A Simple Screening Approach for Assessing Community Prevalence and Phenotype of Polycystic Ovary Syndrome in a Semiurban Population in Sri Lanka

V. Kumarapeli¹, R. de A. Seneviratne², C. N. Wijeyaratne³, R. M. S. C. Yapa⁴, and S. H. Dodampahala³

² Department of Community Medicine, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka.
³ Department of Obstetrics and Gynecology, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka.
⁴ De Zoysa Hospital for Women, Colombo, Sri Lanka.

Received for publication October 29, 2007; accepted for publication April 28, 2008.

In most of South Asia, prevalences and phenotypes of polycystic ovary syndrome (PCOS) among women in the community are unknown. The authors aimed to estimate prevalence and phenotype in a community setting in Sri Lanka and to test a valid, feasible screening approach to early diagnosis. A community-based, cross-sectional study was carried out in 2005–2006. A random sample of 3,030 women aged 15–39 years was selected by cluster sampling proportionate to population size. An interviewer-administered questionnaire was utilized to screen for “probable cases” of PCOS based on menstrual history and clinical manifestations of hyperandrogenism. Selected “probable cases” underwent clinical, biochemical, and ovarian ultrasound assessment. The response rate was 96.2% (n = 2,915). A total of 220 (7.5%) “probable cases” were identified: 209 women with oligo/amenorrhea (95%) and 11 women with hirsutism (5%). Further evaluation of the 220 probable cases confirmed 164 newly diagnosed cases of PCOS based on the 2003 Rotterdam diagnostic criteria. With 19 previously diagnosed cases already present, total prevalence was 6.3% (95% confidence interval: 5.9, 6.8). Of the women with “oligo/amenorrhea and/or hirsutism,” 91.1% were confirmed to have PCOS; 99.4% of women with “regular cycles in the absence of clinical hyperandrogenism” were confirmed as normal. The most common phenotypes of PCOS were oligo/amenorrhea and polycystic ovaries (91.4%) and oligo/amenorrhea and hirsutism (48.3%).

Abbreviations: FG, Ferriman and Gallway; PCOS, polycystic ovary syndrome.

Polycystic ovary syndrome (PCOS) is the most common endocrine disturbance in women of reproductive age (1, 2). Although its common clinical features are oligo/amenorrhea and hirsutism, clinical presentation can vary considerably (2). Participants in the 2003 Rotterdam consensus workshop (3) concluded that PCOS is a syndrome of ovarian dysfunction with the cardinal features of hyperandrogenism and polycystic ovarian morphology. Diagnosis requires the exclusion of disorders that mimic PCOS (3). The National Institutes of Health criteria used previously did not consider ultrasonographic evidence of polycystic ovaries (4).

The majority of reports on the prevalence of PCOS have been based on studies carried out in Europe and the United States (5–8). Although PCOS is believed to be the most common reproductive endocrine disorder in women, there is very little information on its prevalence in South Asia. The most frequently used marker of reproductive endocrine disorders among South Asian women has been an abnormal menstrual pattern; hormone evaluation and/or...
ultrasonographic scanning has not been used because of resource limitations (9, 10).

Symptoms of PCOS can affect quality of life from the late teens, and its associated metabolic problems have implications for long-term health. Hence, we carried out a community-based study to estimate the prevalence and phenotype of PCOS among young women in Sri Lanka, using recommended diagnostic criteria. In view of limited resources in providing biochemical and ultrasonographic evaluation at the field level, we developed and tested the validity of a simple screening tool for selecting women with “probable PCOS” to undergo further evaluation. We believe that use of such an approach would help facilitate early detection of PCOS in South Asia.

MATERIALS AND METHODS

Study population and design

A community-based cross-sectional study was carried out from August 2005 to February 2006 among women aged 15–39 years who were permanent residents of the district of Gampaha, Sri Lanka. Four of 13 divisional secretariat areas were randomly selected.

