Assessment of Nutritional Status of Young Women with and Without PCOS in Fatehabad District, Haryana

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HIGHLIGHTS

- Analyzed comparative intake of micro and macronutrients among women with and without polycystic ovarian syndrome

- Investigated the body compositional difference among women with and without polycystic ovarian syndrome

- Compared food intake of women with and without polycystic ovarian syndrome.

GRAPHICAL ABSTRACT

Daily nutrient intake of young womean with and without PCOS
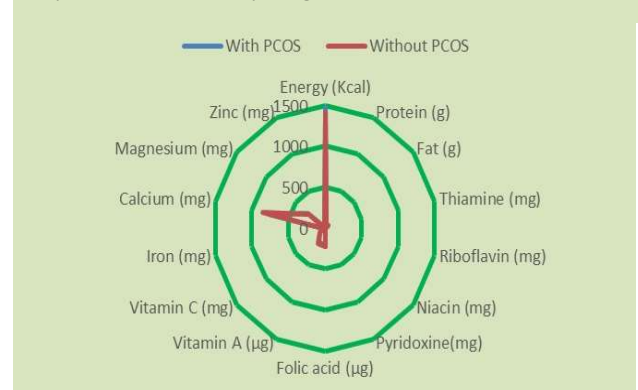
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ABSTRACT

Context: Polycystic ovarian syndrome (PCOS) is a disorder suspected in patients with irregular menses and clinical signs of hyperandrogenism. PCOS not only affects women of childbearing age but also the adolescent girls and post-menopausal women. Most of the women affected by PCOS belong to the age group of 18-44 years.

Objective: To assess the body composition and nutrient intake of young women with and without polycystic ovary syndrome (PCOS).

Methods: The information was collected about family type, size and makeup. Additionally, information about the subject's and their families' medical history, eating habits, anthropometric measures, clinical features, dietary and nutrient intake and physical activity patterns were gathered using the questionnaire.

Results and Discussion: Among PCOS respondents 52.0, 44.0 and 4.0 percent were in the age group of 19 to 25, 26 to 32 and 33 to 40 years, respectively. BMI (24.03kg/m²), waist (85.03cm), hip (103.81cm) and MUAC (14.16 inch) circumference of women with PCOS were significantly higher than those of women without PCOS. There was no significant difference in the mean daily food intake of young women with and without PCOS except intake of sugar which was higher in women suffering from PCOS. Vitamin A was significantly lower in women suffering from PCOS compared to normal women.

Significance: There is great scope for enhancing young women's health and nutritional status if they are advised timely about their health issues and emphasized making them understand the importance of a balanced diet.

Polycystic ovarian syndrome (PCOS) is a disorder suspected in patients with irregular menses and clinical signs of hyperandrogenism (Lilhare and Pawar, 2014; Aswini and Jayapalan, 2017). PCOS is a complex endocrine condition that affects the ovaries. It's linked to long-term metabolic problems like insulin resistance (IR), dyslipidemia, and other disorders that predispose to cardiovascular risk, systemic inflammation, and endothelial dysfunction. Elevated serum levels of luteinizing hormone (LH) are another symptom of PCOS (Iervolino et al., 2021). PCOS not only affects women of childbearing age but also adolescent girls and post-menopausal women. Most of the women affected by PCOS belong to the age group of 18-44 years (Ganie et al., 2019). This condition affects about 5-10 percent of women of reproductive age and it is the most common endocrine disorder in women. Obesity, hirsutism and infertility are all reported to have a significant impact on one's psychosocial well-being. Women with PCOS are more likely to have fertility issues (menstrual irregularities etc.), metabolic issues (insulin resistance, late menopause, endometrial cancer and infertility), failure to ovulate, late menopause, endometrial cancer and infertility resistance, type 2 diabetes, dyslipidemia, hypertension and cardiovascular illnesses (Thara and Divakar, 2017).

