Repeat 8 times	Cycle ergometer	4 minutes

CONTROL:

Participants in the control group did not receive any intervention and instructed to continue their lifestyle and medical treatments.

COOL DOWN:

The process involved a post conditioning resting period of 2 (Thompson et al., 2013, Finn, 1996) minutes, during which the patients asked to sit on a chair and performed deep breathing exercises. During the cool down process, patient vitals; pulse rate, oxygen saturation and blood pressures were monitored.

EXERCISE TERMINATION CRITERIA:

On the happening of the one of the following events at any time during the session the exercises will be prematurely have been terminated:

- i. Complain of chest pain:
- ii. Decrease in oxygen saturation.
- iii. patient's request:

INCLUSION CRITERIA:

The following criteria were included in the study:

- Women aged 18–45 years with a BMI greater than 25 kg.m² .
- Diagnosed with PCOS by gynecologist using the Rotterdam criteria will be recruited for this study.
- Polycystic ovaries on ultrasound and exclusion of other causes of hyperandrogenism.

EXCLUSION CRITERIA:

The following criteria were excluded from the study:

- Pregnant or breastfeeding.
- Post-menopausal status.
- History of cardiovascular, kidney, respiratory disease, uncontrolled hypertension or cancer.
- Have any medical condition that may be responsible for the symptoms of PCOS, such as congenital hyperplasia, androgen-secreting tumor, hyperprolactinemia, or Cushing’s syndrome.
- Females with osteoporotic fracture and any other disability and surgery that may limit recruitment in exercise protocol.

RESULTS

DEMOGRAPHIC REPRESENTATION

A total of 86 participants were recruited in the study; the mean age of the participants, weight, and BMI measurement at the baseline are illustrated in Table 1.

At baseline, the participants in both the groups have similar demographic characteristics in terms of age, weight, and BMI.

Table 1: Demographic characteristics of overweight polycystic ovary syndrome female

	TABATA	CONTROL
Age(years)	18-45	18-45
Weight	79±5	74±5
Height	164±5	162±10
BMI kg/m ²	24<	24<

N=total
Height is

number of participant measured in foot inches

Weight in kilogram

BMI is body mass index

LEVEL OF SIGNIFICANCE

The level of significance within the group was calculated at 95% of C.I using a paired *t*-test (two tailed) statistics. Table 2 depicts the values obtained after 12 weeks of interventional strategies on insulin resistance (IR) and Body Weight.

Table 2: The pre- and post-values of Insulin resistance and Body weight among overweight polycystic ovary syndrome female

Table 2: Paired t-test showing within the group analysis						
Intervention strategy	n		HOMA-IR	P-value	Bodyweight	P-value
Tabata protocol	43	Pre	2.78	.000	79.07	.000
		Post	1.71	.000	74.21	.000
Control group	43	Pre	2.04	.043	76.93	.043
		Post	1.79	.043	74.81	.043

n=number of participant

P-value level of significance at 95% of CI

The changes in muscle mass and Fat Mass in both the group are clearly revealed in table 3, in the Tabata protocol group pre muscle mass was 48.04 with p value of .048 and post muscle mass was 46.80 with P value of .048. The pre fat mass had P value of .048. the control group pre and post muscle mass and fat mass had the p value of 0.553,

Table 3: The pre- and post-values of Muscle Mass and Fat Mass of overweight polycystic ovary syndrome female

Intervention strategy	n		Muscle Mass	P-value	Fat Mass	P-value
Tabata protocol	43	Pre	48.04	.048	31.12	.048
		Post	46.80	.048	28.78	.048
Control group	43	Pre	45.48	.553	28.83	.553
		Post	44.82	.553	27.16	.553

n=number of participant

P-value level of significance at 95% of CI

The relationship is found to be significant with p value of .0000 of pre and post values of lipid profile among overweight polycystic ovary syndrome female. As shown in table 4.