Sample size was calculated using the formula $N = Z_e^2 \times P(1 - P)/d^2$ for prevalence surveys with an expected proportion $P$ at 5 percent, an alpha $Z_a$ of 0.05, and a level of precision ($d$) of 0.01 (11). The effect of cluster sampling was overcome by making an appropriate correction for design effect, a multiple of 1.5. A nonresponse rate of 10 percent was added, since this was a community-based study. The calculated sample size was 3,030. Cluster sampling proportionate to population size, with 101 clusters and 30 subjects in each cluster, was used to identify subjects. Thirty subjects from a cluster were identified proportionate to the distribution of women in the district, from the age strata 15–19, 20–24, 25–29, 30–34, and 35–39 years (12).

The lower age limit for inclusion was 15 years, since the mean age of menarche reported among Sri Lankan girls is 13.54 years (standard deviation, 0.86) (13). Since 1.5 years after menarche was required to exclude the period of menstrual irregularity that usually follows menarche (14) and 1-year recall of menstrual history was required for the study (15), a 2.5-year limit after menarche was taken subject to a minimum of 15 years. The upper age limit was 39 years, because approximately 5 percent of Sri Lankan women aged 40–44 years have premenopausal menstrual irregularity, which could lead to classification bias (16). Women who were pregnant or within 1.5 years of childbirth were excluded. The latter group was selected on the basis of previous research identifying a median duration of 6 months for resumption of regular menstruation following childbirth among Sri Lankan women (17) and the 1-year recall of menstrual history being used to identify PCOS. Other exclusion criteria were: current use of oral contraceptives for family planning, use of hormone replacement therapy during the previous year, and use of progesterone injections or implants during the preceding 1.5 years. The latter was based on an average period of 6 months needed for resumption of regular menstruation after discontinuing progesterone and the 1-year recall of menstrual history required (13).

Definitions

A confirmed case of PCOS was defined according to the Rotterdam diagnostic criteria (3) as having two of the following: oligo/amenorrhea, clinical and/or biochemical hyperandrogenism, and polycystic ovaries. Oligo/amenorrhea was the absence of menstruation for 35 days or more (13). Clinical hyperandrogenism was defined as a Ferriman and Galloway (FG) score of 8 or higher, with or without acne and/or androgenic alopecia (3). Biochemical hyperandrogenism was considered present with a serum testosterone level 2 standard deviations above the mean of normal women of reproductive age in the absence of other causes of hyperandrogenism (3). Polycystic ovaries on ultrasound scanning was defined as an ovarian volume greater than 10 cm$^3$ and/or 12 or more 2- to 9-mm follicles in a single plane when ultrasonography was performed within 5 days of the beginning of menstruation (3).

Data collection

Approval was obtained from relevant health authorities prior to commencement of the study. Ethical clearance was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo (Colombo, Sri Lanka).

A pretested, interviewer-administered questionnaire was developed which included a checklist that evaluated two common categories of symptoms experienced by women with PCOS: oligo/amenorrhea and hyperandrogenism.

Stage 1—community survey

Data were collected by a team of one field guide, five field investigators, and the principal investigator. Female physicians were selected as field investigators to assist the principal investigator. A public health midwife functioned as the field guide. Field investigators received training followed by a day of field experience prior to commencement of the study. Every selected cluster was covered by the team on a weekday and on a Sunday to identify and interview eligible women. The outcome was recorded as “nonresponse” after a maximum of three failed attempts at interview. When more than one person of the required age stratum was living in a household, the investigator randomly selected one woman. When no woman from the desired age stratum was present in a household, the search continued in consecutive households until a subject in the desired age stratum was found. This procedure was carried out until each age stratum within a cluster had the requisite number of participants.

Informed written consent was obtained for the interview, the clinical examination, and withdrawal of blood from subjects after the study objectives and their implications had been explained. “Probable cases” and “probable controls” were identified during the cross-sectional survey after administration of the questionnaire.

A probable case.” A “probable case” was defined as a woman with symptoms suggestive of PCOS (i.e.,
oligo/amenorrhea according to menstrual cycle length and/or clinical features of hyperandrogenism) as defined above. Since a short recall period was considered unsuitable for the study of menstrual disorders of relatively long duration, menstrual history over the preceding year was assessed (13). It was necessary to identify an equal number of “probable controls” at stage 1 of selection, to help validate the screening method.

