Short Term Effects Of Swiss Ball Exercises Along With Diaphragmmatic Breathing Exercise On Body Composition And Quality Of Life In Subjects With Clinically Diagnosed Polycystic Ovarian Syndrome

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Abstract: Polycystic ovary syndrome (PCOS) is a common endocrine disease that affects women. Common features include Obesity i.e. Central Obesity, Menstrual irregularity and weak core muscle strength. Previous studies have proven that vigorous intensity aerobic exercise has reduced BMI & insulin resistance in polycystic ovarian syndrome. These studies's literature suggests that the ap0.plication of swiss ball exercises in combination with aerobic exercises may reduce the body weight and abdominal fat in polycystic ovarian syndrome. Women with polycystic ovarian syndrome also have a small increased risk of having impaired lung function, so in this study, it's important to include diaphragmatic breathing exercise to improve the lung function. So present study is conducted to find out the short-term effects of swiss ball exercises along with Diaphragmatic breathing exercise on body composition and quality of life in subjects with clinically diagnosed polycystic ovarian syndrome.

Index terms: pcos, swiss ball exercises, diaphragmatic breathing exercise, quality of life, bmi, body composition, skin fold measurements.

Aim and Objectives: To determine the short-term effects of Swiss ball exercises and Diaphragmmatic breathing exercise on Body composition and Quality of Life by using BMI, Skin fold measurements and PCOSQOL Health related questionnaire.

Method: 39 clinically diagnosed pcos women having more than normal bmi between age 20-25 years were included in the study as per inclusion and exclusion criteria. BMI was calculated using the formula BMI = Weight (kg)/[Height] (m^2), quality of life was measured by PCOS health related quality of life questionnaire and skin fold measurements by using a Skin Fold Calliper. Subjects were taken from the Mumbai city, India.

Results: Swiss ball exercises which were focused on the core and back specifically helped in reduction of overall BMI and Skin fold measurements $(p<0.001)$ & with Diaphragmatic breathing exercise is effective on improving the quality of life by 47.6 %.

Conclusion: This study concluded that short term effects were observed after giving an intervention of 8 weeks of swiss ball exercises along with diaphragmatic breathing exercise.

1. INTRODUCTION

PCOS is an acronym which stands short for polycystic ovarian syndrome with the prevalence is seen more in young reproductive age group (20-30%). There is a varying incidence between 0.5-4 percent and is more common amongst the infertile women. Polycystic ovarian syndrome might be seen in about 20% of normal women.[1]

Polycystic ovarian syndrome (PCOS) is a common endocrine disease that affects 9-18 % of women. Hyperandrogenism, menstrual irregularity and polycystic ovaries define the condition, and common features include obesity i.e. central obesity, menstrual irregularity and weak core muscle strength. Pathophysiology for menstrual irregularity starts with increase in production of Gonadotropin releasing hormone from the hypothalamus into the pituitary and therefore causes increase in LH in the ovaries. Which therefore causes increased circulating androgen levels which causes decrease in the levels of SHBG. This leads to further increase in free testosterone and free estrogen levels. [2]

Polycystic ovarian syndrome (PCOS) is a frequent endocrine disease in women during the reproductive period. It is considered a complex metabolic disorder with long-term metabolic, as well as reproductive consequences. The patient complains of increasing obesity (abdominal – 50%), menstrual abnormalities (70%) in the form of oligomenorrhea, amenorrhea or dysfunctional uterine bleeding and infertility. Presence of hirsutism and acne are the important features (70%). [3]

Menstrual cycle disruption has been observed in women with low body weight due to anorexia nervosa, or to athletics. However, the association of the full range of body composition measures with cyclicity has been determined. The relationship between each body composition measure and cycle length was nonlinear with the longest mean cycle lengths occurring with greater BMI, body fat mass or body lean mass. Longer cycle length was also noted at the lowest levels of BMI and body fat mass. [4]

Lifestyle modification through exercises and diet programmes is considered to be important in the management of polycystic ovarian syndrome, especially in subjects with obesity. This also helps in improving their psychological well-being, self-esteem, anxiety, etc Thus exercises are beneficial in both acute and long-term clinical and metabolic health. In the study by Pitchai et al, 62% of the subjects were aware of the beneficial effects of exercises in the management of polycystic ovarian syndrome, 39% were performing exercises regularly. 95% of the study population were willing to undergo lifestyle modifications as part of the management of polycystic ovarian syndrome. [5]

