Abstract:

Polycystic ovary syndrome which is on the rise among adolescent girls is a significant cause of distress to most women affected by it. Women with PCOS are at a higher risk for a number of illnesses, including high blood pressure, diabetes, heart disease, and cancer of the uterus (endometrial cancer) and breast cancer. The current study aims to study the health status of women with PCOS and to predict the risk of metabolic complications in women with PCOS. Women of reproductive age with PCOS with all relevant reports were selected for the study. Most of the PCOS subjects had a tendency of being overweight than normal and had abnormal biochemical parameters both as a consequence of high BMI and imbalanced hormonal levels. The dietary habits are also aggravating their condition as high intake fat will promote their already increasing body fat. The subjects had strong family history of various metabolic complications which is an add-on to their persisting condition and it has placed them at a greater risk of getting diseases like metabolic syndrome, cardiovascular diseases and type-2 diabetes mellitus along with other risk factors. Hence there is an urgent need to create awareness on health and fitness for PCOS women in order to reduce their risk of getting metabolic diseases.

Keywords:

Polycystic ovarian syndrome, PCOS, metabolic syndrome, health risk, metabolic risk

Background:

Polycystic ovary syndrome, characterized as a common endocrinopathy, is a significant cause of distress to most women affected by it (Azziz & Zacur, 1995). Its prevalence ranges from 4%-12% in general population of women of reproductive age. (Dunaif & Thomas, 2001). Prevalence of PCOS in Indian adolescents is 9.13% (Nidhi, Padmalatha, & Amritanshu, 2011). In a report of 827 women with World Health Organization class II oligoovulation (euestrogenic normogonadotropic ovulatory dysfunction), 456 (55 percent) were classified as having PCOS by the NIH 1990 criteria, while 754 (91 percent) women were considered to have PCOS using the Rotterdam 2003 criteria (Broekmans, Knauff, & Valkenburg et al, 2006).

A globally agreed upon consensus definition of PCOS has not been established. A group of experts who were convened in 1990 by National Institutes of Health(NIH) defined PCOS had an ovulatory dysfunction with clinical evidence of hyperandrogenism or/and hyperandrogenemia in
the absence of adrenal or thyroid diseases, including Cushing’s syndrome, cancer and congenital adrenal hyperplasia (Dunaif & Thomas, 2001) (Chappell, Markovitz, & Jackson, 1999).

PCOS is on a rise among the adolescent girls now days, due to unhealthy lifestyle practices, therefore there is need to evoke awareness in the society on the ways to combat this disease. Women with PCOS are at a higher risk for a number of illnesses, including high blood pressure, diabetes, heart disease, and cancer of the uterus (endometrial cancer) and breast cancer (Stöpppler, 2010).

Polycystic ovary syndrome (PCOS) is characterized by chronic anovulation and hyperandrogenism, and affects an estimated 4.6% of U.S. women of reproductive age (Knochenhaue, Key, Kahsar-Miller, W, Boots, & Azziz, 1998). Two-thirds of women with PCOS also have metabolic dysfunction and, thereby, have an increased risk of developing type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD) (Goodarzi et al, 2011).

The current study aims to study the health status of women with PCOS and to predict the risk of metabolic complications in women with PCOS.

METHODOLOGY

Expost-facto type of research was undertaken to explore into the problem under study. Purposive sampling was used to select pre-diagnosed PCOS cases who were attending various gynecological clinics in Udupi District, Karnataka during the time span of four months. Samples in the reproductive age with all relevant recent reports were considered for the study. Interview schedule was designed and pre-tested on 25% of the sample. Interview schedule was reframed with necessary modifications. Tools and materials used for the study included anthropometric measurements (height, weight, waist and hip circumference), biochemical report (OGTT, lipid profile and hormone assay), detailed dietary history (24hr recall, Quantitative food frequency questionnaire)

The interview schedule was administered to elicit information like demographic profile, anthropometric, biochemical, clinical, gynecological and dietary habits of the selected samples. The data thus collected was coded and subjected to statistical analysis using SPSS (16.0).

RESULTS AND DISCUSSION

Demographic profile

Majority of samples belonging to the age group of 15-24 years (47.4%), followed by 42.1% (25-34 years) and least were 35-44 with only 10.5%. Mean age of PCOS cases was found to be 27 years (27.21±6.44) which is compliance with study by (Kandasamy et al, 2010) who reported that the mean age for PCOS subjects was a 27.33±3.30 years.