A “probable control.” A “probable control” was defined as a woman with regular menses and no clinical features of hyperandrogenism who was not a relative of a probable case. Probable controls were selected by drawing lots among eligible women from the same age stratum within a cluster. If the selected control refused to participate, this procedure was repeated among the rest of the women in the same age stratum until a control who agreed to participate was available. The process was repeated until the desired number of controls was obtained at a 1:1 ratio.

When known patients with PCOS were encountered among persons who participated in the community survey, we confirmed them as being affected by checking their clinic records, diagnosis cards, or prescriptions. They were not included as “probable cases” but were reassessed and had their PCOS confirmed in the specialist clinic, and they were included in the final determination of the prevalence of PCOS.

Of respondents in stage 1 (figure 1), all “probable cases” and randomly selected “probable controls” were invited to undergo further evaluation (stages 2 and 3). They were offered assessment at the nearest field clinic or hospital on a preselected day. Calendar dates and the location of study were agreed upon by subjects.

Stage 2—clinical examination and biochemical investigations

Clinical examination. Selected women were examined for the presence of hirsutism, acne, and androgenic alopecia. The degree of hirsutism was determined by modified FG score, which quantified the presence of terminal hair over nine body parts: the upper lip, chin, chest, upper and lower abdomen, thighs, upper and lower back, and upper arms. Degree of
hirsutism was scored on a scale of 0–4 at these sites. Women with an FG score of 8 or higher were defined as hirsute (18). Acne was defined as the presence of comedones on the face, neck, upper chest, upper back, and upper arms.

Anthropometric measurements and resting blood pressure were recorded. Clinical examination was performed by the principal investigator alone, who was trained by an endocrinologist (C. N. W.) to standardize the recognition of clinical signs until a high degree of agreement was reached (kappa > 0.7).

Biochemical investigations. Venous blood (10 ml) was drawn from both probable cases and probable controls. It was packed in ice (3–4°C) and transported to the laboratory within 4–6 hours for separation. Serum obtained by centrifuging for 10 minutes at 3,000 revolutions per minute was pipetted into plain tubes and stored at −20°C until it was analyzed for serum testosterone and sex hormone-binding globulin at the Reproductive Biology and Endocrinology Laboratory of the University of Colombo. Biochemical hyperandrogenemia was defined as a serum testosterone level 2 standard deviations above the mean level among probable controls who participated in stage 2.

Stage 3—ultrasound scanning

Women identified as probable cases and probable controls were invited to undergo pelvic ultrasound scanning within the first 5 days of commencement of their next menstrual period. Ultrasonography was performed by a single gynecologist (R. M. S. C. Y.) trained under the guidance of a certified senior gynecologist (S. H. D.) who first standardized the recognition of ultrasound findings until a high degree of agreement was reached (kappa > 0.7). The gynecologist was blinded to the case/control status of subjects. Transvaginal ultrasound scanning was carried out on women who were married, and transabdominal scanning was carried out on unmarried women. A count of the highest number of follicles measuring 2–9 mm in diameter seen in a single plane from each ovary was recorded. Ovarian volume was calculated using the simplified formula for a prolate ellipsoid (0.5 × length × width × transverse diameter). The mean of the right and left ovarian volumes was determined. Among women in whom only one ovary was visualized with sufficient clarity for measurement, the volume of the visualized ovary was used. Ovaries which contained cysts greater than 10 mm in diameter were excluded from the calculations as per diagnostic recommendation, since they do not represent immature follicles of PCOS (3). All women with clinical, biochemical, or radiologic abnormalities were referred to an endocrinologist (C. N. W.) for confirmation of the diagnosis by exclusion of other possible causes (hypothyroidism, prolactinoma, congenital adrenal hyperplasia, androgen-secreting tumors, and Cushing’s syndrome) and for initiation of treatment where indicated.

Analysis of data

Statistical analysis was performed by the principal investigator using the Statistical Package for the Social Sciences, version 11.0 (SPSS, Inc., Chicago, Illinois). Bivariate analysis was carried out to assess clinical and biochemical parameters associated with PCOS in comparison with controls. The significance level and $p$ value of the findings were estimated by Mann-Whitney test for two medians.