Swiss ball is a commonly used mode of exercise in both therapeutic and recreational setup. Exercises performed in Swiss ball increases muscular demand in adopting various postures performed with less perceived exertion. It is safe as well as interesting for women of all ages, and does not require specific area to perform or financial demands. Swiss ball exercises improve strength, endurance, balance, proprioception, joint stability, coordination and flexibility. It demands the activation of both global and local muscles, thus, assists in improving muscle stimulation and contraction of the major muscle groups. [5]

Weight-gain and obesity worsen insulin resistance and features of the metabolic syndrome. Weight-gain and obesity in women with polycystic ovarian syndrome also promote worsening insulin resistance, and both metabolic dysfunction (mediated through further impairment of the PI3-kinase post-receptor insulin pathway). Therefore, the effects of weight-gain on insulin resistance and hyperinsulinaemia, and the dysmetabolic and steroidogenic implications of the impaired PI3-kinase and intact MAP kinase post-receptor insulin pathways, respectively, from a central component of polycystic ovarian syndrome pathogenesis and underlie the association of weight-gain and obesity with polycystic ovarian syndrome. This explanation also provides a rationale for the benefits of successful weight-loss in obese and overweight women with polycystic ovarian syndrome, through improved insulin sensitivity and serum insulin levels and favourable impact on metabolic health, reproductive function (including restoration of ovulation, menstrual cyclicity, and fertility), and hyperandrogenic features. [6]

Obesity worsens the presentation of polycystic ovarian syndrome and weight management (weight loss, maintenance or prevention of excess weight gain) is proposed as an initial treatment strategy, best achieved through lifestyle changes incorporating diet, exercise and behavioural interventions.[10]

Polycystic ovarian syndrome is very common, so it's important to find out whether this condition is associated with poor lung health. We found that women with polycystic ovarian syndrome have a small increased risk of having impaired lung function. Poor lung function can cause difficulty in breathing and inadequate exchange of oxygen to the blood of carbon dioxide from the blood.[11]

2. MATERIALS AND METHODS:

2.1 Study Setting- It is an interventional study carried out in a metropolitan city, Mumbai, India.

2.2 Participants- A total of 39 having clinically diagnosed polycystic ovarian disorder were randomly selected for the study in Mumbai. They were screened according to the inclusion and exclusion criteria. After screening, a total of 39 women were fulfilling the criteria and they were included in the study. Nature and purpose of the study was explained to the subject in detail in language they understood. All the subjects acknowledged their understanding of the study and their willingness to participate by providing a signed consent form. This study included adolescent's and women with age between 20-25 years, with a BMI of more than 18.5-24.9 kg/m^2. The study excluded subjects undergoing any hormone replacement therapy (HRT), regular physical training, medical management for PCOS, or have had any recent abdominal surgeries. After the consent taken from all the participants, the body mass index (BMI) calculated by using the formula BMI = Weight (kg)/[Height] (m^2), and Skin fold measurements of biceps, triceps, subscapular and suprailiac regions were taken by using a Skin fold caliper. Quality of life was assessed by using PCOS Health related Quality of life questionnaire by scoring between 1-7 pointer scale each of total 26 questions.

3A. PROCEDURE

A questionnaire was used to record demographic data of the participants which contained information regarding their age, gender, height, weight, BMI (kg/m^2) and menstrual history inclusive of the last menstrual period, duration and regularity of menstruation. After attaining data mentioned above, PCOS health related quality of life questionnaire, Body Mass Index (BMI) and Skin fold measurements were used as an outcome measure to identify the quality of life and body fat which helped determine the pre and post intervention outcomes.

Included participants were given swiss ball exercises. Participants were instructed to perform the following exercises: - Abdominal Curl Ups, Abdominal oblique Curl Up, Back extension, Plank, Side Plank, Knee Tucks. The following was the dosage of the exercise protocol: - 1st week – 3 sets of 15 repetitions, 2nd week – 4 sets of 15 repetitions, 3rd and 4th week – 4 sets of 20 repetitions, 5th week – 4 sets of 25 repetitions.

