A Comparative Study on the Effect of Different Management Options on Body Mass Index in Overweight Polycystic Ovarian Syndrome Patients at a Tertiary Care Hospital

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Abstract

Introduction: According to the data from the World Health Organization, polycystic ovarian syndrome (PCOS) may affect as many as 116 million women worldwide (3.4%). The main objective of the study was to determine the effectiveness of treatment on the body mass index (BMI) of overweight PCOS patients. **Materials and Methods:** This prospective, observational study was conducted from December 2022 to February 2023 and 252 PCOS patients were included in the study. **Results:** A detailed analysis of the risk factors in the study population concluded that a family history of the PCOS, lack of exercise, regular consumption of fast food, broiler chicken, high sugar, soft drinks, and packed foods had contributed to the lifestyle syndrome, where each showed a $P = 0.0001$. **Conclusion:** The comparative analysis of the treatment effectiveness in terms of BMI among three treatment strategies—(1) medication, (2) lifestyle, and (3) medication along with lifestyle established the conclusion that the treatment with lifestyle alone and lifestyle along with medication together showed similar extend in weight reduction in overweight PCOS patients after performing *post hoc* statistical analysis. However, a greater proportion of people who experienced weight reduction falls under lifestyle + exercise.

Keywords: Body mass index, lifestyle, medication, polycystic ovarian syndrome, *post hoc* analysis, risk factors, weight gain, weight reduction

Introduction

Polycystic ovarian syndrome (PCOS), also known as hyperandrogenic anovulation, is a multifactorial endocrine disorder affecting women of reproductive age.[1] Nowadays, the rate of PCOS occurrence is very high. According to the data from the World Health Organization (WHO), PCOS may affect as many as 116 million women worldwide (3.4%).[2] Lifestyle changes are the primary line of treatment for women with PCOS, but they are not an alternative to pharmacological treatments. Regular physical exercise, maintaining a healthy body weight, and adhering to healthy dietary habits are all important in the prevention and treatment of PCOS.[3] Obesity is increasing globally in PCOS patients. Studies suggest that this incremental trend is linked to the elevated insulin level, which results from insulin resistance, a significant inhibitor of adipogenesis, lipogenesis, and lipolysis.[4]

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Management strategies adopted for weight reduction include medication, lifestyle changes, and a combination of both. The medications used mainly are metformin and myoinositol.

This study aims to analyze the best treatment option for weight reduction in overweight females due to PCOS.

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MATERIALS AND METHODS

Study setting

A total of 252 PCOS women were selected from patients visiting the Obstetrics and Gynaecological Outpatient Department of Caritas Hospital, Kottayam, Kerala, India, who fulfilled the inclusion and exclusion criteria from December 2022 to February 2023. The study was approved by the institutional ethical committee of the hospital.

Inclusion criteria

Female aged 12 year till menopause in gynecology department, females with ultrasound report, 6 month to 1 year follow-up period, patients followed treatment with medicine and lifestyle modification or either medicine/lifestyle modification.

Exclusion criteria

Females without ultrasound report excluded and files with incomplete data are excluded from the study.

Study design

Data on the patients with PCOS who visited the hospital during the period were collected from questionnaires, patient medical charts, and electronic medical records after obtaining written informed consent from all the women enrolled in the study. A prestructured data collection form was prepared and validated by an expert panel under the Ethical Clearance Committee of Nirmala College of Pharmacy. The data collection form included the patient's OP number, patient demographics, symptoms experienced by the patient, bilateral ovarian status, and treatment. In addition, a questionnaire was developed based on references from literature to analyze the lifestyle of PCOS and non-PCOS women. This included a family history of PCOS, exercise pattern, consumption of broiler chicken, fast food, soft drinks, sugar intake, and packed food. The questionnaire helps subcategorize the overweight PCOS patients into the three treatment groups based on their lifestyle modifications and compliance with therapy.

Sociodemographic assessment

Sociodemographic details such as age, family history, and marital status were collected from the patient records.

