DOI: 10.7860/JCDR/2022/50394.16030

Original Article

Nursing Section

Effectiveness of Multimodular Interventions of Lifestyle Modification on Symptoms of Polycystic Ovarian Syndrome and Quality of Life among Women- A Pilot Study

PRAMILA D'SOUZA[1], DEVINA E RODRIGUES[2], RAJA GOPAL KAIPANGALA[3], KUNNATH CHACKO LEENA[4]

ABSTRACT

Introduction: Polycystic Ovarian Syndrome (PCOS) is a common endocrine disorder encountered in female. Multimodular interventions of lifestyle modifications emphasise bearable weight loss through dietary, exercise, and behavioural modification. The timely recognition, understanding, and handling of clinical characteristics of this syndrome shall prevent long-term health issues.

Aim: To evaluate the efficacy of multimodular interventions on symptoms of PCOS and the quality of life of women with PCOS.

Materials and Methods: A pilot study was conducted at Father Muller College of Nursing, Mangaluru, Karnataka, India, between May 2019 to February 2020. The female diagnosed with PCOS were selected through a purposive sampling technique, from two tertiary settings (15 subjects for the intervention group and 15 for the control group). The multimodular interventions (diet, exercises, and behavioural modifications) were provided to the study group. Follow-up was done in the 2nd, 4th and 6th month. The control group subjects continued the regular medical treatment and followed-up at 6th month. The intervention and control group results were compared in the 6th month. The tools used for data collection were baseline variables, PCOS symptom assessment tool, and World Health Organisation Quality of Life questionnaire (WHOQOL-BREF) tool.

Results: The mean age of study participants was 24.26±3.84 years in the intervention, and 24.20±3.54 years in the control group. A significant improvement in the waist-hip ratio, hirsutism acne (p-value <0.001) and quality of life in women with PCOS was observed in the post-test 2 (2nd month), post-test 3 (4th month), and post-test 4 (6th month) in the intervention group (p-value <0.001). A minimal change was noticed in the Body Mass Index (BMI) and Fasting Blood Sugar (FBS) scores. The Mann-Whitney test (z values) revealed a significant difference in the symptoms of PCOS of waist-hip ratio (z value=3.328, p-value <0.001) and hirsutism (z-value 2.296, p-value <0.022) between intervention and control group after the 6 months. The pretest mean and standard deviation of physical health domain was 21.00±2.59, psychological health domain 18.13±3.04, social relationship 9.27±1.67, and environmental domain 23.00±3.66. The post-test mean and standard deviation was 24.00±3.05, 22.67±4.03, 12.20±1.74, 28.07±6.71 (p-value <0.001) in physical, psychological, social, and environmental domain, respectively. A statistically significant increase in quality of life observed in the intervention group (p-value <0.001) whereas in the control group there was no change.

Conclusion: The multimodular interventions were found to be effective in reducing the clinical symptoms of PCOS like hirsutism acne and the quality of life steeply improved after 6 months of these interventions in PCOS women.

Keywords: Anthropometric measurements, Diet, Exercises, Obesity, Psychological health

INTRODUCTION

As per the Rotterdam criteria, if one ovary of a woman reveals multiple cysts and is associated with ovulatory dysfunction and excessive secretion of androgens with or without complaints of oligomeneorrhoea it is said to be a polycystic ovary [1]. Polycystic Ovary Syndrome (PCOS) is an endocrine disorder characterised by changes in hormonal levels. The common symptoms are menstrual irregularities, anovulation, obesity, acne, hair growth in unwanted areas, alopecia, and a male pattern of baldness [2]. Infertility, Type 2 diabetes, gestational diabetes, hypertension, and gynaecological cancers are found to be long-term complications of PCOS [3].

Worldwide, the prevalence of the syndrome ranges from 2.2%-26%, depending on the choice of diagnostic criteria and population being studied [4]. In India limited prevalence studies on PCOS have been conducted. Based on these data, it can be said that the occurrence of PCOS ranges from 3.7%-22.5% [5]. A large scale survey conducted in 2020 reported 16.81% incidence of PCOS among women aged 20-29 years [6]. Another cross-sectional survey identified approximately 28.5% of females diagnosed as PCOS and 40.5% of females have two or more features of PCOS. An urban community-based study in Mumbai found 22.5% of PCOS [7]. One of the studies in south India observed 18% of young adolescent girls are with PCOS [5].