Table 4: The pre- and post-values of lipid profile among overweight polycystic ovary syndrome female

Table 4: Paired t-test showing within the group analysis								
Intervention strategy	n		LDL-cholesterol (mg/dl)	P-value	HDL-cholesterol (mg/dl)	P-value	Triglyceride (mg/dl)	P-value
Tabata protocol	43	Pre	131.28	.000	51.95	.000	164.48	.000
		Post	121.35	.000	65.30	.000	146.79	.000
		Pre	133.28	.660	45.72	.000	199.40	.011

Efficacy of supervised tabata protocol on endocrine-metabolic disorder of stressed Overweight Polycystic Ovary Syndrome Female in Pakistan

Control group	43	Post	130.60	.660	55.70	.000	184.65	.011
---------------	----	------	--------	------	-------	------	--------	------

The P-values of insulin resistance and BMI among the overweight polycystic ovary syndrome female is found to be significant in tabata protocol group with .000 and the control group showing insignificant relationship with 0.553 p value. As shown clearly in table 5.

Table 5: P-values of insulin resistance and BMI among the overweight polycystic ovary syndrome female.

Group/Outcome measure	HOMA-IR	P-value	Body Weight	P-value
Tabata protocol	1.07	.000	4.86	.000
Control group	0.24	.553	2.0	.553

P-Values of Muscle Mass and Fat Msss among the Overweight Polycystic Ovary syndrome Female after 12-week intervention are elaborated in table 6 below. The tabata protocol group had the P value of .056 and control group had the value of 0.324.

Table 6: P-Values of Muscle Mass and Fat Msss among the Overweight Polycystic Ovary syndrome Female after 12-week intervention are elaborated in table 6.

Group/Outcome measure	Muscle Mass	P-value	Fat Mass	P-value
Tabata protocol	1.59	.056	2.33	.056
Control group	.66	.324	1.66	.324

P-Values of lipid profile among the Overweight Polycystic Ovary syndrome Female after 12-week intervention are elaborated in table 7 below. The p values of tabata protocol group and control group showing significant relationship with p value of 0.000 that is less than 0.005.

Table 7: P-Values of lipid profile among the Overweight Polycystic Ovary syndrome Female after 12-week intervention are elaborated in table 7.

Group/Outcome measure	LDL-cholesterol (mg/dl)	P-value	HDL-cholesterol (mg/dl)	P-value	Triglyceride (mg/dl)	P-value
Tabata protocol	9.93	.000	-13.34	.000	18.04	.000

Control group	2.67	.000	-9.97	.000	14.74	.000
---------------	------	------	-------	------	-------	------