Anthropometric assessment

Anthropometric measurements such as body weight (kg) and height (cm) were assessed using the established tools. The body mass indices of the patients were calculated, and the body mass index (BMI) categories were determined using the WHO standards: underweight ≤18.5, normal weight = 18.5–24.9, overweight = 25–29.9, obesity = a BMI of 30 or more.

Sample size

The sample size is calculated using the G*Power statistical software version 3.1.9.2 (IBM, Chicago, Illinois USA). The required sample size is 190, but 252 PCOS patients were recruited for the study. For the study with a power of 80, the level of significance was between 0.05 and 95% confidence interval.

Statistical analysis

Data from the data collection forms were entered into the Excel sheet. Analysis was carried out using IBM SPSS Version 25 - Is a statistical software used in the statistical analysis of the study. Inferential statistics, that is analysis of variance (ANOVA), are used to find out whether there is a significant difference in mean BMI before and after treatment. After this; *post hoc* analysis is done to find out which treatment groups mean differences differ from each other.

Ethics

The study procedure followed was in accordance with the ethical standards of the institutional review board. Informed consent was obtained from all the research participants.

IRB approval id

CH/EC/NOV/2022/025.

RESULTS

Proportion of various symptoms associated with polycystic ovarian syndrome

Out of 252 PCOS patients, the various clinical manifestation experienced by the patient is obtained by patient history interview and the proportion of patient who experienced each symptom is noted. The clinical manifestation, frequency, and proportion of patient who experienced each symptom are depicted in Table 1.

From Table 1 and Figure 1 menstrual irregularity, 81.3% ($n = 205$) are the most common symptom experienced by the majority of PCOS patients. Various other symptoms are pigmentation 68.2% ($n = 172$), alopecia 64.7% ($n = 163$), infertility 59.5% $n = 150$), weight gain 49.2% ($n = 124$), dysmenorrhea 35.7% ($n = 90$), hirsutism 34.9% ($n = 88$), acne 25.8% ($n = 65$), heavy bleeding 23% (58), anemia 9.9% ($n = 25$), and hyperglycemia 2.8% ($n = 7$).

Categorization of polycystic ovarian syndrome patients based on the number of symptoms experienced

Two hundred and fifty two patients were interviewed to analyze

Table 1: Overall frequency and proportion of various clinical manifestation of polycystic ovarian syndrome experienced by polycystic ovarian syndrome patients

Symptoms experienced	Frequency, *n* (%)
Menstrual irregularity	205 (81.30)
Pigmentation	172 (68.20)
Alopecia	163 (64.70)
Infertility	150 (59.50)
Weight gain	124 (49.20)
Dysmenorrhea	90 (35.70)
Hirsutism	88 (34.90)
Acne	65 (25.80)
Heavy bleeding	58 (23)
Anemia	25 (9.90)
Hyperglycemia	7 (2.80)

Table 2: Categorization of polycystic ovarian syndrome patients based on the number of symptoms experienced

Number of symptoms experienced	Frequency, *n* (%)
1–3	72 (28.50)
4–6	139 (55.10)
7–9	41 (16.20)
Total number of patients	252 (100.00)

Table 3: Frequency and proportion of patient undergone weight reduction in three treatment alternatives

Treatment category	Number of patients experienced weight gain	Weight reduction after treatment, *n* (%)
Medication	39	18 (46.15)
Lifestyle	41	24 (58.53)
Medication+lifestyle	44	33 (75)

Table 4: Distribution of risk factors in polycystic ovarian syndrome (*n*=252) versus nonpolycystic ovarian syndrome patients (*n*=252)