Familial history, stress, unhealthy diet, less or and lack of physical activity and lack of sleep are contributing factors to PCOS [8]. Sedentary lifestyle, access to junk food, addiction to social media and the use of complex gadgets for simple daily tasks is highly prevalent among the higher socio-economic population and is also a contributor to the rise of PCOS [9].

Many researchers have pointed out the poor quality of life in women with PCOS. Psychological morbidities like mood swings, anxiety, depression, poor body image, self-esteem, and eating disorders, are frequently observed in PCOS women. These symptoms hamper the work environment, personal and professional life which in turn leads to distress in health-related quality of life [10].

The management of PCOS addresses the associated manifestations and co-morbidities of the syndrome. Weight loss is the first recommended line of management. Healthy diet, regular physical activity, aimed to control excess weight gain, menstrual irregularities, and control of acne and hirsutism [5]. The counselling strategies on lifestyle modification encourage women positively to adapt and continue the healthy practice [8]. However, in some severe

conditions, insulin-sensitising agents and androgen blockers, along with the modified lifestyle are beneficial [9].

In the present study, the Multimodular Intervention (MMI) of lifestyle modification was used. It refers to a comprehensive approach which includes nutritional therapy, physical activity and behavioural modifications. The lifestyle is categorised as moderate (high or moderate levels of physical activity and low prohealthy diet); sedentary (low or no physical activity and low prohealthy diet); healthy (high or moderate levels of physical activity and prohealthy diet) [11].

The American College of Sports Medicine reported that 200-300 minutes of moderate exercise per week facilitates long-term maintenance of weight loss. However, the short sessions of exercises (15-30 minutes), 5 days per week have shown greater effectiveness compared with the traditional structured approach [12]. A systematic review highlights that a 3-4 month structured aerobic training programme reduces total testosterone and free androgen index and fasting insulin levels [13]. Thomson RL et al., reported that 20 weeks of aerobic-resistance exercises and an energy-restricted diet significantly improved the glucose fasting insulin, testosterone, free androgen and reproductive functions of PCOS women [10]. In view of these considerations, the pilot study was conducted to evaluate the efficacy of MMI on symptoms of PCOS, and the quality of life of women with PCOS.

MATERIALS AND METHODS

A pilot study was conducted at Father Muller College of Nursing, Mangaluru, Karnataka, India, between March 2019 to December 2019. The study included 30 female diagnosed with PCOS. Ethical clearance was obtained (letter number FMMCTEC/CCM/430/2018), followed by prior permission from the hospital authorities.

Sample size calculation: The sample size was calculated based on the sample size determination table (95% confidence intervals, ±2.5% margin of error) [14]. Total 15 subjects for the intervention group and another 15 subjects for the control group were recruited, from the Obstetrics Outpatient Department (OPD) of the two tertiary care settings, which belongs to Father Muller Medical College and Hospital.

Inclusion criteria: The study included women between age group of 18-30 years who have been diagnosed with PCOS by an Obstetrician.

Exclusion criteria: The antenatal women, postpartum women with symptoms of PCOS up to one year, surgical conditions which contraindicate exercises (fractures, cardiac diseases, musculoskeletal disorders), women with medical conditions such as (thyroid impairments, cushing syndrome, and metabolic disorders) and those who were already with similar treatment and already engaged in exercise schedule were excluded from the study.

Parameters

Informed written consent was obtained from the study participants after explaining the client information sheet. A pretest was conducted; baseline proforma was used to collect the baseline characteristics of females, followed by a PCOS assessment tool was administered. This tool consists of the following information:

- Information on menstrual irregularities [15] such as amenorrhoea (absence of menstruation more than 3 months), polymenorrhea (monthly bleeding less than 21 days), oligomeneorrhoea (bleeding occurring more than 35 days apart), regular (bleeding at 28-35 days interval).
- Body Mass Index (BMI) {World Health Organisation (WHO) Asian criteria [12]} was calculated for which weight was measured by using a digital weighing scale to the nearest 0.1 kg, which was calibrated by the Biomedical Department; while height was measured using a standard stadiometer to the nearest 0.5 cm.
- Waist-hip ratio was calculated based on WHO criteria [16].
- Acne was assessed using the Acne Global Grading Scale [17].
- Fasting Blood Glucose (FBG) was interpreted based on the American Diabetes Association- normal (<100 mg/dL), prediabetes (100 to 125 mg/dL), and diabetes (126 mg/dL or higher). The venous blood was collected in the laboratory after an overnight 8 hours of fasting [18].
- Hirsutism was assessed by using the modified Ferriman and Gallwey Scale where a score of 8 or more indicates hyperandrogenism [19].

