Effect of Swiss Ball Exercise and Progressive Resisted Exercise in Polycystic Ovarian Syndrome among Young Obese Women.

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ABSTRACT:

BACKGROUND
Poly cystic ovarian syndrome is an hyper androgenic anovulation syndrome. The heterogeneous condition is characterized by a series of symptoms including hirsutism, irregular menstruation and chronic anovulation. The physiology behind poly cystic ovarian syndrome is the excess secretion of androgen referred to hyperandrogenism which is marked by increased level of testosterone secretion in the blood

AIM
To study the effectiveness of Swiss ball exercise and progressive resisted exercise on polycystic ovarian syndrome among young obese women.

METHOD
The study was conducted on 30 participants, they were divided into 2 groups with 15 participants. Group A performed Swiss ball exercise and Group B performed progressive resisted exercise with outcomes measures including BMI, waist hip ratio and PCOSQ.

RESULT
The exercise program including progressive resistance training showed significant improvement among polycystic ovarian syndrome with p value less than 0.001

CONCLUSION
The progressive resisted exercise is effective in reducing the weight in polycystic ovarian syndrome among young obese women with the BMI score, waist hip ratio and pcos questionnaire.

KEYWORDS:
Polycystic ovarian syndrome, obese females, swiss ball exercise, progressive resisted exercise.

INTRODUCTION

Women's health is often associated with a complex and multifaceted area of events in life[1]. Poly cystic ovarian syndrome is an hyper androgenic anovulation syndrome. The heterogeneous condition is characterized by a series of symptoms including hirsutism, irregular menstruation and chronic anovulation. It is also referred to Stein leventhal syndrome[2] as the described the term in 1935 stating it a combination

of oligomenorrhoea and poly cystic ovaries[3] . Poly cystic ovarian syndrome is an endocrinopathy that affects the women of reproductive age[4]. The condition is presented with an average of 10 small cysts with a diameter ranging from 2 to 9mm, that can be developed in one or both the ovaries or can be estimated with an ovarian volume exceeding 10ml[2]. The physiology behind poly cystic ovarian syndrome is the excess secretion of androgen referred to hyperandrogenism which is marked by increased level of testosterone secretion in the blood[2]. Women who are insulin resistant have difficulty in lowering blood sugar level which contributes to the increase of testosterone[5]. Excessive production of androgen leads to the development of primordial follicle at the early gonadotropin stage. The gonadotropin releasing hormone from the hypothalamus leads to the release of gonadotropin hormone in the pituitary gland. The luteinizing hormone acts on the luteinizing hormone receptor, thereby releasing the androgen in ovarian theca cells. The follicle stimulating hormone acts on the follicle stimulating hormone receptor to convert the androgen to estrogen leading to the follicle growth. Due to the dysregulation in the neuroendocrinal system, there is marked increase in luteinizing hormone than follicle stimulating hormone. Excess luteinizing hormone production causes disruption in the luteinizing hormone surge for releasing egg and also trigger the production of testosterone. Reduced follicle stimulating hormone production causes poor egg development leading to fertility problems[2].

According to National institute of health(NIH), about 4 to 10% of women who are affected with poly cystic ovarian syndrome. Women with poly cystic ovarian syndrome accounts for 85% of hyperinsulinemia, 95% obesity and 65% lean body mass. According to the Rotterdam diagnostic criteria, the rate of affected individuals were a minimum of 3%[2] . By World Health Organization(WHO), over 116 million women(34%) were affected with the condition. The prevalence rate is about 7 to 14% of reproductive women[6]. The rate of the disease is increased by 18%(17.8+2.8%) when diagnosed with Rotterdam criteria[4]. 5 million young women are affected in united states of America with a lifelong condition. Poly cystic ovarian syndrome had an impact on racial factors with a prevalence of 9.13%[3]. Poly cystic ovarian syndrome is characterized by ovarian steroidogenesis, insulin signalling and excessive oxidative stress with environmental or genetic factors[2].

Hyperandrogenism:

Puberty is a sequence of physiological hyperandrogenism. During menarche, the level of testosterone is raised and reaches maximum level[2]. Hyperandrogenism accounts for 60 to 80% of poly cystic ovarian cases[3]. Due to the biochemical raise of the androgen, there is increased rise in the production of ovarian androgen. Other cause of increased androgen is increased luteinizing hormone and elevated level of insulin in the blood. The clinical presentation of hyperandrogenism are hirsutism, acne and male pattern hair growth or alopecia. Hirsutism is a male type terminal hair growth which accounts for 60%, mainly caused due to race and degree of obesity. Acne contributes to 1/3rd symptom of poly cystic ovarian syndrome. The male pattern alopecia is less common and related to familial predisposition[4].