Unhealthy lifestyle, diet or infectious mediators increase the risk of PCOS, and obesity and insulin resistance are also strongly implicated in the etiology of PCOS (Williams et al., 2016; Teede et al., 2011). The diagnosis of PCOS is based on ruling out recognized illnesses that mirror the symptoms of PCOS (Malik et al., 2014). Pharmacological therapy and a lifestyle modification program are used in the management of PCOS, with a focus on behavioral change, a balanced diet, and frequent exercise. Menstrual irregularities, the impact of hyperandrogenism (acne and hirsutism), infertility and insulin resistance, as well as related long-term metabolic problems (T2DM, hyperlipidaemia and obesity) are the key components of PCOS that are the focus of the therapeutic plan (Ganie et al., 2019).

As a result of the constant health demands of globalization and economic liberalization, middle-class urban women are more vulnerable than rural women who live a traditional lifestyle. The higher prevalence of PCOS among India's higher socio-economic urban population has been attributed to sedentary lifestyles, access to high-calorie foods and machineries for all housework. The strongest and most significant link between the illness and family history has been discovered. As a result, further genetic research is needed to understand the hereditary pathophysiology of this complex condition (Bharathi et al., 2017). In our daily lives, nutrition is really important. A balanced diet and our body's capability to effectively digest and absorb nutrients are the two factors that regulate our nutritional status. In addition, clinical observation, biochemical testing, evaluation of lean and fat body mass, and other methods can be used to measure nutritional status. Moreover, deciding each person's height, weight, and Body Mass Index (BMI) is the hippest and most straightforward way to evaluate the nutritional quality of a community.

All ages of the population suffer from malnutrition, but women are disproportionately affected because it starts in infancy and lasts the entirety of their lives (Jethi and Chandra, 2013; Nautiyal et al., 2023, Noopur et al, 2021 and Noopur et al., 2023). Health decline is complicated by the triple burden of malnutrition, which is defined as stunting, wasting, being overweight or obese, and micronutrient deficiencies (Khatri et al., 2022 and Noopur et al, 2021). Raising awareness of dietary problems and encouraging household heads to facilitate women's availability of diet (Sharma et al., 2014) may contribute to the good health of women. Food management, a balanced diet, and the individual nutrient needs of various age groups greatly benefit from understanding nutrition. Food security for a family can only be achieved if women possess the utmost expertise in this area, enabling them to nourish themselves and their families sufficiently. They can simply prevent malnutrition in their household as well. According to Kumari et al. (2010), women can be crucial in the choice, cooking, and serving of meals for their families. Healthy eating habits are fostered during childhood and the mother's nutritional knowledge plays an important role in making appropriate choices (Chayal and Dagar, 2017; Rajni et al., 2024). Nutrition education should be provided to young women and mothers so that they can serve better nutrition within the limited resources (Kaur et al., 2015; Rani et al., 2024). Since the prevalence of PCOS is increasing and there is an urgent need to educate young women, so keeping this in mind, the present study was carried out to assess the body composition and nutrient intake of young women with and without PCOS.

METHODOLOGY

The study was carried out in the Fatehadab city and Alipur Bharota, Ayalki, Bhodia Khera, Bhuthan kalan, Dhani Chanchak and Jandwala villages of Fatehabad district (atitude 29°3′N and longitude 75°30′E), Haryana purposively depending on the availability of respondents and convenience of the researcher. For this study, 50 young women with polycystic ovary syndrome (PCOS) and 50 without PCOS above 18 years of age were selected purposively. A preliminary questionnaire was developed to collect information on the individuals' age, caste, religion, and educational status. The background information was collected on various aspects such as family type, size, and makeup. Additionally, the medical history of the respondent and her family members was asked, and information was collected on eating habits, anthropometric measures, clinical features, dietary and nutrient intake, and physical activity patterns using the questionnaire. To check the validity and viability of the schedule, the preliminary questionnaire was pre-tested on 20 respondents who weren't part of the study. Based on their responses questionnaire was modified and was made more functional. Dietary intake information was collected using the 24-hour recall method.