World Health Organisation Quality of Life questionnaire (WHOQOL-BREF): The quality of life was measured by using WHOQOL- Bref tool. The tool consists of a total of 26 items. Out of it, 24 items are distributed on the four domains such as physical health, psychological health, social relationships, and environment. And one question is about the overall perceived quality of life, another one about the overall perceived satisfaction with health. Item number 21 was reworded as menstrual health from sexual life because the study involves women who have not experienced sexual life [20]. The reliability of the Kannada version was 0.56-0.95) [21], internal consistency was measured by using Cronbach's alpha (0.94).

Procedure

For the women in the interventional group, subjects were counselled for an insulin resistance diet which is composed of healthy fat, high protein, and fewer carbohydrates. The diet menu was prepared with the help of a dietician based on the BMI. Brisk walk for 30 minutes first one month followed by jogging from the month onwards for the same duration was advised. Core muscle exercises, half push-ups, and four types of burpees (beginners, basic, squat thrust, and mountain climber) were demonstrated by the investigator. Subjects practiced for the first month, each exercise repeating for 10 counts; second month onwards same exercises (two sets) were continued with 5 minutes of warm-up and cool down for five days a week, with a total of 20 minutes per day. A video on exercises and the instructional booklet with detailed information on diet and prescribed exercises and a logbook was given to the subjects to document the diet and exercise on daily basis. A compliance chart was maintained by the investigator. The participants who were absent for 2nd post-test were excluded from the study. Reminders on What's App were sent to the clients as motivation. Follow-up was done every month and post-test was conducted after the 2nd,4th, and 6th months from the pretest.

Regular hospital medical treatment was continued for both intervention and control group. For the control group pretest and after the 6th month post-test was done. A comparison of the measurements was done.

STATISTICAL ANALYSIS

Data were tabulated, analysed, and interpreted using descriptive and inferential statistics like frequency, percentage. Mann-Whitney test, Analysis of Variance (ANOVA), post-hoc test, and paired Eta square. IBM Statistical Package for the Social Sciences (SPSS) version 23.0 was used.

RESULTS

Distribution of baseline characteristics and homogeneity of the subjects are presented in [Table/Fig-1]. Total 53% of women were aged between 21-25 years in both groups and the mean age was 24.26±3.84 years, 24.20±3.54 years in the intervention and control group, respectively. Out of 15 women in the interventional group, more than 70% of them were qualified above 12th standard in both the groups, above 65% of subjects practiced moderate type of lifestyle, and above 70 % of them did not have a family history of PCOS in the intervention and control group.

Variables	Intervention group (15)	Control group (15)	p-value (Fishers exact test)
Mean age (years)	24.26±3.84	24.20±3.54	
18-20	2 (13.3%)	2 (13.3%)	1.0
21-25	8 (53%)	8 (53%)	
26-30	5 (33.3%)	5 (33.3%)	
Qualification			
1st to 7th standard	0	1 (6.7%)	1.0
8th to 10th standard	1 (6.7%)	1 (6.7%)	
11th to 12th standard	2 (13.3%)	2 (13.3%)	
Above 12th standard	12 (80%)	11 (73.3%)	
Lifestyle			
Sedentary	2 (13.3%)	4 (26.7%)	0.717
Moderate	11 (73.3%)	10 (66.7%)	
Healthy	2 (13.3%)	1 (6.7%)	
Residence			
Urban	10 (66.7%)	9 (60%)	0.7095
Rural	5 (33.3%)	6 (40%)	
Menarche (years)			
10-12	3 (20%)	7 (46.7%)	0.1277
13-15	12 (80%)	8 (53.3%)	
Family history of PCOS			
Yes	2 (13.3%)	4 (26.7%)	0.651
No	13 (86.7%)	11 (73.3%)	

[Table/Fig-1]: Distribution of baseline characteristics and homogeneity of the subjects.