Diaphragmatic breathing Exercise was also taught and were asked to practice this exercise for 3 to 4 times and then rest. Do not hyperventilate during the breathing exercise. Pre and post assessment were taken after 8 weeks of the treatment respectively with the help of outcome measures. After 8 weeks the post interventional responses were recorded in the form of BMI, skin fold measurements and PCOS health related Quality of Life Questionnaire.

3A. 1. Body Mass Index (BMI): Body mass index is a value derived from the mass and height of a person. The BMI is defined as the body mass divided by the square of the body height, and is expressed in units of kg/m², resulting from mass in kilograms and height in metres.

3A. 2. Skinfold measurements: Skinfold measurement is a technique to estimate how much fat is on the body. It involves using a device called a caliper to lightly pinch the skin and underlying fat in several places like biceps, triceps, subscapular, abdominal, suprailiac etc.

3A. 3. PCOS Health related QOL questionnaire: PCOSQ (Cronin et al., 1998) is a disease-specific QoL measure for women with PCOS. It has 26 items and uses a 7-point Likert-type scale. Questions focus on issues concerning growth of visible hair, infertility problems and feelings of depression.

3B. STATISTICAL ANALYSIS

A total of 39 subjects (clinically diagnosed women between age group 20-25) were included in this study. Data was collected on a data sheet and recorded using Microsoft Excel. Their pre-test and post-test values of the bmi, pcos health related QOL questionnaire scores, skin fold measurements of biceps,triceps, abdominal, subcapular, suprailiac regions were taken after giving the 8 weeks swiss ball exercise protocol.

4A. RESULTS

Table: Descriptive statistics of subjects

Variables	N	Mean	Std. Deviation
Age	40	22.80	1.56
Duration of menstruation	40	5.73	2.29

Mean age subjects suffering from PCOS was 22.80 years.

Mean duration of menstruation was 5.73 days.

Figure: Pie chart representing distribution of subjects according to menstruation

Menstruation of PCOS subjects

- Irregular 80%
- Regular 20%
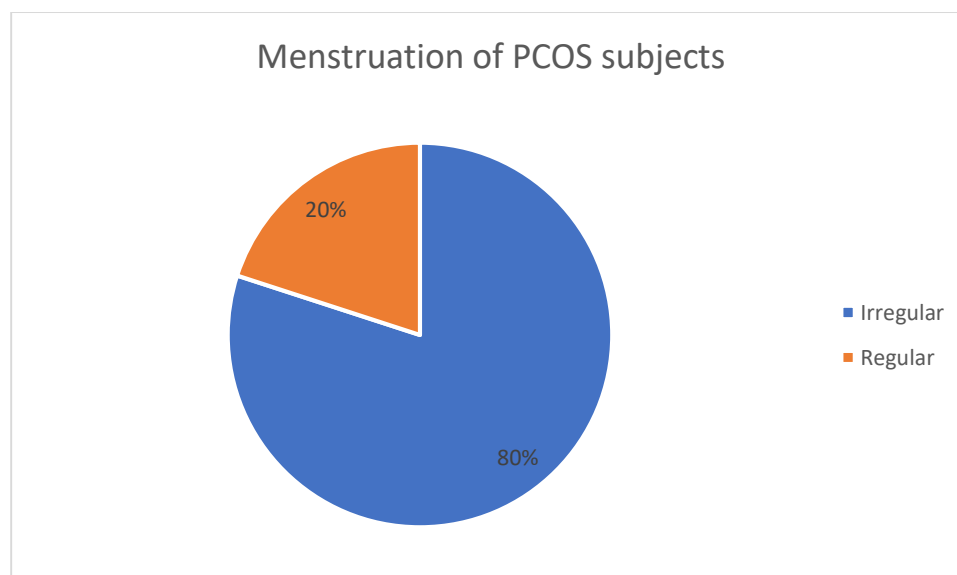
It was found that 32(80%) subjects had irregular menstruation and 8(20%) had regular menstruation.
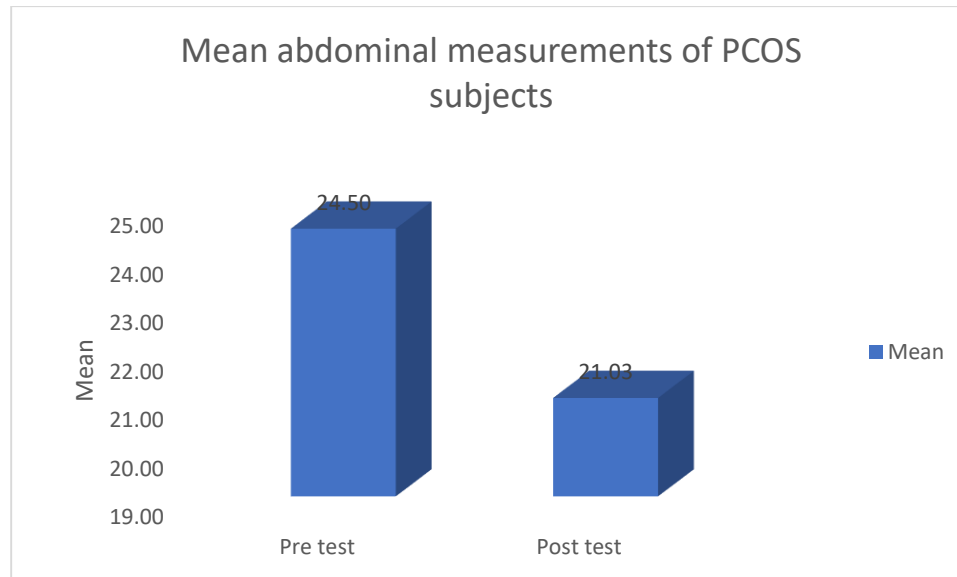
Table: Short term effect of swiss ball exercises on BMI