Insulin resistance:

Insulin resistance plays a key role in increasing the risk of metabolic disturbance in poly cystic ovarian syndrome. The physiology is, the level of insulin is raised along with the level of luteinizing hormone which arrest the growth of follicles leading to anovulation. Hyperinsulinemia also causes gonadotropin releasing hormone

pulse secretion to alter, thereby suppressing the sex hormone binding globulin leading to elevated androgen production in the body[2].

Ovarian dysfunction:

Ovarian dysfunction is associated with chronic oligo ovulation or anovulation. Patient with poly cystic ovaries may have ovarian dysfunction along with oligomenorrhoea or amenorrhoea. 80 to 90% were diagnosed with oligomenorrhoea and 40% amenorrhoea with hypothalamic dysfunction. This oligomenorrhoea usually develops in adolescents and later leads to weight gain[3].

Menstrual irregularity:

Due to the declined maturation of hypothalamic hypopituitary ovarian axis, adolescents and young women undergo physiological menstrual irregularity such as oligomenorrhoea which is mainly seen in the first 2years of menarche[2].

Obesity:

The risk of developing obesity varies between 61 to 76%. The main reason behind obesity depend on the genetic or environmental factors and lifestyle. Childhood obesity is one of the main cause for poly cystic ovarian syndrome. Obese children are more likely to develop insulin resistance and metabolic syndrome. Some studies suggests, due to the increased production of androgen, there is increased distribution of visceral and subcutaneous fat. The condition is associated with atherogenic lipid profile characterized by low density lipoprotein, triglycerides and cholesterol. Due to this, they tend to develop atherosclerosis, arterial stiffness and altered vascular endothelium[2].

Rotterdam criteria is important as the poly cystic ovarian syndrome is a spectrum of disease. There are four main classifications:

- Frank or classic poly cystic ovary(hyperandrogenism, chronic anovulation and poly cystic ovary)
- Classic non poly cystic ovary(hyperandrogenism, chronic anovulation and normal ovary)
- Non classic ovulatory poly cystic ovary(regular menstrual cycle, hyperandrogenism and poly cystic ovary)
- Non classic mild or normo - androgenic poly cystic ovary(chronic anovulation, normal androgen and poly cystic ovary)[2].

Women with poly cystic ovarian syndrome are presented with certain sequalae including psychological aspects(depression, anxiety and poor self esteem) reproductive aspects(infertility and hirsutism) and metabolic aspects(insulin resistance). These clinical symptoms varies with age, as young women complaints of reproductive and psychological aspects whereas the older women complaints of metabolic problems. There is no investigation to rule out poly cystic ovarian syndrome[3]. A proper physical examination, history of the patient and laboratory findings are needed for accurate diagnosis. It is advised to terminate the oral contraceptive medication prior to the luteal phase, a period of one month to provide appropriate diagnosis[2].The diagnosis includes prolactin and thyroid stimulating hormone to exclude the elevated level of testosterone. To assess the androgen level, free androgen index and sex hormone binding globulin tests are done[3].

Other testing includes BMI, lipid profile test, thyroid screening and 2- h glucose challenge test is necessary to rule out menstrual irregularity. The risk factors of poly cystic ovarian syndrome includes type 2 diabetes mellitus, cardiovascular disease, infertility and cancer. The type 2 diabetes mellitus accounts for 1 in 5 women constituting family history are affected with poly cystic ovaries. Androgen excess population showed more risk of developing cardiovascular diseases. The prevalence of

poly cystic ovaries has the increased the bio makers including lipoprotein and c reactive protein[2]. Due to the endocrinal and gynaecological abnormality, poly cystic ovarian syndrome has an impact on fertility. Some women who have conceived had increased rate of gestational diabetes and pregnancy induced hypertension along with pre-eclampsia than the normal individuals. The effect of poly cystic ovaries on embryo leads to risk of delivering 2.5 times small gestational age children. The infants showed higher rate of mortality and morbidity. Anovulation causes the unopposed uterine estrogen exposure leading to hyperplasia causing endometrial cancer[2].