Assessment of symptoms of PCOS in various time points are presented in [Table/Fig-2], shows the steady improvement in menstruation pattern, Body Mass Index, (BMI) waist-hip ratio, acne, and FBS scores in the intervention group after 6 months comparing to control group.

The [Table/Fig-3] shows the quality of life of women in each domain is considerably increased (p-value <0.001).

Symptom	Intervention group		Control 6th month N (%)
	Pretest N (%)	6th month N (%)	Pretest N (%)
Menstrual pattern			
Regular	3 (20%)	12 (80%)	5 (33.3%)	5 (33.3%)
Amenorrhea	6 (40%)	2 (13.3%)	7 (46.7%)	4 (26.7%)
Polymenorrhea	4 (26.7%)	0 (0%)	0 (0%)	1 (6.7%)
Oligomeneorrhoea	2 (13.3%)	1 (6.7%)	3 (20%)	5 (33.3)
Body mass index				
Underweight	5 (33.3%)	1 (6.7%)	3 (20%)	3 (20%)
Normal	1 (6.7 %)	10 (66.7%	3 (20%)	3 (20%)
Overweight	3 (20%)	2 (13.3%)	2 (13.3%)	3 (20%)
Obese	6 (40%)	2(13.3%)	7 (46.7%)	6 (40%)
Waist-hip ratio				
0.85	3 (20%)	11 (73.3%)	7 (46.7%)	6 (40%)
>0.85	12 (80%)	4 (26.7%)	8 (53.3%)	9 (60%)
Hirsutism				
<8	3 (20%)	3 (20%)	5 (33.3%)	5 (33.3%)
≥8	12 (80%)	12 (80%)	10 (66.7%)	10 (66.7%)
Acne				
Mild	14 (93.3%)	15 (100%)	15 (100%)	15 (100%)
Moderate	1 (6.7%)	0	0	0
Fasting blood sugar				
Normal	10 (66.7%)	14 (93.3%)	10 (66.7%)	12 (80%)
Prediabetes	5 (33.3%)	1 (6.7%)	5 (33.3%)	3 (20%)

[Table/Fig-2]: Assessment of symptoms of PCOS at various time points.

Domains	Intervention group					
	Before intervention	2 months Mean±SD	4 months Mean±SD	6 months Mean±SD	p1 value	p2 value
Physical health	21.00± 2.59	22.73± 2.81	23.67± 2.79	24.00± 3.05	**0.001**	**0.013**
Psychological health	18.13± 3.04	19.13± 2.77	21.60± 3.98	22.67± 4.03	**0.001**	**0.004**
Social relationships	9.27± 1.67	10.00± 1.81	12.13± 1.64	12.20± 1.74	**0.001**	**0.001**
Environmental health	23.00± 3.66	25.20± 4.93	27.27± 5.90	28.07± 6.71	**0.001**	**0.019**

[Table/Fig-3]: Domain-wise comparison of quality of life within the intervention group at various time points.
p1-intragroup (ANOVA), p2-intergroup (multiple post-hoc test)

The [Table/Fig-4] shows that the subjects' perception on QOL and satisfaction with health is improved after the interventions (p-value <0.001).

Variables	Intervention group					
	Before intervention	2 months Mean±SD	4 months Mean±SD	6 months Mean±SD	p1 value	p2 value
Perception of QOL	11.33±8.10	11.40± 7.61	13.07± 8.68	13.93± 9.46	**0.001**	**0.005**
Satisfaction with health	5.80±3.45	6.40±3.48	8.40±4.07	8.47±4.00	**0.001**	**0.001**

[Table/Fig-4]: Comparison of the overall perception of the quality of life and satisfaction with health within the intervention group at various time points.
p1-intragroup (ANOVA), p2-intergroup (Bonferroni test)

The [Table/Fig-5] shows the improvement waist hip ratio (p-value <0.003), hirsutism (p-value <0.001), and acne (p-value <0.008) within the group at various time points. A significant difference is noticed between pretest and post-test 3 values of hirsutism (p-value <0.036).