RESULTS

The response rate was 96.2 percent ($n = 2,915$). Figure 1 outlines the data collection procedure and outcomes. A “probable diagnosis” of PCOS was found among 220 women (7.5 percent) identified for the first time by this survey to have oligo/amenorrhea and/or clinical hyperandrogenism. Of these women, 209 (95 percent) had oligo/amenorrhea in the presence or absence of hyperandrogenism, while 11 others (5 percent) were selected because of the presence of hirsutism alone with regular menstrual cycles. No women were selected solely because of the presence of acne or androgenic alopecia. The refusal rate among “probable controls” selected to find a participant was determined on the basis of available records of our review meetings with field investigators; this figure was 7.6 percent (18 “probable control” women refused from a total selection of 238).

As figure 1 shows, of the 220 “probable cases,” 178 women (80.9 percent) participated in the clinical examination and blood collection at the local clinic or hospital (stage 2) and 163 (74.1 percent) underwent ultrasound scanning (stage 3). Twelve women bypassed stage 2 and participated directly in stage 3. Since only one other criterion was necessary to confirm a definite case of PCOS among women reporting oligo/amenorrhea and/or clinical hyperandrogenism, those who participated in either stage 2 or stage 3 alone were also included for final analysis. A definite diagnosis could not be arrived at for 41 women in this group. Of those women, 27 did not participate in further testing after stage 1, and thus their diagnosis remained unknown. The remaining 14 women who participated for only one additional investigation had a negative result. Both of these groups were labeled equivocal. Among the 179 (220 − 41) women with oligo/amenorrhea and/or hyperandrogenism who underwent evaluation, 163 (sensitivity, 91.1 percent) were confirmed to have PCOS and 16 (8.9 percent) were excluded from having PCOS based on the Rotterdam criteria.

Among 171 “probable controls” (i.e., women with regular menses and no clinical features of hyperandrogenism) who participated in all investigations, one woman was identified as a “definite case” on the basis of abnormal biochemistry and ultrasound scanning (specificity, 99.4 percent).

In summary, there were 183 confirmed cases of PCOS, of which 19 were previously diagnosed and 164 were newly diagnosed, out of the 2,915 women screened. Thus, the community prevalence of PCOS was 6.3 percent (95 percent confidence interval: 5.9, 6.8). Among 179 “probable cases” who completed their evaluation, 91.2 percent with oligo/amenorrhea in the presence or absence of hyperandrogenism and 87.5 percent with hirsutism alone with regular menstrual cycles had PCOS.

Table 1 shows the demographic, anthropometric, clinical, biochemical, and ultrasonographic characteristics of probable cases, definite cases, and definite controls. Body mass
index, waist:hip ratio, and systolic blood pressure were significantly greater among women with PCOS than among age-matched definite controls. Total testosterone level was significantly greater and sex hormone-binding globulin was lower among women with PCOS, although the proportions of women among “definite cases” and “definite controls” whose testosterone level exceeded 2 standard deviations of the mean testosterone level of “probable controls” were similar.

Of the 164 “definite cases,” 95.1 percent had oligo/amenorrhea in the presence or absence of hyperandrogenism and 53.1 percent had an FG score of 8 or higher, although only 6.1 percent had a testosterone level greater than 2 standard deviations of the mean testosterone level of probable controls. Polycystic ovaries were seen among 96.7 percent. The main diagnostic criteria fulfilled among “definite cases” were oligo/amenorrhea and polycystic ovaries on ultrasound scanning (table 2).

DISCUSSION

To the best of our knowledge, this was the first community-based study of PCOS ever carried out in Sri Lanka and, indeed, in South Asia. We found the community prevalence of PCOS to be 6.3 percent (95 percent confidence interval: 5.9, 6.8) in women aged 15–39 years, of which only 0.65 percent had been diagnosed previously. Other studies of the prevalence of PCOS in different geographic locations and populations have found similar results: 6.5 percent

Women with PCOS were studied on the basis of two symptoms feasible for screening in a community survey: oligo/amenorrhea and hirsutism (table 3). Over 90 percent of women with “oligo/amenorrhea and hirsutism” and women with “oligo/amenorrhea but no hirsutism” had polycystic ovaries (93.1 percent and 98.5 percent, respectively).

