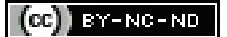


Supervised Structured Exercise Program on Adolescents with Polycystic Ovary Syndrome: Two Case Reports

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ABSTRACT

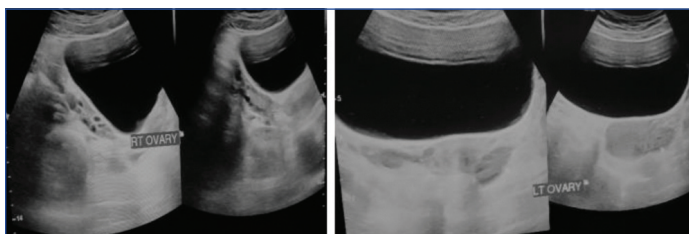
Healthy lifestyle intervention has been incorporated as first line of management when treating adolescents with Polycystic Ovary Syndrome (PCOS) but benefits of structured therapeutic programs with defined dosimetry on psychological parameters is poorly understood. Here, authors present two adolescent girls (15-year-old and 13-year-old) who presented with irregular menstrual cycle and polycystic ovarian morphology on ultrasonography. Both the girls were anxious and concerned about irregular menses. Both the girls had weight gain, anxiety and mild stress. Oral contraceptives were prescribed to one adolescent girl to regulate her menses. Supervised exercise program with combination of exercises and dietary counselling proved effective in managing adolescents with PCOS and improving their physiological and psychological health. Thus, clinicians must consider incorporating supervised exercise regime in managing adolescents with PCOS.

Keywords: Adolescent girls, Healthy lifestyle, Irregular menstrual cycle

CASE REPORT

Case 1

A 15-year-old school going girl (age at menarche 12 years) reported with a significant weight gain of 20 kg in two years, with an increase of 6-7 kg within last six months. She complained of irregular menstrual periods during the last one year, with a gap of 45-50 days between consecutive menstrual cycles and periods lasting for five to six days. She is a classical Bharatanatyam dancer practicing for five years for 4 hours/week. She has one sibling with no known medical history, while her mother is a known case of Type II Diabetes Mellitus. On evaluation her blood pressure was 120/70 mmHg and Resting Heart Rate (RHR) ranged between 90-100 beats/min. On thyroid testing her Triiodothyronine (T3), Tetraiodothyronine (T4) and Thyroid Stimulating Hormone (TSH) levels were 83.3 ng/dL, 5.08 µg/dL and 1.01 mIU/L respectively. Her ultrasonography report indicated enlarged bilateral ovaries with multiple small follicles (5-8 mm) noted both centrally and peripherally but without any peripheral predominance of the follicle. The right ovary measured 3.1×2.1×2.8 cm with a volume of 10.1 cc, and the left ovary measured 4.6×1.8×2.2 cm with a volume of 10.2 cc [Table/Fig-1]. Her weight was 72 kg, Body Mass Index (BMI)-27.169 kg/m², waist circumference-34 inches and hip circumference-39 inches. Her depression, anxiety and stress scores were 8, 18 and 14, respectively on Depression Anxiety Stress Scale (DASS)-21 scale [1]. She was not prescribed with any medications by her gynaecologist, but was referred for physiotherapy. The case was discussed with the parents and as per the consent of parents, patient was counselled to follow first line of management i.e., lifestyle management.



[Table/Fig-1]: Ultrasound imaging of the subject's right and left ovary.

A three month structured exercise program was administered three days/week which included warm up for five minutes, followed by progressive resistance training protocol for major muscle groups using thera band. After resistance training, aerobic workout was performed starting on a low step height [Table/Fig-2] achieving 65-75% of HR max and progressed by increasing height as well as duration followed by five minutes of cool down. Additionally, the patient was encouraged to go for walk for at least half an hour on remaining four days of the week.



[Table/Fig-2]: Images demonstrating aerobic exercise protocol using stepper of progressively increasing heights and resistance training protocol using TheraBand.