Dietary assessment: Information on the consumption of cereals, pulses, legumes, green leafy vegetables, roots & tubers, fruits, milk & milk products, sugar & jaggery, and fats & oils were collected using the 24-hour recall method and was compared with recommended dietary intake suggested by ICMR (2010). Standard measures including bowls, spoons, and glasses of standard size were shown to the respondents to help them in estimating the amount of food consumed. Nutrients namely energy, protein,

fat, calcium, iron, B-vitamins, vitamin-C, β-carotene, etc. were calculated using software 'Diet-Cal'. Average daily nutrients intake was compared with Recommended Dietary Allowance (RDA) given by ICMR (2020).

Body composition: The weight, height, waist circumferences, hip circumferences, and mid-upper arm circumferences were measured by using standard methodology while the Body mass index (BMI), waist-to-hip circumference ratio (WHR), waist-to-height ratio (WHtR) were calculated.

Statistical analysis : The qualitative and quantitative data were tabulated to draw meaningful inferences. The data was analyzed with the help of percentage, mean and standard deviation, one-sample t-test, two-sample t-test and paired t-test using SPSS software. One sample t-test was used to test the difference in mean scores of random sample with that of the recommended daily allowance and reference value. An independent sample t-test was used to test the difference of the mean ofthe two samples.

RESULTS

Results of socio-economic profile of young women with PCOS and without PCOS indicated that maximum number (65.0%) of respondents belonged to general category followed by backward (23.0%) and Schedule class (12.0%). Among PCOS respondents 52.0, 44.0 and 4.0 per cent were in the age group of 19 to 25, 26 to 32 and 33 to 40 years, respectively. All PCOS (100.0%) and 94.0 per cent of normal respondents were Hindu while only 6.0 per cent of respondents were Sikh. The majority of the respondents belonged to nuclear families (82.0%). Further, it was observed that 52.0 per cent of the PCOS respondents were students, whereas 46.0 and 2.0 per cent were housewife and in service, respectively.

The mean height of PCOS women was 160.04cm which was significantly lower than the reference value while the mean height of women without PCOS (normal) was 160.39cm which was also considerably lower than the reference value. The mean weight of with and without PCOS (normal) women was 61.60 and 56.56 kg, respectively.

The observed value of weight for PCOS women was significantly higher than the reference value, while that of normal women was in the desirable range. It was found that the mean values of BMI of

Study area map

Table 1. Anthropometric profile of the young women with and without PCOS

Anthropometric measurements	With PCOS (n=50)	Without PCOS (n=50)	Ref. Value	t- value
Height (cm)	160.04±4.33	160.39±4.74	162.0[1]	0.38 [NS]
Weight (Kg)	61.60±9.22	56.56±8.36	55.0[1]	2.86*
BMI (kg/m^2)	24.03±3.29	21.94±2.72	20.95[1]	3.44*
Waist circumference (cm)	85.03±8.26	78.44±9.49	<80.0	3.70*
Hip circumference (cm)	103.81±11.31	95.18±8.29	97-108	4.35*
MUAC	14.16±1.16	13.66±1.15	-	2.15*
Waist-to-Hip Ratio (WHR)	0.94±0.06	0.93±0.04	<0.85[2]	1.02 [NS]
Waist-to-HeightRatio (WHtR)	0.49±0.02	0.47±0.05	0.4-0.5[2]	2.31*