DISCUSSION

Moreover, Baharloo et al conducted randomized control trial on 30 women to assess the effect of 12 weeks of water-based Tabata training on insulin resistance in obese women (body mass index more than 29.9) with the polycystic ovarian syndrome. The results of the study showed the interaction of exercise and time had a significant effect on insulin levels(11). A typical female ailment known as polycystic ovarian syndrome (PCOS) is marked by metabolic, hyperandrogenic, and reproductive characteristics. Obesity makes the hereditary disorder polycystic ovary syndrome worse. Based on epidemiological evidence and more recently confirmed via genetic investigations, obesity and PCOS are closely related. The effects of weight gain and obesity on the onset of PCOS are mediated by a number of different pathways. Important processes include the metabolic consequences of insulin resistance and the steroidogenic and reproductive effects of hyperinsulinemia. Subcutaneous and visceral fat appear to produce adipokines that are involved in metabolic process. Given the intricacy of PCOS pathogenesis, it is crucial to take into account any potential consequences of PCOS on subsequent weight gain or, at the very least, on efforts to lose weight and maintain it through lifestyle changes. According to current study, it is commonly acknowledged that weight gain and obesity are significant risk factors for PCOS clinical and biochemical symptoms in women who are genetically susceptible to the condition the numerous processes that mediate this process are intricate. But the relationship between obesity and PCOS is more nuanced than a straightforward cause-and-effect scenario, and it probably involves intricate relationships between a numbers of other variables. The development of PCOS through indirect processes (such as sadness, perceived lack of self-control, and increased discomfort) in at least some obese women with PCOS looks likely to impede continued efforts at lifestyle adjustment and, consequently, effective weight loss. Such elements may even encourage more weight gain, triggering a cycle that can be hard to break. (12). According to the research, excessive androgen has a significant impact on granulosa cell activity and follicular growth through intricate pathways that result in obesity and insulin resistance. The majority of hyper androgenic PCOS patients have steroid secretion deficiencies, which lead to aberrant follicle development and unsuccessful dominant follicle selection. Obesity, hairy skin, acne, and androgenetic alopecia are all caused by hyperandrogenism. For women, these symptoms can cause a lot of psychological stress. By lowering testosterone levels in vivo, medications including pioglitazone, metformin, combination oral contraceptives, and low-dose spironolactone contribute to higher conception rates. Notably, PCOS is diverse, and pathogenic factors other than hyperandrogenism exist. The signs of hyperandrogenism are exacerbated by obesity and insulin resistance, creating a vicious cycle that encourages the growth of PCOS. Although several research have been done, it is still unclear exactly how PCOS is able to develop. (13). A recent research investigation compared normal and obese women with PCOS and looked at the relationship between BMI and the LH/FSH

ratio. The Department of Obstetrics and Gynecology conducted a case-control research in which women with PCOS were enrolled and categorized based on their BMI. The demographic, clinical, and laboratory data were collected from their electronic records. The t-test was used to compare the study groups, and the BMI and LH/FSH ratio Spearman correlation was computed. In all, 63 women were involved in the study ($n = 30$ for the normal BMI group and $n = 33$ for the high BMI group). Regarding the LH/FSH ratio, there was no difference between the two groups (2.76 vs. 2.79, $P=0.48$). Prolactin, thyroid stimulating hormone (TSH), and LH/FSH ratio levels did not significantly correlate with BMI (Spearman correlation, $P>0.05$). The information shows that a higher LH/FSH ratio was not associated with a lower body mass index. Healthcare practitioners need to consider other methods to correct this ratio as it was the same among women with normal BMI. (14). One prevalent aspect of polycystic ovarian syndrome (PCOS) is insulin resistance (IR). Body fat measures can serve as IR predictors. This study uses body fat indicators to forecast IR in Chinese women with PCOS who have varied body shapes. In this study, a total of 723 women who had been given a Rotterdam PCOS diagnosis were included, and they were then split into two groups according to their BMI. On days 3-5 of the menstrual cycle, blood was drawn from each participant after they had medical exams, ultrasounds, and blood collection. They had their BMI, waist-to-hip ratio, waist-to-height ratio, visceral adiposity index, lipid accumulation product index, and homeostasis model assessment index of insulin resistance (HOMA-IR) measured. In the normal weight group (BMI 24, $n = 333$), the VAI and LAP index were the most accurate predictors of IR based on HOMA-IR 2.77, whereas in the overweight/obese group (BMI 24, $n = 390$), the BMI, WC, WHtR, and LAP index had a significant correlation with HOMA-IR. BMI (best cut-off value: 26.43, $AUC = 0.644$, $P = 0.001$) and WHtR (best cut-off value: 0.544, $AUC = 0.604$, $P = 0.021$) were the representative indicators used to measure IR. In Chinese PCOS women, particularly in those who have normal weight, body fat indices are prognostic indicators of IR. (15). The purpose of this systematic review was to produce useful tools for medical practitioners to help PCOS-affected women have more sustainable, healthy lives. The systematic review was carried out in accordance with PRISMA principles. The inclusion of eleven randomized controlled studies was determined to be appropriate. Diet, exercise, behavioral counseling, or a combination of treatments were some examples of lifestyle modification techniques. The range of the mean weight decrease from the starting body weight was +0.5 to -10.6%. The bulk of the studies did not note significant drop-out rates, which ranged from 12% to 47%. Extrapolating these findings to routine clinical treatment is difficult due to the variability of the stated interventions and the high drop-out rates. Therefore, it appears that none of the strategies outlined is more effective than the others at causing significant weight reduction. In a nutshell it is now widely recognized that overweight and obese women with PCOS need to lose weight in order to be healthier. However, both patients and healthcare professionals still face difficulties in accomplishing this objective. (16). A cross-sectional study was done on 947 PCOS patients who were either overweight (BMI > 24 kg/m²) or not (BMI 23.9 kg/m²) based on their body mass index (BMI). Clinical symptoms, endocrine characteristics, metabolic condition, and levels of inflammation in the patients were thoroughly evaluated and compared between the two groups. Additionally, using STRING and