Poly cystic ovarian syndrome has an negative impact and leads to higher risk of anxiety and depression which can cause suicidal thoughts[4,5]. The impact of poly cystic ovarian syndrome in young women(18 to 25 years) is 3.7% and are associated with increased risk of abnormal waist hip ratio and metabolic syndrome. The lifestyle changes are the most approached treatment plan. Weight reduction up to 5 to 10% also have an improvement in the psychological outcomes and reproductive aspects. A proper structured exercise program along with the diet plan has showed good prognosis[3]. Exercises with Swiss ball can be initiated, as it enhances the abdominal tone and musculature. The advantage of using Swiss ball is, it provides instability which contributes to greater activation of balance and core muscles. It also aids in the activation of global and local muscles, thereby improving muscle contraction and stimulation[6]. The progressive resisted exercise has an effect on improving skeletal muscle mass and quality of life[7].

Hence, this study is to investigate whether the Swiss ball exercise and progressive resisted exercise is effective in reducing weight thereby improving the quality of the young women with poly cystic ovarian syndrome.

AIM OF THE STUDY

To study the effectiveness of Swiss ball exercise and progressive resisted exercise on polycystic ovarian syndrome among young obese women.

OBJECTIVE OF THE STUDY

- To evaluate the effect of Swiss ball exercise on poly cystic ovarian syndrome management among young obese women.

- To determine the efficacy of progressive resisted exercise on poly cystic ovarian syndrome management among young obese women.

NEED OF THE STUDY

Many studies were conducted to find out the effectiveness of progressive resisted exercise on poly cystic ovarian syndrome. There were several studies done on Swiss ball exercise and aerobic exercise with diet modification. Hence, this study was focused on the effectiveness of Swiss ball exercise and progressive resisted exercise on poly cystic ovarian syndrome among young women.

BACKGROUND OF THE STUDY

The exercises done with Swiss ball along with aerobic exercise training is more effective in poly cystic ovarian syndrome by reducing body weight, abdominal fat and menstrual irregularity**(Dr. Jayabalan et al, 2021**). The progressive resisted exercise with aerobic training and diet modification showed significant improvement in BMI, PCOSQ and hormonal levels**(Dr. Veena krithika et al 2019)**. Hence, this study

was done on young obese women with poly cystic ovarian syndrome by training them with Swiss ball exercise and progressive resisted exercise training.

METHODOLOGY:
The study was a Quasi experimental study with Convenient sampling of 30 young obese females. The exercise were carried out for 12 Weeks at Apple physiotherapy clinic. Age ranging from 20 to 25 years with a BMI of 25 to 35 kg/m^2 were included.
Females with thyroid diseases, other neurological or orthopaedic illness, Recent abdominal surgeries, any systemic illness(hypertension) were excluded. The outcome measures used were BMI, waist hip ratio and SF 26 PCOS questionnaire. The materials used in the study were Swiss ball. Inch tape to measure the waist and hip circumference.

PROCEDURE
The study was conducted on 30 participants, they were divided into 2 groups with 15 participants in each group under the inclusion criteria. The consent from each participants taken and a thorough assessment is carried out prior to the study. Group A performed Swiss ball exercise and Group B performed progressive resisted exercise. The pre test and post test were taken with outcomes such as BMI, waist hip ratio and PCOSQ.

Group A(Swiss ball exercise)

Warm up(10 minutes)
- Breathing exercise(diaphragmattic breathing)
- Stretching(Pectoralis, biceps, triceps, quadriceps, hamstring and calf muscles)

Aerobic exercise
- Jumping jacks
- Wall sit
- Step up onto the chair
- Squats
- High knees
- Lunges

The exercises were performed for 8 to 12 repetitions, 3 sets, 20 minutes 6 days per week.

Swiss ball exercise
- Abdominal curl up
- Abdominal oblique curl up
- Knee tuck
- Back extension
- Front plank
- Side plank

The exercises were performed for 8 to 12 repetition, 3 sets, 20 minutes for 6 days per week.

Cool down(10 minutes)
- Breathing exercise
- Ankle toe movement

The Swiss ball exercises were performed for a total of 60 minutes, 6 days per week for a period of 12 weeks.