Values are Mean ± SD; *Significant at 5.0 %, NS – Non-significant

Table 2. Mean daily food intake of young women with and without PCOS

Food groups	With PCOS(n = 50)	Without PCO (n = 50)	RDI (g)	t-value
Cereals and Millets (g)	256.50±43.2	253.53±53.83	300	0.30[NS]
Pulses and legumes (g)	54.56±21.5	55.03±20.06	90	0.11 [NS]
Green leafy vegetables (g)	74.52±37.0	68.41±38.85	100	0.80 [NS]
Other Vegetables (g)	160.58±89.5	154.14±84.79	200	0.36 [NS]
Roots and Tubers (g)	65.23±43.6	80.65±38.74	100	1.86 [NS]
Fruits (g)	99.65±56.6	108.53±59.92	150	0.76 [NS]
Milk & milk products(g)	386.8±85.6	396.32±135.41	300	0.29 [NS]
Fats and Oils (g)	32.91±4.9	31.97±6.44	20	0.81 [NS]
Oil seeds & Nuts (g)	17.98±18.5	14.20±11.92	30	1.21 [NS]
Sugar (g)	29.30±28.5	13.88±6.24	20	3.74*

Values are Mean ± SD;   *Significant at 5.0 %;   NS – Non-significant

women with and without PCOS (normal) were 24.03 and 21.94kg/m^2, respectively. The observed values of BMI in both groups were significantly higher than the reference value. The mean waist circumference of with and without PCOS women were 85.03 and 78.44cm, respectively. The waist of women suffering from PCOS was significantly higher than the reference value. The mean hip circumference of with and without PCOS (normal) women were 103.81 and 95.18cm, respectively and the values were within the desirable range (Table 1). The mean MUAC of with and without PCOS (normal) women were 14.16 and 13.66inches, respectively. The mean waist-to-hip ratio of with and with PCOS (normal) women were 0.94 and0.93, respectively and values were significantly higher than the reference value. The mean waist-to-height ratio of

with and without PCOS (normal) women were 0.49 and 0.47, respectively and values were within the reference range.

The result presented in Table 2 indicated that there was no significant difference in the mean daily food intake of young women with and without PCOS except intake of sugar which was higher in women suffering from PCOS. However, it was observed that the consumption of cereals and millets, pulses and legumes, green leafy vegetables, other vegetables, roots and tubers, fruits, and oil seeds and nuts was significantly lower than the recommended level of intake.

The results presented in Table 3 showed that there was no significant difference in the energy, protein, fat, thiamine, niacin, pyridoxine, folic acid, vit. C, iron,

Table 3. Mean daily nutrient intake of young women with and without PCOS				
Nutrient	With PCOS (n=50)	Without PCOS (n=50)	RDA	t-value
Energy (Kcal)	1474.46±417.1	1405.49±285.3	2130	0.96 NS
Protein (g)	42.25±8.6	42.39±7.7	46	0.08 NS
Fat (g)	50.05±18.7	49.36±12.2	20	0.22 NS
Thiamine (mg)	0.84±0.3	0.88±0.2	1.7	0.92 NS
Riboflavin (mg)	0.75±0.3	0.87±0.2	2.4	2.16**
Niacin (mg)	5.72±2.1	5.06±1.2	14	1.93 NS
Pyridoxine(mg)	3.86±1.7	3.41±0.8	1.9	1.66 NS
Folic acid (μg)	231.51±95.4	219.61±50.3	220	0.78 NS
Vitamin A (μg)	176.22±81.9	214.89±99.4	840	2.12**
Vitamin C (mg)	80.06±50.6	78.83±23.8	65	0.15 NS
Iron (mg)	17.64±6.7	17.82±4.3	29	0.16 NS
Calcium (mg)	767.23±243.3	848.99±339.1	1000	1.38 NS
Magnesium (mg)	296.61±116.9	277.30±64.5	370	1.02 NS
Zinc (mg)	7.36±3.8	7.84±4.5	13.2	0.57NS

Values are Mean ± SD;   *Significant at 5.0 %, NS – Non-significant

calcium, magnesium and zinc intake of women with and without PCOS (normal). However, it was observed that the mean daily intake of riboflavin and vitamin A was significantly lower in women suffering from PCOS compared to normal women.