Cystoscope software, a predictive analysis on the relationship between inflammation and metabolism was carried out, and potential pathways of metabolic abnormalities associated in the overweight PCOS were initially investigated. Increased average age, waist-to-hip ratios, and the prevalence of acanthosis nigricans were all linked to overweight PCOS. These individuals had a higher propensity for insulin resistance (IR), were more likely to have familial hypertension and diabetes, and showed clear signs of low levels of luteinizing hormone (LH) and a low ratio of LH to follicle-stimulating hormone. Additionally, inflammatory cytokines complement components C5/C5, CXCL12/SDF-1, MIF, and Serpin E1/PAI-1 were definitely present at higher quantities in overweight PCOS than in non-overweight PCOS, indicating the presence of a chronic low-grade inflammatory state. These inflammatory cytokines were shown to be either directly or indirectly linked with IR according to a Pearson analysis. (17). a prospective cross-sectional research including PCOS patients referred to tertiary gynecological clinics in Singapore and healthy women (21–45 years) recruited during an annual health screening for hospital employees and volunteers from the university community. Subjects were split into four groups: non-PCOS (normal BMI), non-PCOS (high BMI), PCOS (normal BMI), and PCOS (high BMI) in order to analyze the independent and/or combined effects of PCOS and BMI on the phenotypic traits. Clinical, ovarian, hormonal, and metabolic characteristics were compared among these four groups using general linear modeling. A total of 389 people were included; 134 (34.4%) were identified as having PCOS, and 255 (65.6%) were not. In all, 45.2% of women had a BMI over 23. Women with PCOS exhibited a higher BMI than non-PCOS individuals (mean (SD): 25.14 6.46 vs. 23.08 4.36, $p < 0.001$). Modified Ferriman-Gallwey (mFG) scores were 2.96 times higher in PCOS and high BMI women than in healthy-normal BMI women (mean difference: 1.85, 95% CI 0.80-2.90), indicating greater hair growth. PCOS women with high BMI reported substantially greater mean differences in mFG scores (1.79, 95% CI 0.64-2.93) compared to healthy-high BMI women. High BMI in PCOS women was similarly associated with a 1.85-fold increase in mFG scores (mean difference; 1.82; 95% CI 0.52-3.12). (18). Evidence indicates that pregnant women with PCOS may be more likely to experience unfavorable pregnancy outcomes, however it is yet unclear if pre-pregnancy overweight/obesity and pregnancy outcomes in women with PCOS are related. Researchers are attempting to explain how being overweight or obese before to becoming pregnant affects the course of the pregnancy. They performed this systematic review and meta-analysis as a result. They conducted hand-searching in addition to using databases from PubMed, Web of Science, and Cochrane databases to look at the relationship between pre-pregnancy overweight/obesity and pregnancy outcomes in women with PCOS. There were 11,314 women in total for the analysis thanks to 16 cohort studies, comprising 14 retrospective cohort studies ($n = 10,496$) and two additional prospective cohort studies ($n = 818$). According to the meta-analysis, women with PCOS who had pre-pregnancy BMIs that were overweight or obese (OR 1.71 [95% CI 1.38-2.11] or OR 2.00 [95% CI 1.38-2.90]) had considerably higher risks of miscarriage than women without PCOS. No matter whatever body mass index cutoff for overweight (24 or 25 kg/m²) or obesity (28 and 30 kg/m²) was employed, the tests for subgroup difference showed the elevated risk was constant. Based on the aforementioned findings, an early fetal death in these PCOS women with

pre-pregnancy overweight/obesity may be the major essential factor contributing to a poorer pregnancy outcome. (19).