Group B(Progressive resisted exercise)
Warm up(10 minutes)
- Breathing exercise(diaphragmatic breathing)
- Stretching(Pectoralis, biceps, triceps, quadriceps, hamstring and calf muscles)

Aerobic exercise
- Brisk walking in treadmill

The exercise were performed for 30 minutes for 5 days in a week.

Progressive resisted exercise
- Lateral pull down
- Leg curls
- Seated row
- Calf raise
- Chest press
- Split squats
- Shoulder press
- Biceps curl
- Triceps extension
- Abdominal curl up

The progressive resisted exercise were performed for 8 to 12 repetitions, 3 sets, 20 minutes for 2 days in a week. In non progressive resisted exercise days, calisthenic exercises were performed.

Calisthenic exercise
- Side leg raise
- Push up with knees
- Oblique curl up
- Wall squats
- Bird dog exercise
- Abdominal hallowing
- Clamshell or lying external rotation

The exercises were performed for 10 repetition, 3 sets, 20 minutes, 4 days per week.

Cool down(10 minutes)
- Breathing exercise
- Ankle toe movement

The progressive exercise are performed for 2days a week and calisthenic exercise are performed in remaining 4 days of the week, 60 minutes for a period of 12 weeks.

Data analysis:

The data which are collected through the outcome measures are analysed and tabulated using the statistical package of social science(SPSS). Paired t test is carried out to evaluate the statistical difference between the groups.

Table 1: Comparison of the pre and post test values of BMI between group A and group B.

BMI	Pre test		Post test		t - test	df	Significance
	Mean	S.D	Mean	S.D			
Group A	28.82	2.37	27.94	2.49	13.446	14	0.00
Group B	25.09	2.72	24.84	2.41	16.956	14	0.00

Graphical representation of the pre and post test values of BMI between group A and group B.

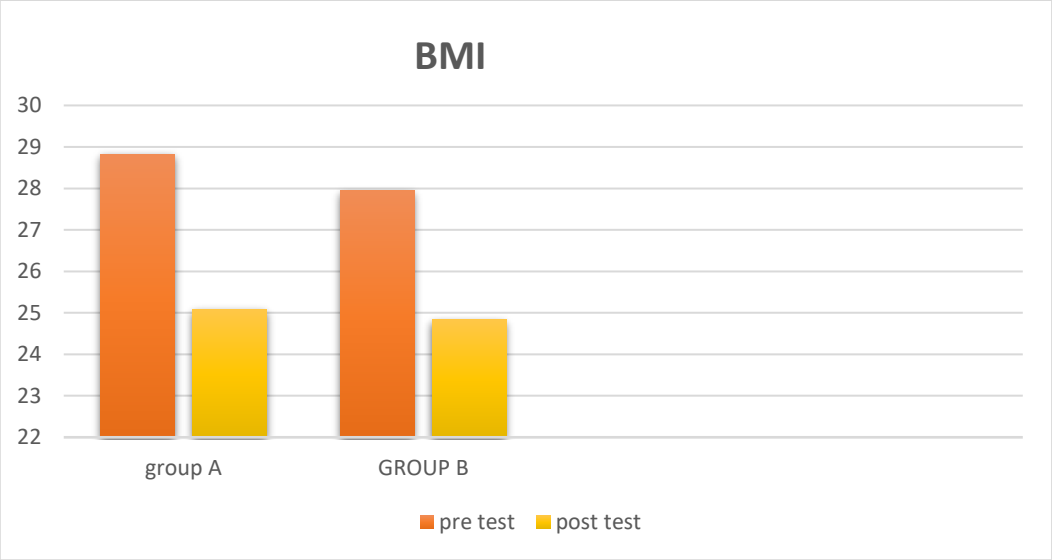


Table 2: Comparison of the pre and post test values of waist hip ratio between group A and group B.

Waist hip ratio	Pre test		Post test		t - test	df	significance
	Mean	S.D	Mean	S.D			
Group A	0.912	0.55	0.805	0.063	13.196	14	0.00
Group B	0.913	0.043	0.766	0.062	10.004	14	0.00

Graphical representation of the pre and post test values of waist hip ratio between group A and group B.