Symptoms	Intervention group					
	Before intervention	2 months Mean±SD	4 months Mean±SD	6 months Mean±SD	p1 value	p2 value
Body mass index	23.39± 6.16	23.03± 5.34	22.54± 4.80	22.30± 4.64	0.109	0.893
Waist-hip ratio	0.90±0.07	0.89±0.07	0.87±0.03	0.87±0.03	**0.003**	0.159
Hirsutism	13.93± 8.71	14.00± 8.47	12.53± 8.03	12.27± 7.68	**0.001**	**0.036**
Acne	12.00± 6.23	11.67± 5.19	10.27± 4.92	9.67±4.39	**0.008**	**0.030**
Fasting blood sugar	95.00± 8.61	91.41± 6.50	92.67± 6.29	85.93± 21.22	0.121	0.556

[Table/Fig-5]: Comparison of scores of symptoms of PCOS within the group at various time points.
p1-intragroup (ANOVA), p2-intergroup (Bonferroni test)

[Table/Fig-6] depicts the significant difference in the waist-hip ratio p-value=0.001 and hirsutism p-value=0.022 after the intervention compared to the control group.

[Table/Fig-7] shows a highly significant difference in all domains of quality of life in the intervention group, while there was no improvement in the control group after 6 months.

[Table/Fig-8] shows a highly significant difference in the perception towards the quality of life and satisfaction with health in the intervention group, whereas the scores of the control group remained stable after six months.

Karl Pearson's correlation showed a moderately strong positive relationship between BMI and satisfaction with health (r=0. 568, p-value <0.027) and waist-hip ratio (r=0.521, p-value <0.046) in the intervention group.

The statistical test MANOVA showed the association of BMI with menarche (p-value <0.033) and qualification (p-value <0.014) in the intervention group, whereas, in the control group the association

Parameters	Group	Paired difference Mean±SD	Mann Whitney test Z value	p-value
Body mass index	Interventional	1.09±2.76	1.811	0.070
	Control	-0.53±1.75		
Waist-hip ratio	Interventional	0.04±0.06	3.328	**0.001**
	Control	-0.01±0.02		
Fasting blood sugar	Interventional	9.07±19.46	1.438	0.151
	Control	0.93±10.21		
Hirsutism	Interventional	1.67±2.61	2.296	**0.022**
	Control	0.00±1.13		
Acne	Interventional	2.33±3.50	1.712	0.087
	Control	0.47±3.20		

[Table/Fig-6]: Comparison of post-test scores of PCOS symptoms.
(post-test is 6th month)

Parameters	Group	Paired difference Mean±SD	Mann Whitney test Z value	p-value
Physical health	Intervention	-3.00±3.12	2.645	**0.008**
	Control	0.60±2.32		
Psychological health	Intervention	-4.53±3.98	3.627	**0.000**
	Control	1.07±2.55		
Social relationships	Intervention	-2.93±2.12	2.982	**0.003**
	Control	1.00±6.22		
Environmental health	Intervention	-5.07±5.52	2.566	**0.010**
	Control	0.60±3.44		

[Table/Fig-7]: Comparison of post-test scores of quality of life (domain wise) N=15+15.
(post-test is 6th month)

Parameters	Group	Paired difference Mean±SD	Mann Whitney test Z value	p-value
Quality of life	Intervention	-2.60±3.29	3.247	**0.001**
	Control	-0.13±0.52		
Satisfaction	Intervention	-2.67±1.68	3.953	**0.001**
	Control	-0.07±0.70		

[Table/Fig-8]: Comparison of post-test scores of perceptions of the quality of life and satisfaction with health N=15+15.
(post-test is 6th month)

was observed with a family history of PCOS (p-value <0.038) and BMI (η^2=0.541).

DISCUSSION

Lifestyle reform is forefront in the management of PCOS symptoms. Healthy diet and physical exercise regimes are an excellent rehabilitation in mitigating PCOS signs and related metabolic illnesses. Additionally, these regimes had highlighted positive results in improving holistic health of women with this the disorder.

This study was focussed to reduce the symptoms and improve the quality of life of women with PCOS after administering the MMIs of lifestyle modification. Overall, this study revealed a statistically and clinically significant improvement in reducing PCOS symptomology and quality of life.