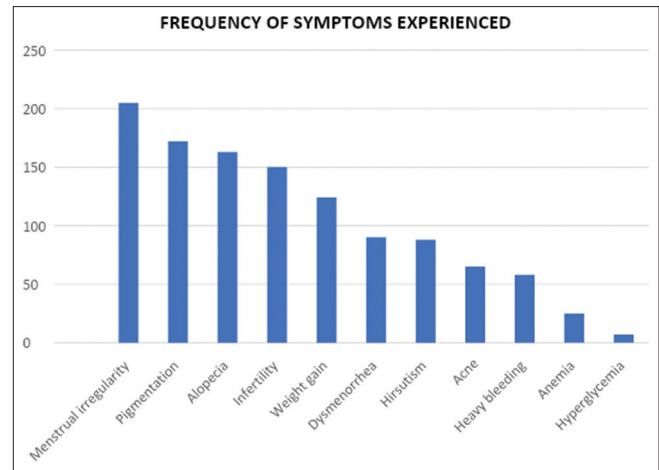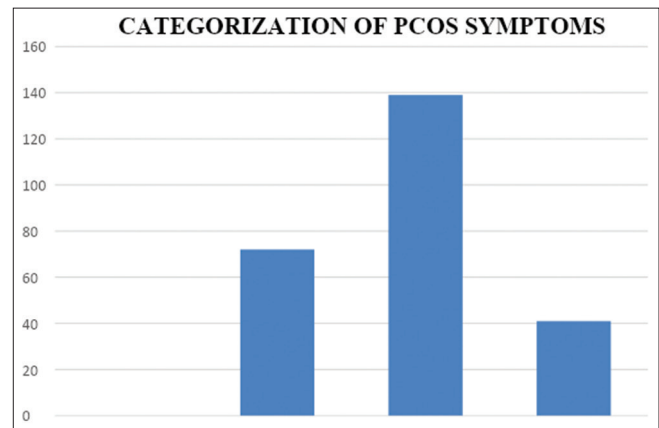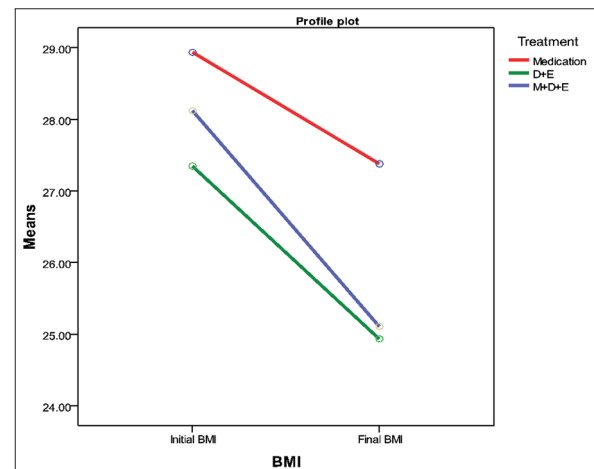| Risk factors	PCOS patients (%)	Non-PCOS patients (%)	*P*
Family history of PCOS	29/252=11.5	0	NA
Exercise	55/252=21.8	183/252=72.6	0.0001
Fast food (regular consumption)	163/252=64.7	7/252=2.7	0.0001
Broiler chicken (regular consumption)	220/252=87.3	43/252=17	0.0001
High sugar consumption	179/252=71.03	20/252=7.9	0.0001
Soft drinks (regular consumption)	76/252=30.2	1/252=0.4	0.0001
Packed foods (regular consumption)	88/252=34.9	1/252=0.4	0.0001

PCOS: Polycystic ovarian syndrome, NA: Not available

Table 5: Repeated measure ANOVA to analyze initial and final body mass index before and after treatment

Treatment	Initial BMI (mean±SD)	Final BMI (mean±SD)	F	Significant
Medication	28.93±3.95	27.37±4.73	5.81	0.004
Lifestyle	27.34±2.39	24.93±2.19		
Medication+lifestyle	28.12±4.18	25.10±3.30		
Total	28.12±3.63	25.76±3.67		

BMI: Body mass index, SD: Standard deviation

Figure 1: Overall frequency and proportion of various clinical manifestation of polycystic ovarian syndrome (PCOS) experienced by PCOS patients

Figure 2: Categorization of polycystic ovarian syndrome patients based on the number of symptoms experienced

Figure 3: Profile plot showing comparison between three treatment groups

Comparison on the effect of different management options on body mass index of overweight polycystic ovarian syndrome patients

Overweight PCOS patients account for 124 in total, i.e.,

the number of symptoms they experienced as a result of PCOS. From Table 2 and Figure 2 a total of 11 symptoms were taken into consideration and it was observed that the patients had experienced minimum 1 symptom and a maximum of 9 symptoms. Hence, the symptoms are categorized as 1–3, 4–6, and 7–9 symptoms and the frequency and proportion of patients in each category are evaluated. It is observed that maximum patients had experienced 4–6 symptoms, i.e., 139 (*n* = 55.1%).