BMI	Mean	Std. Deviation	Paired t statistic	p value
Pre test	27.10	2.08	12.54	<0.001
Post test	25.62	1.52		

Figure: Bar diagram representing short term effect of swiss ball exercises on BMI
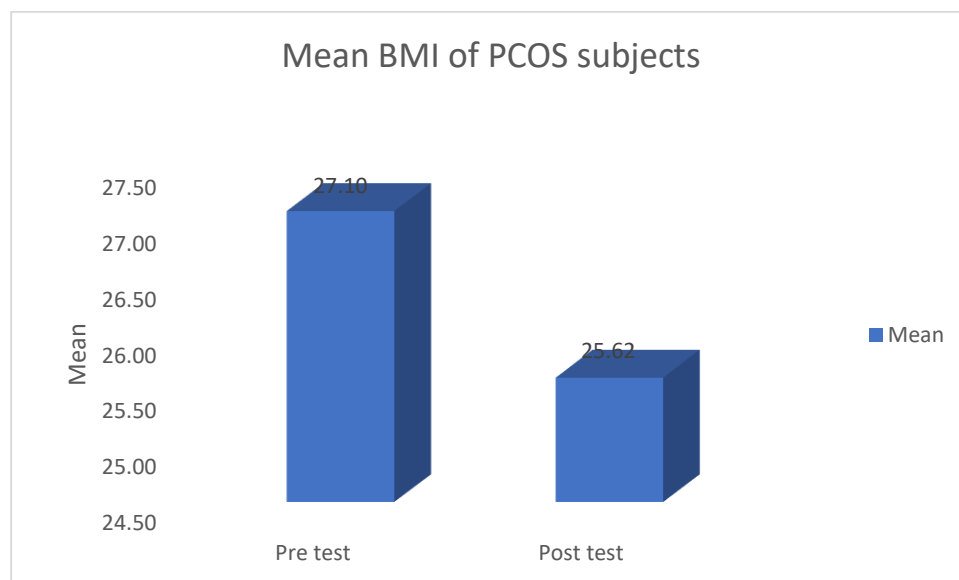
Paired t test was done to compare between BMI before and after swiss ball exercises. It was found that mean pre test BMI 27.10 was significantly higher than mean post test BMI (25.62) (p<0.001).