The efficacy of MMI was more evident in reducing waist-hip ratio {df(3,42)=5.304, hirsutism df(3,42) =6.853, and acne df(3,42)=4.497, p-value<0.001}, within the intervention group over 6 months. Moreover, 80% of women had menstrual irregularity, 33.3% were prediabetes and only 6.7% of them were with normal BMI before intervention. After 6 months of interventions 80% attained regular menstruation, 13.3% of subjects remained as prediabetes and 66.7% achieved normal BMI compared with control group. These findings were congruent with the trial outcomes conducted by Arentz S et al., [22]. They found improvement in the menstrual cycle, BMI and fasting insulin (p-value <0.001). Another study by Jiskoot G et al., supports the finding of the current study [23].

In the present study, the η^2 values (0.373 -0.641) in each domain of quality of life showed improved after the 6 months of MMI administration in the intervention group. The p-values (p-value <0.001), denote highly significant influence of MMI on enhancing quality of life comparing to control group. Several research studies have reported that the lifestyle modification will improve the quality of life of women with PCOS [21]. Ramya R et al., conducted a hospital-based intervention for 6 months on women suffering from PCOS, used WHOQOL-Bref tool and found increased quality of life in each domain in the post-test [24]. Evidences show that the lifestyle modification is the prime need of women with PCOS to improve the physical, clinical, and metabolic parameters and heighten the quality of life [25].

Limitation(s)

Even though exercise had a good effect on the PCOS symptoms and quality of life there was some drawback in the study. The study outcomes were limited to physical, clinical parameters and quality of life of women. Further studies can be done on various pattern of exercises which in moderate intensity will help to control the physical signs, clinical and metabolic parameters of women with PCOS.

CONCLUSION(S)

The PCOS is one of the reproductive health problems faced by the females. The quality of life is significantly lower in females with PCOS in comparison to healthy women. The lifestyle modification remains as utmost priority in women to sustain good reproductive health. The current study has demonstrated its efficacy on a small sample. Nevertheless, this information can be used for better patient outcomes by clinicians, nurses and paramedical personnel when they encounter the PCOS female.

REFERENCES

[1] Balaji S, Amadi C, Prasad S, Bala Kasav J, Upadhyay V, Singh AK, et al. Urban rural comparisons of polycystic ovary syndrome burden among adolescent girls in a hospital setting in India. Biomed Res Int. 2015;2015:158951.

[2] Haq N, Khan Z, Riaz S, Nasim A, Shahwani R, Tahir M. Prevalence and knowledge of Polycystic Ovary Syndrome (PCOS) among female science students of different public Universities of Quetta, Pakistan. Imperial Journal of Interdisciplinary Research. 2017;3(6):385-92.

[3] Dos Santos IK, Ashe MC, Cobucci RN, Soares GM, de Oliveira Maranhão TM, Dantas PMS. The effect of exercise as an intervention for women with polycystic ovary syndrome: A systematic review and meta-analysis. Medicine (Baltimore). 2020;99(16):e19644.

[4] Choudhary A, Jain S, Chaudhari P. Prevalence and symptomatology of polycystic ovarian syndrome in Indian women: Is there a rising incidence? Int J Reprod Contracept Obstet Gynaecol. 2017;6(11):4971-75;4971-76.

[5] Ganie MA, Vasudevan V, Wani IA, Baba MS, Arif T, Rashid A. Epidemiology, pathogenesis, genetics & management of polycystic ovary syndrome in India. Indian J Med Res. 2019;150(4):333-44.

[6] India: polycystic ovary syndrome issues among women by age group 2020 [Internet]. Statista.com. [cited 2021 Sep 17]. Available from: https://www.statista.com/statistics/1136572/india-polycystic-ovary-syndrome-issues-among-women-by-age-group/.

[7] Rao M, Broughton KS, LeMieux MJ. Cross-sectional study on the knowledge and prevalence of PCOS at a multiethnic university. Prog Prev Med (NY). 2020;5(2):e0028.

[8] Joshi B, Mukherjee S, Patil A, Purandare A, Chauhan S, Vaidya R. A cross-sectional study of polycystic ovarian syndrome among adolescent and young girls in Mumbai, India. Indian J Endocrinol Metab. 2014;18:317-24.

[9] Vidya R, Bharathi S, Swetha J, Neerajaa J, Madhavica V, Moorthy D, et al., An epidemiological survey: Effect of predisposing factors for PCOS in Indian urban and rural population. Middle East Fertility Society Journal. 2017;22(4):313-16. https://doi.org/10.1016/j.mefs.2017.05.007.