Medical History

About 52.6% of the subjects had a family history of PCOS, 26.3% had obesity in their family, and 21.1% had family history of Diabetes. Family history of diabetes and obesity is an indication
of the possible risk of metabolic disorders. The personal medical history showed 5.3% with diabetes and about 26.3% were obese which will possibly increase their risk of metabolic disorders.

**Anthropometric Assessment**

The sample consisted of women with wide range of BMI: underweight (5%), Normal (21%), Overweight (60%), Obese Grade I (11%) and Obese Grade II (5%). About 78.9% experienced weight fluctuations and changes in past 3 months. Of those 33.33% each had a weight change of 1-2 kg and 3-4 kg, followed by 13.33% of subjects whose weight changed from 2-3 kg. Waist circumference (WC) measurements showed about 42% with normal WC (<80cm), 32% at increased risk for metabolic problems (80-88cm) and 26% with substantially increased risk ie., >88cm WC. About 48% of the samples had WHR > 0.85 which indicates substantially increased risk for metabolic disorders; equal percentage (26%) of samples had WHR < 0.85 and 0.8-0.85 respectively.

The chi-square test of association between BMI and waist circumference of sample a significant association ($\chi^2 = 17.964; p=0.022$) between the two parameters at 5% level indicating BMI influences waist circumference also a highly positive correlation ($r=0.912; p=0.000$) was found between the two meaning an increasing BMI will lead to an increasing waist circumference and vice-versa. BMI showed a positive correlation ($r=0.689; p=0.001$). Chi-square showed a significant association between waist circumference and waist-hip ratio ($\chi^2 = 13.145; p=0.011$). A positive correlation was found between WC and WHR ($r=0.733; p=0.000$). These findings are indicative of the risk for PCOS cases for metabolic disorders (Figure 1).

Physical activity was performed by 63.15% of the sample population, which was in the form of household work or special exercise regime like walking. Majority, 57.9% of the subjects practiced medium intensity physical activity whereas 36.8% had no form of physical activity in their daily routine, rest 5.3% each performed low intensity and high intensity activities. A correlation between BMI and physical activity level showed a negative correlation indicating an increasing frequency of physical activity will lead to a decreasing BMI.

**Biochemical Assessment:**

The biochemical parameters of the samples were assessed using the already available reports. The data was obtained for Fasting blood Sugar, post-prandial blood Sugar, total cholesterol, LDL, HDL and TGL levels. It was observed that majority of the subjects, 78.9% had normal fasting levels, 15.8% were having impaired Sugar tolerance and 5.3% were diabetic. In case of Post-prandial levels 57.9% were normal and 42.1% had impaired Sugar tolerance (figure 2a).

Lipid profile (figure 2c) showed that 68.4% of subjects had a desirable level of total cholesterol, 26.3% had borderline high and 5% had a high level of total cholesterol. LDL levels were optimal for 47.4% of subjects whereas 26.3% of subjects each had near optimal and borderline high level of LDL. Majority of the samples, 68.4% had normal HDL levels but 31.6% had low levels of
HDL. The triglyceride levels were borderline for 57.9% of subjects but Normal for 42.1% of the subjects.

The hormonal assay (figure 2b) was also recorded for the samples which indicated that majority of subjects, 73.7% had a normal level of FSH level whereas 26.3% had low levels indicating abnormality and a sign for PCOS. Similar results were seen in case of LH levels, where 78.9% of subjects had normal levels, 5.3% had low levels but 15.8% had higher than normal levels meaning an abnormality in hormonal levels. This kind of trend in hormonal levels is characteristic in PCOS population where FHS levels are lower than normal whereas LH levels are elevated.

**Figure 1. Association between anthropometric measurements**

**Clinical signs and symptoms associated with PCOS women**

The majority of samples were found to be experiencing fatigue (73.7%), followed by bloating (52.6%) and hirsutism (36.8%). 26.3% of subjects each were found to be experiencing Acne and sleep apnea. Also 21.1% had a feeling of nausea and 15.8% of subjects each had alopecia, heartburn and constipation. 5.3% of samples suffered from Acanthosis nigricans whereas none had experienced vomiting.
Gynecological Characteristics of PCOS Women

The frequency of one menstrual cycle was normal for 57.89% subjects, abnormal for 26.32% and menstrual cycle was absent for 15.20% of samples. All the samples experienced irregular menstruation. 73.7% of subjects had absence of menstruation for more than 3 months once, 78.9% had excessive bleeding or menorrhagia, 94.7% experienced dysmenorrhea during periods and 36.8% of subjects had prolonged periods i.e. a duration of bleeding for more than 5 days in a cycle. About 57.9% of subjects had conceived previously; 31.58% of samples did not have any complications in their pregnancies but 21.1% had miscarriage and 5.3% had hypertension.