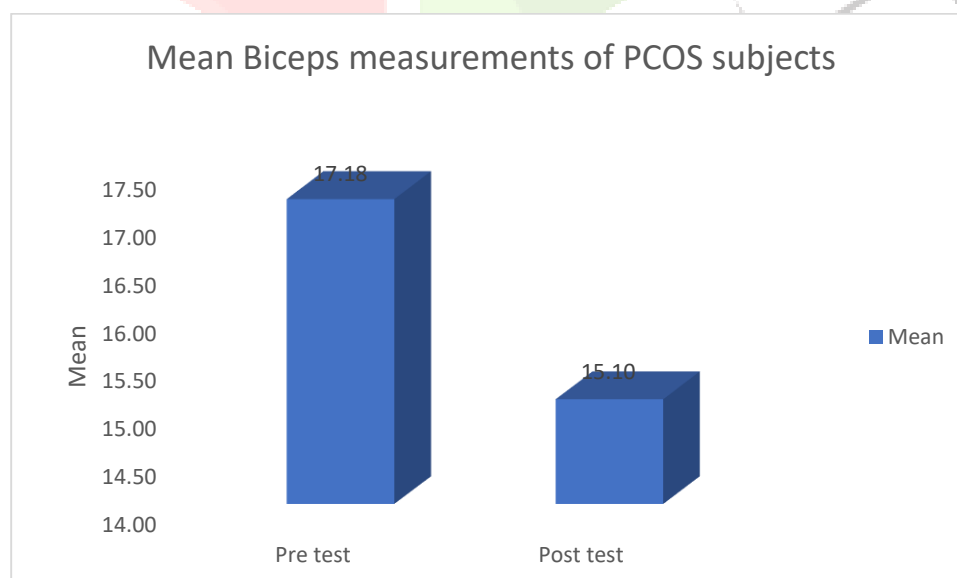**Table: Short term effect of swiss ball exercises on abdominal measurements**

Abdominal measurements	Mean	Std. Deviation	Paired t statistic	p value
Pre test	24.50	6.25	20.24	<0.001
Post test	21.03	6.34		

Figure: Bar diagram representing short term effect of swiss ball exercises on abdominal measurements

Mean abdominal measurements of PCOS subjects

Paired t test was done to compare between abdominal measurements before and after swiss ball exercises. It was found that mean pre test abdominal measurements (24.50) was significantly higher than mean post test abdominal measurements (21.03) (p<0.001).

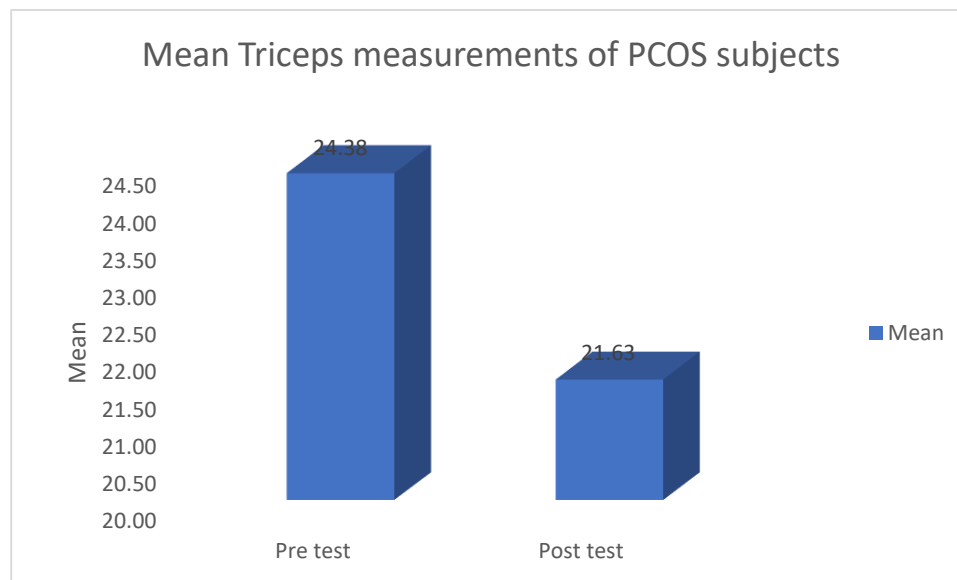**Table: Short term effect of swiss ball exercises on biceps measurements**

Biceps measurements	Mean	Std. Deviation	Paired t statistic	p value
Pre test	17.18	3.38	15.28	<0.001
Post test	15.10	3.46		

Figure: Bar diagram representing short term effect of swiss ball exercises on biceps measurements

Mean Biceps measurements of PCOS subjects

Paired t test was done to compare between biceps measurements before and after swiss ball exercises. It was found that mean pre test biceps measurements (17.18) was significantly higher than mean post test biceps measurements (15.10) (p<0.001).