After three months protocol, the patient's body weight and BMI reduced to 68 kg and 24.528 kg/m² respectively. Hip and waist circumference, Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) remained the same. Her VO₂ max (maximum rate of oxygen consumption measured during incremental exercise) improved from 32.46 mL/kg/min to 34.24 mL/kg/min. Her depression, anxiety and stress scores reduced to 6, 6 and 12, respectively on DASS-21 scale. Weight was a matter of concern even after three months protocol. Although, the time gap between consecutive menstrual cycle length reduced to 40 days or even lesser. Further follow-up of the patient could not be continued as she developed vertigo and dizziness and was under treatment for vertigo.

Case 2

Another patient was a 13-year-old school going girl who presented with complaint of prolonged bleeding per vagina lasting for 10-15 days continuously in a month. She reported a weight gain of

8 kg in one year. She has two siblings one elder sister and another younger brother. Her elder sister was also suffering from PCOS and was on medications for the same. This 13-year-old girl was a known case of PCOS. Her BP was 120/80 mmHg and RHR ranged between 60-75 beats/min. Her weight was 55 kg, BMI-22.357 kg/m², waist circumference-32 inches and hip circumference-36 inches. Her TSH level was 4.85 mIU/L and ultrasonography report indicated polycystic ovaries. Her depression, anxiety and stress scores were 4, 8 and 10, respectively on DASS-21 scale. She was prescribed meprate (10 mg TDS for 4 days) (a progestin, an oral contraceptive pill) then twice daily for 21 days to improve her menstrual cyclicity. Patient took the above medication for one month. Syrup shelcal twice daily for one month was prescribed. Simultaneously, she was recommended to be physically active and control carbohydrate and fat intake with more of proteins in her diet to regulate her hormonal profile. She was also administered the same structured exercise program for a duration of three months.

After three months protocol her weight and BMI increased to 61.6 kg and 25.04 kg/m² respectively. Hip and waist circumference, SBP and DBP remained the same. Her predicted VO₂ max was 40.31 mL/kg/min but it reduced slightly to 39.04 mL/kg/min which may be due to increase in BMI. Her depression, anxiety and stress scores reduced from 4, 8 and 10, respectively to 0, 0 and 4 respectively post three months protocol. Her menstrual cyclicity improved to be between 35-40 days. In present case along with medical management, exercise protocol may have added benefit.

DISCUSSION

The present case reports aimed to perform a preliminary assessment of the beneficial effects of an individualised, structured physiotherapy exercise program in two adolescent girls with PCOS. This was the first study indicating the effect of structured exercise regime in adolescent girls. Findings suggest that individualised structured supervised physiotherapeutic regime along with dietary counselling and active lifestyle may be effective in improving physical and psychological parameters in young girls with PCOS.

In first case study, the BMI reduced by 9.59% similar to findings of previous studies conducted on adolescents provided with dietary modification or lifestyle modification for three months, six months and 12-months duration [Table/Fig-3] [2-9]. Although, in lifestyle intervention studies aerobic exercises were included while in present case study combination of aerobic and resistance training was included. Combination exercise training result in greater benefits as it counteracts the potential decrease in muscle mass associated with aerobic training driven weight loss [10]. In contrast increase

Authors	Year of study	Intervention	Time duration	Outcome measure
Ornstein RM et al., [2]	2011	Dietary modification	12 weeks	BMI reduced
Rofey DL et al., [3]	2009	Cognitive-behavioural therapy	3 months	BMI improved from mean of 39-35
Wong JM et al., [5]	2016	Dietary intervention	6 months	Decrease in BMI percentile
Marzouk TM et al., [6]	2015	Dietary intervention	6 months	Decrease in BMI and weight
Hoeger K et al., [7]	2008	Lifestyle modification	6 months	Decrease in weight and BMI
Lass N et al., [8]	2011	Lifestyle intervention	1 year	SDS BMI decreased
Reinehr T et al., [9]	2017	Lifestyle intervention	1 year	Weight loss
Reinehr T et al., [4]	2009	Lifestyle intervention	1 year	SDS BMI decreased significantly