The clinical, gynecological, psychological symptoms were scored individually and then added up to get a total symptom score. The majority of subjects had low clinical symptoms, 57.9% and 42.1% had moderate clinical symptoms. The scoring of gynecological symptoms revealed that majority has high score /, 63.2% whereas the rest of the samples have a moderate score. In case of psychological symptoms, 42.1% had low symptoms score 31.6% had moderate and 26.3% had high core. The total symptom score was moderate for majority of the samples, 47.4% but 36.8% had a high symptom score. A linear regression when applied between the total symptom score and BMI a significant relationship was obtained between the two at 5% level.

Dietary assessment

Most of the subjects (58.8%) were non-vegetarians whereas 42.2% were vegetarians. The mean food group intake was compared to the mean RDA to assess the differences in food intake (table 1). It was observed that no significant difference was obtained between the mean cereal and milk products intake of the sample population. But in case of pulses, vegetables, fruits, meat, fish and poultry the intake was significant lower than the recommended servings. Also in case of sugars and fats and oils the intake, Sugar intake (17.39g) and Fats and oils (27.9ml) was significantly higher than the RDA for sugar (5g) and fats and oils (10ml).

<table>
<thead>
<tr>
<th>Food group intake/month</th>
<th>Mean ± Standard Deviation</th>
<th>RDA</th>
<th>t-value</th>
<th>Significance (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals (g)</td>
<td>195±36.06</td>
<td>210</td>
<td>1.813**</td>
<td>0.086</td>
</tr>
<tr>
<td>Pulses (g)</td>
<td>24.7±10.07</td>
<td>60</td>
<td>15.271**</td>
<td>0.000</td>
</tr>
<tr>
<td>Vegetables (g)</td>
<td>177.63±66.6</td>
<td>500</td>
<td>21.095**</td>
<td>0.000</td>
</tr>
<tr>
<td>Fruits (g)</td>
<td>117.1±31.24</td>
<td>100</td>
<td>2.387*</td>
<td>0.028</td>
</tr>
<tr>
<td>Meat, fish poultry (g)</td>
<td>63.16±63.7</td>
<td>100</td>
<td>2.522*</td>
<td>0.021</td>
</tr>
<tr>
<td>Sugar (g)</td>
<td>17.39±8.23</td>
<td>5</td>
<td>6.553**</td>
<td>0.000</td>
</tr>
<tr>
<td>Milk and its products (ml)</td>
<td>263.16±64.21</td>
<td>250</td>
<td>0.893NS</td>
<td>0.384</td>
</tr>
<tr>
<td>Fats and oils (ml)</td>
<td>27.9±8.4</td>
<td>10</td>
<td>9.302**</td>
<td>0.000</td>
</tr>
</tbody>
</table>

** - Significant at 1% level; * - Significant at 5% level; NS - Not significant.
The mean nutrient intakes of the sample population were compared with RDA (figure 3). It was found that no significant difference existed between the intake and RDA for Energy, Carbohydrate and Dietary fiber but the protein intake was significantly lower than the RDA whereas the fat intake was significantly higher than the RDA.

![Figure 3 Comparison of mean nutrient intake with RDA](image)

**Risk of PCOS women for metabolic diseases**

A risk assessment was done based on various current characteristics of PCOS subjects including past history, age, anthropometric measurements, biochemical values, dietary intake and Total symptom score. A risk score was given for each characteristic based on increasing severity. The percentage of total score was then classified as low, moderate, high and very high risk of metabolic disorders like diabetes, cardiovascular diseases etc (Figure 4). The majority of samples (53%) had high risk of contracting a metabolic disease in future, where as 37% of samples had very high risk and only 11% of samples had a moderate risk of getting a metabolic disease in future in case the modifiable factors are not controlled.

**CONCLUSION**

Most of the PCOS subjects had a tendency of being overweight than normal and had abnormal biochemical parameters both as a consequence of high BMI and imbalanced hormonal levels. The dietary habits are also aggravating their condition as high intake fat will promote their already increasing body fat. The subjects had strong family history of various metabolic complications which is an add-on to their persisting condition and it has placed them at a greater risk of getting diseases like metabolic syndrome, cardiovascular diseases and type-2 diabetes mellitus along with other risk factors. Hence there is an urgent need to create awareness on health and fitness for PCOS women in order to reduce their risk of getting metabolic diseases.

**BIBLIOGRAPHY**