Table: Short term effect of swiss ball exercises on triceps measurements

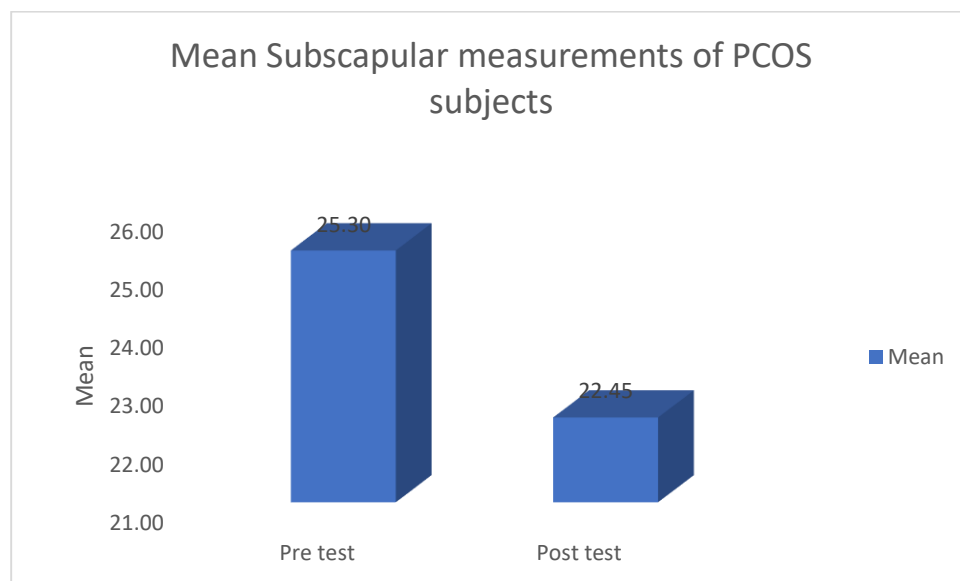| Triceps measurements	Mean	Std. Deviation	Paired t statistic	p value
Pre test	24.38	4.09	16.47	<0.001
Post test	21.63	4.05		

Figure: Bar diagram representing short term effect of swiss ball exercises on triceps measurements

Paired t test was done to compare between triceps measurements before and after swiss ball exercises. It was found that mean pre test triceps measurements (24.38) was significantly higher than mean post test triceps measurements (21.63) (p<0.001).

Table: Short term effect of swiss ball exercises on subscapular measurements

Subscapular measurements	Mean	Std. Deviation	Paired t statistic	p value
Pre test	25.30	3.83	15.75	<0.001
Post test	22.45	3.77		

Figure: Bar diagram representing short term effect of swiss ball exercises on subscapular measurements

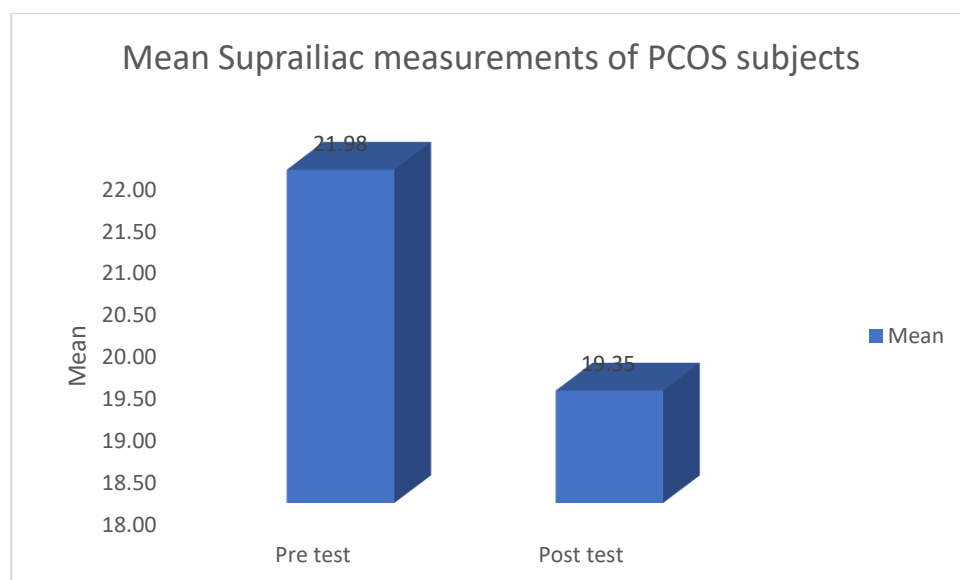Mean Subscapular measurements of PCOS subjects