Further, results indicated that the intake of energy, protein, thiamine, riboflavin, niacin, vitamin-A, iron, calcium, magnesium and zinc was significantly lower than their respective recommended allowances.

DISCUSSION

The weight of women with PCOS was significantly higher than that of women without PCOS. The higher weight of the PCOS respondent might be due to hormonal disturbances. Similarly, Gupta *et al.,* (2015) showed that women with PCOS had significantly higher body weight than women without PCOS. It was confirmed that obesity was more prevalent in women with PCOS, contributing to insulin resistance and hyperinsulinemia, which are central to the pathophysiology of PCOS. Similar findings were reported by Ahmadi *et al.,* (2013) that waist circumference of young women suffering from PCOS was significantly higher than the control group. It was observed that the BMI of women with PCOS was significantly higher than of women without PCOS (normal). These findings highlight the increased central adiposity and overall body weight associated

with PCOS, which are critical factors in the syndrome's metabolic and reproductive complications. Ezeh *et al.,* (2013) identified higher BMI in women with PCOS than without PCOS. The waist circumference of PCOS women was significantly higher than that of without PCOS (normal) women. These findings emphasize the increased overall and central obesity in PCOS. Gupta *et al.,* (2015) reported a statistically significant difference in waist circumference of the PCOS group and Non-PCOS group, which corroborated with the present study. Hip circumference of women suffering from PCOS was significantly higher than that of without PCOS. Gupta *et al.,* (2015) observed non signfinant difference in regard to WHR in the PCOS (0.80 ± 0.10) subjects and Non-PCOS (0.77 ± 0.08) subjects. This suggests that while overall and central adiposity are higher in PCOS, the WHR does not significantly differ, indicating similar fat distribution patterns between the groups.

There was a non-significant difference in the mean daily food intake of young women with and without PCOS except intake of sugar which was higher in women suffering from PCOS. The overweight in PCOS women might not be attributed to dietary differences among both the groups however, it was due to hormonal disturbances. Shishehgar *et al.,* (2016) also found that PCOS participants had low levels of legume consumption, indicating dietary patterns in

PCOS women may influence their condition. The study participants' poor intake of micronutrients was a reflection of their low intake of fruits and vegetables. However, vegetables are viewed as protective food since they are a vital component of immunity and effectively fight infection and inflammation. They are also an excellent source of minerals and vitamins. (Noopur *et al*., 2023). Moran *et al.,* (2013) also found that the women with PCOS had higher energy intake than with PCOS women. Additionally, Preetha and Ramaswamy (2013) observed that only 32 and 15 per cent, respectively, of PCOS participants consumed fruits and vegetables. The outcomes of present study are consistent with those of Katte *et al.,* (2021) who found that PCOS participants consumed more fat and sugar and relatively fewer preventive foods than the control group. This dietary pattern may contribute to the exacerbation of PCOS symptoms. Therefore, inadequate food intake, especially micronutrient deficits that result in hidden hunger, is significantly affected by social disparities (Vij and Mann, 2022). This highlights the impact of socioeconomic factors on nutrition and health.

CONCLUSION

From the present study, it is concluded that early diagnosis and treatment of PCOS is pivotal for normal health, well-being and improved nutritional status of young women suffering from PCOS. There is great scope for improvement in the health and nutritional status of young women if they are advised timely about their health issues and emphasis is given on making them understand the importance of eating a balanced diet, including protective foods in their diet especially fruits and vegetables and role of physical activity in overall health. Nutrition awareness programs aimed at women of reproductive age group are the need of the day for promoting utilization of available community and national level health and nutrition referral facilities. The findings of the present study can be utilized for framing the health and nutrition education policies aimed at improving the reproductive and nutritional status of young women.

Declaration of competing interest: The authors have no conflicts of interest.

Data availability: Data would be made available on request.

Authors' contribution: All the authors contributed equally.

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