(I) treatment	(J) treatment	Mean difference (I−J)	95% CI		Significant
			Lower bound	Upper bound	
Medication (M)	Lifestyle (D+E)	2.01	0.49	3.54	0.10
	Medication and lifestyle (M+D + E)	1.54	0.043	3.03	0.044
Lifestyle (D+E)	Medication and lifestyle (M+D + E)	−0.47	−1.95	1.00	0.525

Table 6: *Post hoc* analysis for comparison between three treatment groups

CI: Confidence interval

49.2%. They were enrolled into three treatment groups: medication (*n* = 39) versus lifestyle (*n* = 41) versus medication and lifestyle (*n* = 44). The number of patients who yield weight reduction after following each treatment patterns is as follows: medication 46.15% (*n* = 18), lifestyle 58.53% (*n* = 24), and medication + lifestyle 75% (*n* = 33). Hence, [Table 3] it is concluded that a significant number of patients have reduced weight after following medication and lifestyle.

Here, lifestyle implies diet and exercise interventions.

The exercise patterns of PCOS patients are categorized as vigorous, intermediate, and irregular, where vigorous means those patients who regularly workout in the gym or follow cardio, skipping, dance, and zumba; intermediate means daily activities such as yoga, jogging, cycling, shuttle, and squatting; and irregular means walking and other physical activity but not on a regular basis.

Dietary restrictions involve all those dietary risk factors, as mentioned in Table 4.

To analyze whether there is any significant difference between initial and final BMI among the three alternatives before and after the treatment, a statistical analysis using the repeated measures ANOVA is performed and is presented in Table 5.

Here, the $P = 0.004 < 0.05$, so we can conclude that there is a significance difference between the variables.

The *post hoc* analysis is done to find out the effective treatment method among these and is presented in Table 6.

Here, the $P < 0.05$ for medication versus D + E and medication versus M + D + E. However, for treatment D + E and M + D + E $P = 0.525 > 0.05$. From this and below profile plot, we can conclude that treatment D + E and M + D + E are better than medicine treatment only but D + E and M + D + E are almost similar since the mean BMI value after treatment is almost similar among both treatments and is represented in Figure 3.

Discussion

Narwal *et al.* in 2018 performed a brief systematic review on the prevalence of PCOS. Based on their studies, the majority of patient experienced menstrual irregularity (88.21%) which

is consistent with our study followed by hirsutism (58.12%), obesity (54.26%), and infertility (6.33%) which is not consistent with our study.[5]

In our study, overweight patients are provided with three treatment alternatives; medication versus lifestyle versus medication + lifestyle. It is seen that medication + lifestyle (75%) is the most effective treatment option for weight reduction followed by lifestyle modification. Dileep et al. conducted a study on the effect of weight loss on symptoms of PCOS among women of reproductive age. In this study, they concluded that a combination of lifestyle modification and metformin was effective in achieving a successful weight loss which resulted in significant improvement in the clinical symptom of PCOS.[4] A part from this study, our study also compared the effectiveness of weight gain between three treatment groups.

Conclusion

Hence, to conclude, the number of patients who reduced weight is higher in the medication + lifestyle category (medication + lifestyle *n* = 33/44; lifestyle *n* = 24/41; medication alone *n* = 18/39), but the extent of weight reduction is the same in both the medication and lifestyle categories ($P = 0.525 > 0.05$) versus lifestyle alone ($P < 0.05$).

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Conflicts of interest
There are no conflicts of interest.

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