### TABLE 1. Distribution of clinical, biochemical, and ultrasonographic parameters among probable cases, definite cases, and definite controls in a community-based study of polycystic ovary syndrome, Gampaha, Sri Lanka, 2005–2006

<table>
<thead>
<tr>
<th></th>
<th>Probable cases</th>
<th>Definite cases</th>
<th>Definite controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic, anthropometric, clinical, and biochemical parameters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>25.0 (12–38)</td>
<td>25.0 (12.5–37.5)</td>
<td>27.0 (14–40)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>154.0 (145–163)</td>
<td>155.0 (146–164)</td>
<td>154.0 (146–162)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>57.0 (39–75)</td>
<td>57.0 (38–76)**</td>
<td>51.5 (34.5–68.5)</td>
</tr>
<tr>
<td>Body mass index§</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>23.7 (15.7–31.7)</td>
<td>24.2 (16.1–32.3)**</td>
<td>21.8 (15.1–28.5)</td>
</tr>
<tr>
<td>Hip circumference (cm)</td>
<td>96.0 (79–113)</td>
<td>97.0 (80–114)**</td>
<td>91.0 (78–104)</td>
</tr>
<tr>
<td>Waist:hip ratio</td>
<td>0.85 (0.75–0.95)</td>
<td>0.86 (0.76–0.96)**</td>
<td>0.83 (0.73–0.93)</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>120.0 (110–130)</td>
<td>120.0 (110–130)*</td>
<td>120.0 (110–130)</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>77.0 (67–87)</td>
<td>77.0 (67–87)</td>
<td>80.0 (70–90)</td>
</tr>
<tr>
<td>Serum testosterone (ng/dl)</td>
<td>59.8 (27.5–92.1)</td>
<td>60.6 (18.5–102.7)**</td>
<td>40.9 (5.7–76.1)</td>
</tr>
<tr>
<td>Sex hormone-binding globulin (nmol/liter)</td>
<td>43.6 (4.1–83.1)</td>
<td>41.0 (10.3–71.7)**</td>
<td>58.5 (20.6–96.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnostic criteria</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of hirsutism (FG† score ≥8)</td>
<td>82</td>
<td>46.1</td>
<td>78</td>
<td>53.1</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Absence of hirsutism (FG score &lt;8)</td>
<td>96</td>
<td>53.9</td>
<td>69</td>
<td>46.9</td>
<td>170</td>
<td>100.00</td>
</tr>
<tr>
<td>Serum testosterone level &gt;2 SDs† of the mean♀</td>
<td>9</td>
<td>5.1</td>
<td>10</td>
<td>6.8#</td>
<td>7</td>
<td>4.1</td>
</tr>
<tr>
<td>Serum testosterone level ≤2 SDs of the mean</td>
<td>169</td>
<td>94.9</td>
<td>137</td>
<td>93.2</td>
<td>163</td>
<td>95.9</td>
</tr>
<tr>
<td>Ultrasound scanning</td>
<td></td>
<td></td>
<td>(n = 163)</td>
<td>(n = 151††)</td>
<td>(n = 170)</td>
<td></td>
</tr>
<tr>
<td>Polycystic ovaries</td>
<td>143</td>
<td>87.7</td>
<td>146</td>
<td>96.7#</td>
<td>30</td>
<td>17.6</td>
</tr>
<tr>
<td>Normal ovaries</td>
<td>20</td>
<td>12.3</td>
<td>5</td>
<td>3.3</td>
<td>140</td>
<td>82.4</td>
</tr>
</tbody>
</table>

* p < 0.01; **p < 0.001 (Mann-Whitney test comparing definite cases and definite controls).
† IQR, interquartile range; FG, Ferriman and Gallway; SD, standard deviation.
‡ 17 definite cases defaulted clinic evaluation.
§ Weight (kg)/height (m)².
♀ Two standard deviations above the mean of normal women of reproductive age.
# One definite case was found among probable controls.
†† 13 definite cases defaulted ultrasound scanning.