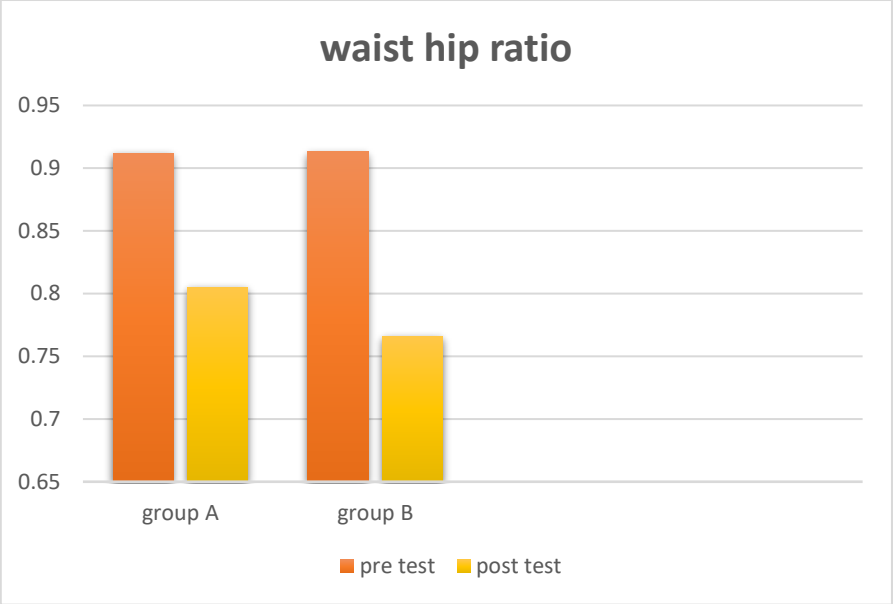
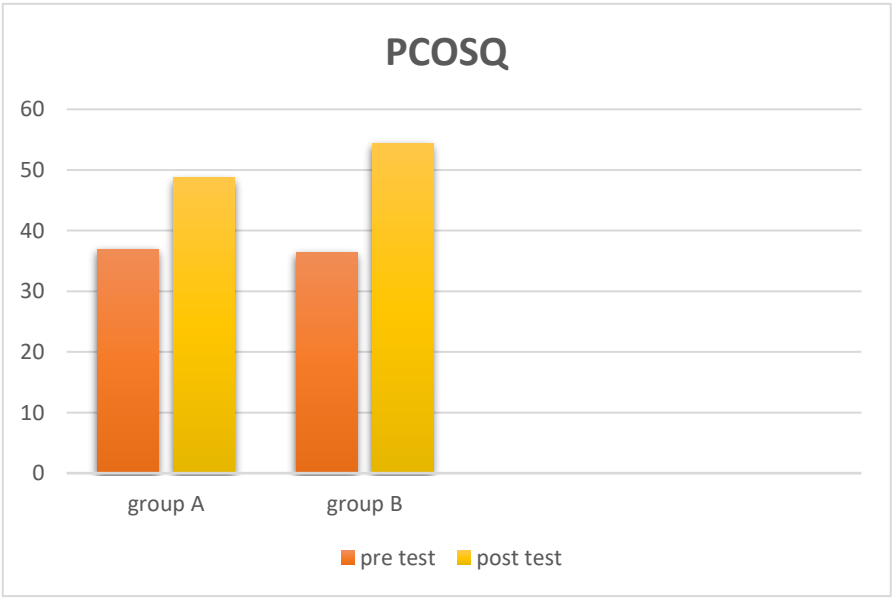


Table 3: Comparison of the pre and post test values of PCOSQ between group A and group B.

Pcosq	Pre test		Post test		t - test	df	significance
	Mean	S.D	Mean	S.D			
Group A	36.93	2.99	48.73	3.43	17.065	14	0.00
Group B	36.40	2.44	54.40	3.72	19.661	14	0.00

Graphical representation of the pre and post test values of PCOSQ between group A and group B



Result

The statistical analysis of the study showed significant improvement from the obtained values of the outcome measures, of both the groups, by comparing the pre and post test values.

Pre and post test values of BMI measurement:

The pre and post mean values of group A performing swiss ball is 28.82 and 25.09; the values for group B performing progressive resisted exercise is 27.94 and 24.84. Group B is more significant in decreasing the BMI in the pcos population.

Pre and post test values of waist hip ratio measurement:

The pre and post mean values of group A performing swiss ball is 0.912 and 0.805; the values for group B performing progressive resisted exercise is 0.913 and 0.766. Group B is more significant in reducing the waist hip ratio among pcos young women.