Despite this, there are very few researches on the efficacy of different exercise dose on mental health and health related quality of life in PCOS. However, there is currently a need for additional research to assess the effect of exercise in PCOS with decrease in health related quality of life.

CONCLUSION

The individuality of this study is based on the concept of exercises as medicine, in which the 12 weeks of training protocol was used. Besides, determining the effect of exercise regimes as a medicine, the study also aimed to identify the efficacy of exercises applied in the management of polycystic ovary syndrome symptoms and for that purpose data had been collected from the patient before the twelve weeks of intervention and after completion of 12 weeks sessions. The criteria of tabata exercise that were performed only 3 days per week for nonconsecutive days i.e. only 36 session ,each session last for 4 minutes performed during a period of 12 weeks, thus establishing a fact that regime of exercises was time and cost effective and its perfect for those who looking result in short volume exercise. The good news is tabata intervention is short on time and tough for fat .It is short but effective and relatively quick than other exercise and favorable for those with a busy schedule. The study was unique in its approach as the results showed that exercises were not only found to be effective in the management of the BMI, insulin resistance, androgen menstrual cycle but indeed it was also revealed that high intensity interval training based on tabata protocol found to be potent and provide significant result on muscle mass, lipid profile and ovary cyst in overweight polycystic ovary syndrome female. A few limitations of the study need to be overcome where only 12 weeks of protocol was used and no residual effects were checked as a follow-up of next 6 months was to be checked. However, this is beyond the scope of our study.

REFERENCES

1. Anjum S, Askari S, Riaz M, et al. (December 02, 2020) Clinical Presentation and Frequency of Metabolic Syndrome in Women with Polycystic Ovary Syndrome: An Experience from a Tertiary Care Hospital in Pakistan. *Cureus* 12(12): e11860.
2. Nasira Munawar Lone, Sana Babar, Sikandar Sultan, Saira Malik, Kiran Nazeer & Saba Riaz (2021) Association of the CYP17 and CYP19 gene polymorphisms in women with polycystic ovary syndrome from Punjab, Pakistan, *Gynecological Endocrinology*, 37:5, 456-461,
3. Rizvi M, Islam MA, Aftab MT, Naqvi AA, Jahangir A, Ishaqui AA, et al. (2023) Knowledge, attitude, and perceptions about polycystic ovarian syndrome, and its determinants among Pakistani undergraduate students. *Plos ONE* 18(5): e0285284.
4. Zulfiqar, S. ., Tahir, S. ., Gulraiz, S. ., Razzaq, M. A. ., Abid, A. ., Shahid, T. ., Babar, A., Rehman, B. ., Rafique, H. ., Noor, S. ., & Anjum, I. . (2022). Investigation of Prevalence and Awareness of Polycystic Ovary Syndrome among Pakistani Females: Polycystic Ovary Syndrome in Pakistani Women. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, 59(1), 77–83