Paired t test was done to compare between subscapular measurements before and after swiss ball exercises. It was found that mean pre test subscapular measurements (25.30) was significantly higher than mean post test subscapular measurements (22.45) (p<0.001).

Table: Short term effect of swiss ball exercises on suprailiac measurements

Suprailiac measurements	Mean	Std. Deviation	Paired t statistic	p value
Pre test	21.98	3.62	15.06	<0.001
Post test	19.35	3.87		

Figure: Bar diagram representing short term effect of swiss ball exercises on suprailiac measurements

Mean Suprailiac measurements of PCOS subjects

Paired t test was done to compare between suprailiac measurements before and after swiss ball exercises. It was found that mean pre test suprailiac measurements (21.98) was significantly higher than mean post test suprailiac measurements (19.35) (p<0.001).

Table: Short term effect of diaphragmatic breathing exercises on PCOS (HOQL)

PCOS	Mean	Std. Deviation	Paired t statistic	p value
Pre test	74.70	15.49	49.58	<0.001
Post test	156.70	16.57		

Figure: Bar diagram representing short term effect of diaphragmatic breathing exercises on quality of life
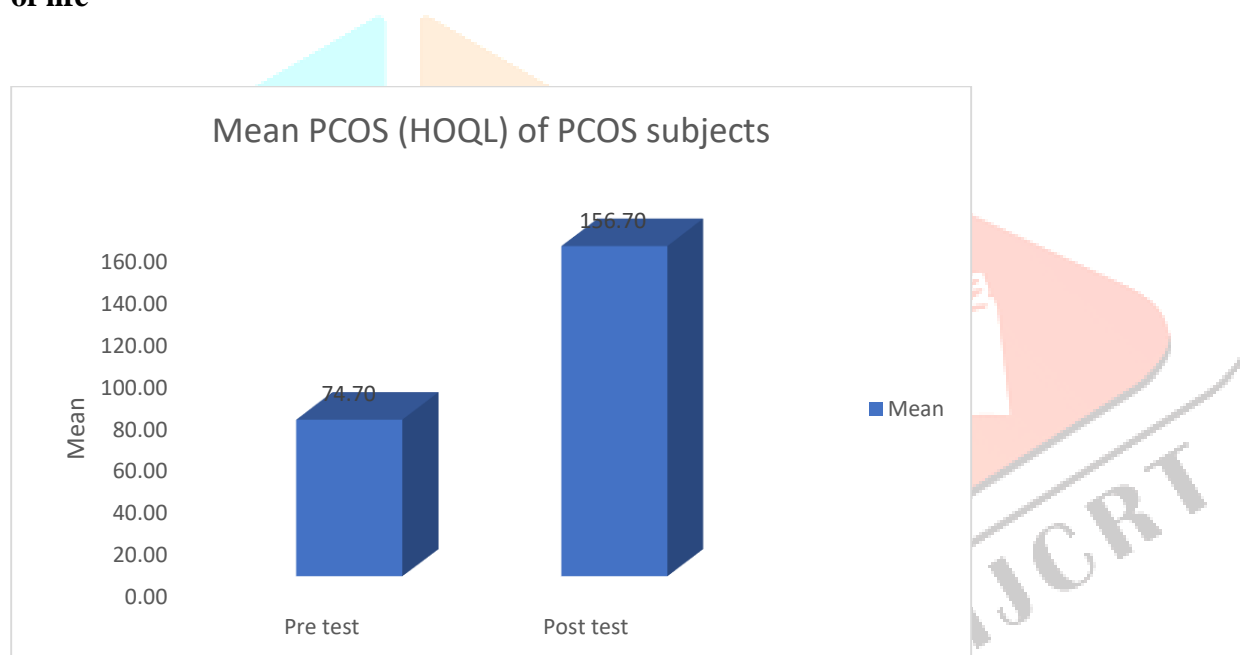
Paired t test was done to compare between quality of life before and after diaphragmatic breathing exercises. It was found that mean pre test quality of life score (74.70) was significantly lower than mean post test quality of life score (156.70) (p<0.001).