Pre and post test values of PCOS questionnaire:

The pre and post mean values of group A performing swiss ball is 36.93 and 48.73; the values for group B performing progressive resisted exercise is 36.40 and 54.40. Group B is more significant in improving the pcosq in the poly cystic ovarian syndrome

Discussion:

The present study included 30 participants who were divided into 2 groups with 15 subjects in each group, where group A performed Swiss ball exercise and group B progressive resisted exercise, who underwent proper assessment.The incidence of type II diabetes is seen along with the obesity, so it is important to rule out the consequence of obesity as it is one of the major risk factor of poly cystic ovarian syndrome in adolescents and young women. The other risk factors including insulin resistance and an ovulation is considered to trigger the uterine exposure to the estrogen, which may have consequence of developing endometrial hyperplasia leading to endometrial cancer. Exercises and diet modifications are very important as there is a lot of lifestyle changes and sedentary behaviour among the adolescent population. The exercises are identified to reduce the obesity and the risk of cardiovascular diseases.The general physical conditioning of the body through exercise has an impact on the aerobic capacity and anaerobic threshold which acts in reducing the heart rate, blood pressure,other physiological and metabolic changes in the body. The Swiss ball exercises which are performed with moderate intensity aid in weight reduction thereby regularizing the menstrual flow, increase the chance of ovulation and balance in hormone production.These exercises increases the intra abdominal pressure, which highly increases the stability of the spine which in turn increases the strength of the abdominal muscles. The exercises which are performed with the use of the Swiss ball decreases the strain that may reduce the ability of the muscle to carry out the desired function and also plays a key role in easing out the stress and pain in the hip region and low back area. The Swiss ball acts as an alternative, as the physical exercise increases the amplitude of the joint play, which exerts more pressure on the joint leading to non compliance. The exercise on the Swiss ball provide only a moderate exertion without any loading to the joint.The exercises that are performed with the Swiss ball provides a unstable surface which leads to the activation of the abdominal muscles, that is, it increases the demands of the proprioception, thereby increasing the strength of the core muscles to a maximum level. The abdominal exercises which acts on the abdominal muscles especially

transverse abdomnis tend to activate the pelvic floor muscles, that is, there will be co contraction of the pelvic floor muscles and the transverse abdominis muscle.The aerobic exercises are considered to reduce the fasting insulin and insulin resistance. Interval aerobic training improves the levels of testosterone and acts on the central obesity index. The resistance training is under anaerobic exercise category which involves repeated movements against certain resistance which stimulates the muscle contraction. The resisted exercise are beneficial in the contraction of the muscle which comprises both mechanical and metabolic properties. The exercises increases the functional strength, greater intake of glucose and improves insulin sensitivity.

In type II diabetes with PCOS the effect of progressive resisted exercise has improved the body composition, skeletal muscle size which is accompanied by reduction in the visceral fat and glucose regulation. This glycoregulation reduces the androgen synthesis and shutdowns the hyperandrogenemia which is a main cause of pcos. The regular physical activity reduces the insulin resistance and also as a role in reducing the visceral fat. The exercises has an impact that regulates the signalling of the insulin protein in the skeletal muscles, in order to improve the metabolic rate **(Shaobing Wang et al, 2019)[10]**Combined aerobic resisted is more efficient in improving the insulin resistance and reduction in the abdominal fat among the obese pcos individuals. **(Rebecca L. Thomson et al, 2008)[11].** Proper exercise training with a hypo caloric high protein diet has improved the fertility issues by regulating the menstrual cyclicity and an increased ovulation rate with a improvement in sex hormones, insulin levels and waist circumference. In the study, group B performing progressive resisted exercise has shown improvement in reducing the weight with the BMI score than the group A performing swiss ball exercise. Similarly, in assessing the waist hip ratio, there is a significant reduction in the waist and hip circumference in group B when compared to group A and there is improvement in the pcos questionnaire in group B than group A.

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Conclusion

The progressive resisted exercise is effective in reducing the weight in polycystic ovarian syndrome among young obese women with the BMI score, waist hip ratio and PCOSA questionnaire.

Limitations

- The sample size is small.
- The inclusion criteria is confined only to age and BMI.

Recommendations

- The sample size and the inclusion criteria can be increased.
- Only very studies were conducted on the Swiss ball exercise among PCOS population. Therefore, future studies needsto be conducted.

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