[10] Thomson RL, Buckley JD, Lim SS, Noakes M, Clifton PM, Norman RJ, et al. Lifestyle management improves quality of life and depression in overweight and obese women with polycystic ovary syndrome. Fertil Steril. 2010;94(5):1812-16.

[11] Gasior A, Kolarzyk E, Majewska R, Gasior A, Kwiatkowski J, Zaleska I. Diet and physical activity as determinants of lifestyle chosen by women from Southern Poland. Int J Environ Res Public Health. 2018;15(10):2088.

[12] Moran L. Effects of lifestyle modifi cation in polycystic ovarian syndrome. Reproductive Bio Medicine Online. 2006;12(5):569-78.

[13] Shele G, Genkil J, Speelman D. A systematic review of the effects of exercise on hormones in women with polycystic ovary syndrome. J Funct Morphol Kinesiol. 2020;5:35; pp2-24. Doi: 10.3390/jfmk5020035.

[14] Sharma KS. Nursing research and statistics. 2017; 2nd edition: publi Relx India; pp 230-31.
[15] Jacob Annamma. A comprehensive textbook of midwifery and gynaecological Nursing; 2021; 5th edition: Jaypee publication; pp 622-24.
[16] Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation Geneva, 8-11 December 2008.
[17] Thappa D, Adityan B, Kumari R. Scoring systems in acne vulgaris. Indian J Dermatol Venereol Leprol. 2009;75(3):323-26.
[18] American Diabetes Association. 3. Prevention or delay of type 2 diabetes: Standards of Medical Care in Diabetes- 2020. Diabetes Care. 2020;43(Suppl. 1):S32-36.
[19] Ferriman D, Gallwey JD. Clinical assessment of body hair growth in women. The J Clin Endocrinol Metab. 1961;21(11):1440-47.
[20] World Health Organization. WHO QOL User Manual. Programme on Mental Health. Available at: www.who.int/mental_health/media/en/620.pdf (last accessed on June, 2020).
[21] Rose A, Shashidhara YN, Manjula. Quality of life of people with non communicable diseases. NUJHS. 2015;5(3):71-76.
[22] Arentz S, Smith CA, Abbott J, Fahey P, Cheema BS, Bensoussan A. Combined lifestyle and herbal medicine in overweight women with Polycystic Ovary Syndrome (PCOS): a randomized controlled trial. Phytother Res. 2017;31(9):1330-40. Doi: 10.1002/ptr.5858
[23] Jiskoot G, Timman R, Beerthuizen A, Loos DA, Busschbach J, Laven J. Weight Reduction Through a Cognitive Behavioral Therapy Lifestyle Intervention in PCOS: The Primary Outcome of a Randomized Controlled Trial. Obesity. 2020;28:2134-41.
[24] Ramya R, Ann SK, Mamatha, K Surya. Quality of life in women with polycystic ovarian syndrome: requisite of clinical pharmacist intervention. Asian J Pharm Clin Res. 2019:12(11):100-05.
[25] Nunes DL, Santos D, Cobucci R, Pichini GS, Soares GM, de Oliveira Maranhão. Lifestyle interventions and quality of life for women with polycystic ovary syndrome. Medicine. 2019;98(50):71-79.

PARTICULARS OF CONTRIBUTORS:
1. PhD Scholar, Yenepoya Deemed to be University, Deralakatte, Mangalore, Karnataka, India.
2. Professor and Head, Department of Nursing Research, Father Muller College of Nursing, Mangaluru, Karnataka, India.
3. Professor, Department of Obstetrics and Gynaecology, Kanachur Institute of Medical Sciences, Mangaluru, Karnataka, India.
4. Professor and Dean, Yenepoya Nursing College, Yenepoya Deemed to be University, Deralakatte, Mangalore, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Ms. Pramila D'Souza,
PhD Scholar, Yenepoya Deemed to be University, Deralakatte,
Mangalore-575018, Karnataka, India.
E-mail: dsouzapramila78@gmail.om

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: May 18, 2021
- Manual Googling: Sep 27, 2021
- iThenticate Software: Jan 08, 2022 (11%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **May 17, 2021**
Date of Peer Review: **Aug 04, 2021**
Date of Acceptance: **Nov 24, 2021**
Date of Publishing: **Feb 01, 2022**