[Table/Fig-3]: Summary of studies identified effects of dietary and lifestyle intervention on Body Mass Index (BMI) [2-9].
SDS- BMI SD score

in BMI in second case study may be attributed to the process of sexual maturation during which girls tend to gain Fat Free Mass Index (FFMI) and Body Fat Mass Index (BFMI) and further use of combined oral contraceptives have been associated with non significant weight gain [11,12]. Although, in another study no differences were obtained on BMI and BMI percentage [13]. Further in a meta-analysis it has been stated that as height is not stabilised during adolescence thus, it can affect BMI measurements [14].

In both case studies, menstrual cyclicity improved. In one case it improved from 2 cycles to 2.25 cycles and in other case also it regularised for 3-4 days per cycle. Similar findings were achieved after administration of three months yoga program and six months dietary intervention [6,15]. Weight management may contribute towards improvement of menstrual dysfunction among young PCOS girls [2,8]. In case of abnormal uterine bleeding progestin (medroxyprogesterone) is known to act by stabilisation of the endometrium [16].

In index cases, hip and waist circumference, SBP and DBP remain unchanged. Previous studies conducted on adolescents with high BMI have indicated an association between reductions in blood pressure with weight reduction [4], but in present cases as none of the adolescent recruited was obese so no blood pressure changes were observed.

VO₂ max was found to be improved with reduction in BMI which may be attributed to progressively challenging exercise protocol, though in another case with increase in BMI it reduced slightly. No significant improvements in VO₂ max were reported in previous studies following 12 week exercise regime or 24 week diet and exercise regime [17,18]. Although, improvements in VO₂ max were reported in overweight or obese adolescent girls after a six week physical activity intervention program [19].

Anxiety scores on DASS-21 improved in both the cases and were within normal range. Aerobic exercises have proved to be effective in improving anxiety scores by regulation of the Hypothalamic-Pituitary-Adrenal (HPA) axis, increase in serotonergic and noradrenergic levels in the brain and endogenous opioid release [20,21]. Although, not many studies have analysed the effect of exercise training on anxiety in persons below 18 years.

Depression and stress scores in both the cases were within the normal ranges pre intervention and post intervention. After three months regime further reduction in scores on both the parameters were noted despite that behavioural modification strategy was not a part of the protocol. Cognitive behavioural therapy has shown to improve the depression score with and without weight reduction in adolescents with PCOS [3,22]. In another study, behavioural modification was included in lifestyle therapy but its effects were not studied on psychological parameters of PCOS adolescents [7].

In the present case reports, the effect of three months of supervised exercise intervention with nutritional counselling was not analysed on the biomarkers. Change in biomarkers (insulin resistance, glucose, anti-mullerian hormone, androstenedione, Dehydroepiandrosterone sulfate (DHEAS) levels etc..) can provide mechanistic explanations towards improvement of psychological parameters among adolescents. Also, behavioural modification or cognitive behavioural therapy was not included as a component of lifestyle modification protocol.

CONCLUSION(S)

A three month individualised supervised lifestyle intervention consisting of aerobic and resistance training with dietary counselling may be effective in managing symptoms and psychological parameters of adolescents with PCOS. Inclusion of combination treatment containing lifestyle management with oral contraceptive may have some adverse effects. For further studies along with exercise, inclusion of behavioural therapy in lifestyle management is warranted.

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PLAGIARISM CHECKING METHODS: ^[Jain H et al.]

- Plagiarism X-checker: Oct 21, 2021
- Manual Googling: Dec 30, 2021
- iThenticate Software: Jan 05, 2022 (1%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Oct 20, 2021**
Date of Peer Review: **Nov 25, 2021**
Date of Acceptance: **Dec 31, 2021**
Date of Publishing: **Feb 01, 2022**