4B. DISCUSSION

A study reported that there is 20-30% of prevalence rate of PCOS in young age women. There is a varying incidence between 0.5-4 percent and is more common amongst the infertile women. PCOS might be seen in about 20% of normal women.

Thus, these young women need appropriate treatment and awareness of such therapeutic intervention like Swiss Ball Exercises and proper breathing technique exercises that are necessary for improving BMI and quality of life of the respective subjects.

This study assessed the short-term effects of swiss ball exercises along with diaphragmatic breathing exercise on body composition and quality of life in subjects with clinically diagnosed pcos between the age group 20-25 years of age in a metropolitan city of India using outcome measure such as BMI, Health related quality of life questionnaire and skin fold measurements were used to check the body composition. Swiss Ball Exercises were provided as intervention in order to bring a significant change in their pre and post-test skin fold measurements.

A total of 39 clinically diagnosed pcos subjects were included based on selection criteria. Mean age of subjects was 22.80 and Mean duration of menstruation was 5.73 days.

The 39 Participants were instructed to perform these exercises: - Abdominal Curl Ups, Abdominal oblique Curl Up, Back extension, Plank, Side Plank, Knee Tucks. The following is the dosage of the exercise protocol: - 1st week – 3 sets of 15 repetitions, 2nd week – 4 sets of 15 repetitions, 3rd and 4th week – 4 sets of 20 repetitions, 5th week – 4 sets of 25 repetitions

Diaphragmmatic breathing Exercise was given to practice for 3 to 4 times and then rest. It was made sure that the subject should not hyperventilate.

Pre and Post assessment was taken after 8 weeks of treatment respectively with the help of outcome measures. After 8 weeks the post interventional responses will be recorded in the form of BMI, skin fold measurements and PCOS health related Quality of Life Questionnaire.

Improvement in menstruation and ovulation along with better body composition are found to be achieved by 50% women diagnosed with PCOS with intense exercise training. We identified Swiss ball exercises of moderate intensity, which are safe and interesting helps in reducing the symptoms in subjects with PCOS. Weight reduction through the exercise protocol helps the individuals by improving hormonal balance, promoting ovulation, and correcting irregular menses. Swiss ball exercises, through its activation of global and local core muscles, significantly improves the postural control of individuals with PCOS along with weight reduction. Physical activities demanding greater amplitude of joint motion may put excessive stress on the joints of those who are obese, and may be a major factor leading to non-compliance. This is why, swiss ball exercises are found to be a better alternative which is safe for the joints, and also demands moderate physical exertion without loading joints to stress. Hence, we conclude that the addition of Swiss ball exercise programme along with diaphragmatic breathing exercise is beneficial in women with PCOS in reducing body weight, abdominal fat and irregular menses thus improving the quality of life. [4]

5. CONCLUSION

The study concluded that swiss ball exercises and diaphragmatic breathing exercise had equally effect on body composition and quality of life respectively. On the basis of the result of the study it is also concluded that Swiss ball exercises which were focused on the core and back specifically helped in reduction of overall BMI and Skin fold measurements. Swiss ball exercises along with Diaphragmatic breathing exercise were effective on improving the quality of life by 47.6 %.

6. STUDY LIMITATIONS

This study came across some limitations like the sample size taken for the study was small also a particular age group was selected for the study. The study was done only in a metropolitan city.

7. ACKNOWLEDGEMENT

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