5. Tahir, F. N., Kanwal, S., Safdar, M., Malik, A. A., Hakim, S., & Ashraf, M. N. (2023, April 29). Polycystic Ovaries and Associated Clinical and Biochemical Features in Young Women. *Pakistan Journal of Medical and Health Sciences*.
6. Hira Javed, Sadia Niazi, Adnan Adil, Anam Yousaf, Anam Khan, Saba Ghayas. Body image concern as mediator between obesity and sexual satisfaction: a comparative study of married women with and without polycystic ovarian syndrome. *Rawal Medical Journal*: Vol. 47, No. 2, Apr-Jun 2022.
7. SIDRA, S., TARIQ, M. H., FARRUKH, M. J. & MOHSIN, M. 2019. Evaluation of clinical manifestations, health risks, and quality of life among women with polycystic ovary syndrome. *Plos One*, 14, e0223329.
8. ORBETZOVA, M. M. 2020. Clinical Impact of Insulin Resistance in Women with Polycystic Ovary Syndrome. *Polycystic Ovarian Syndrome*. Intech Open
9. Hellas Cena and others, Obesity, Polycystic Ovary Syndrome, and Infertility: A New Avenue for GLP-1 Receptor Agonists, *The Journal of Clinical Endocrinology & Metabolism*, Volume 105, Issue 8, August 2020, Pages e2695–e2709,
10. Yuanyuan Guan, Dongjun Wang, Huaian Bu, Tieniu Zhao, and Hongwu Wang. The Effect of Metformin on Polycystic Ovary Syndrome in Overweight Women: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Hindawi. International Journal of Endocrinology*.2020; 5150684, 12.
11. Somayeh baharloo, n. S., khosro ebrahim, fahimeh raazmezani tehrani, zahra allameh 2021. The effect of 12 weeks water-based tabata training on insulin resistance, apolipoprotein and apolipoprotein b in obese women with polycystic ovary syndrome. *Razi journal medical sciences*, 28.
12. Thomas M Barber, Petra Hanson, Martin O Weickert, Stephen Franks. Obesity and Polycystic Ovary Syndrome: Implications for Pathogenesis and Novel Management Strategies. *Sage journals. Clinical Medicine Insights: Reproductive Health*. 2019; 13: 1–9.
13. Zeng, Xin, Xie, Yuan, Liu, Ya, Long, Shuang, and Zhong Mo. "Polycystic ovarian syndrome: Correlation between hyperandrogenism, insulin resistance and obesity." *Clinical Chemical Acta*. 2020; 502. 214-221.
14. Saadia, Zaheera. "Follicle Stimulating Hormone (LH: FSH) Ratio in Polycystic Ovary Syndrome (PCOS) - Obese vs. Non- Obese Women." *Medical Archives*. 2020; 74, 4, 289-293.
15. Huang, X., Wang, Q., Liu, T. et al. Body fat indices as effective predictors of insulin resistance in obese/non-obese polycystic ovary syndrome women in the Southwest of China. *Endocrine*. 2019; 65, 81–85.
16. Lie Fong, Sharon, Douma, Annewiets, and Johan Verhaeghe. "Implementing the international evidence-based guideline of assessment and management of polycystic ovary syndrome (PCOS): how to achieve weight loss in overweight and obese

- women with PCOS?" *Journal of Gynecology Obstetrics and Human Reproduction* 2021; 50, 6, 101894.
17. Yu, Jin, Zhou, Yulai, Ding, Jie, Zhang, Danying, Yu, Chaoqin, and Hefeng Huang. "Characteristics and possible mechanisms of metabolic disorder in overweight women with polycystic ovary syndrome." *Frontiers in Endocrinology*. 2023; 13, 970733.
 18. Neubronner, S.A., Indran, I.R., Chan, Y.H. et al. Effect of body mass index (BMI) on phenotypic features of polycystic ovary syndrome (PCOS) in Singapore women: a prospective cross-sectional study. *BMC Women's Health*.2021; 21, 135.
 19. Yang, Szu, Liu, Chia, Ma, Sheng, Chang, Wen, Chen, Yi, Lee, Wen, and Peng Wang. "Association between Pre-Pregnancy Overweightness/Obesity and Pregnancy Outcomes in Women with Polycystic Ovary Syndrome: A Systematic Review and Meta-Analysis." *International Journal of Environmental Research and Public Health*.2022; 19, 15.