Women with PCOS were studied on the basis of two symptoms feasible for screening in a community survey: oligo/amenorrhea and hirsutism (table 3). Over 90 percent of women with “oligo/amenorrhea and hirsutism” and women with “oligo/amenorrhea but no hirsutism” had polycystic ovaries (93.1 percent and 98.5 percent, respectively).
prevalence was reported in Spain (6), 6.6 percent in the southeastern United States (7), and 6.8 percent on the Greek island of Lesbos (8), while another study found a lower prevalence of 4.6 percent in the southeastern United States (5). Reported prevalences from Spain, the United States, and Greece are not directly comparable with the findings of this study, since assessment of PCOS in those studies was based on the National Institutes of Health criteria, which estimated prevalence on the basis of an endocrinologic definition alone. Based on the link between PCOS and type 2 diabetes mellitus and the increasing prevalence of diabetes in Sri Lanka, we could expect the local prevalence of PCOS to be higher than that reported in White populations with similar to those seen in Southern Europe. There could be a lower prevalence of diabetes. However, our findings were higher than that reported in White populations with menopausal effects. Hence, the higher upper age limit in previous studies may have led to higher prevalence estimates.

Biochemical and radiologic investigations were not carried out for all participants in the study (n = 2,915) because of logistical problems in performing such investigations in a large sample in a community setting. Selection of “probable cases” was carried out using two main questionnaire criteria: oligo/amenorrhea and clinical evidence of hyperandrogenism. However, there was a single case of PCOS among “probable controls” selected initially as normal because of regular menstrual cycles and no clinical evidence of hyperandrogenism. This participant was found to have PCOS on the basis of biochemical and radiologic investigations alone. Nonetheless, confining the basis of selecting “probable cases” to two common symptoms of PCOS is likely to have minimized bias. Less than 1 percent of cases would have been missed, since only 0.6 percent of the women were diagnosed as having PCOS among randomly selected “probable controls.” In view of the limitation of resources in South Asian countries, we have developed a reliable method of estimating the prevalence of PCOS which can be used by others in the region for comparison.

Our finding of a community prevalence of 6.3 percent in Gampaha District cannot be generalized to all of Sri Lanka or South Asia, because of varying population characteristics.

### TABLE 2. Fulfillment of diagnostic criteria among definite cases (n = 164*) in a community-based study of polycystic ovary syndrome, Gampaha, Sri Lanka, 2005–2006

<table>
<thead>
<tr>
<th>Diagnostic criterion</th>
<th>No. of women</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oligo/amenorrhea and hirsutism (FG† score ≥8)‡</td>
<td>71</td>
<td>48.3</td>
</tr>
<tr>
<td>Oligo/amenorrhea and serum testosterone level &gt;2 SDs† above the mean‡,§</td>
<td>9</td>
<td>6.1</td>
</tr>
<tr>
<td>Oligo/amenorrhea and polycystic ovaries¶</td>
<td>138</td>
<td>91.4</td>
</tr>
<tr>
<td>Hirsutism (FG score ≥8) and polycystic ovaries¶</td>
<td>7</td>
<td>4.6</td>
</tr>
<tr>
<td>Serum testosterone level &gt;2 SDs above the mean and polycystic ovaries#</td>
<td>1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

* Definite cases in the categories overlap.
† FG, Ferriman and Gallway; SD, standard deviation.
‡ 17 definite cases defaulted clinic evaluation.
§ More than 2 standard deviations above the mean of normal women of reproductive age.
¶ 13 definite cases defaulted ultrasound scanning.
# One definite case was found among probable controls.

### TABLE 3. Biochemical and ultrasound scanning results among definite cases, according to clinical features used for community screening for polycystic ovary syndrome, Gampaha, Sri Lanka, 2005–2006

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Oligo/amenorrhea and hirsutism†</th>
<th>Oligo/amenorrhea and no hirsutism (n = 68)</th>
<th>Regular menstrual cycles and hirsutism (n = 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polycystic ovaries</td>
<td>54‡</td>
<td>93.1</td>
<td>67</td>
</tr>
<tr>
<td>Serum testosterone level &gt;2 standard deviations above the mean§</td>
<td>6</td>
<td>8.5</td>
<td>3</td>
</tr>
</tbody>
</table>

* 17 definite cases defaulted Ferriman and Gallway scoring, and one definite case was detected among probable controls.
† Ferriman and Gallway score ≥8.
‡ 13 definite cases defaulted ultrasound scanning.
§ More than 2 standard deviations above the mean of normal women of reproductive age.
and ethnicity. Nevertheless, this study confirms that PCOS does exist in a young semiurban South Asian community, with oligo/amenorrhea and/or hyperandrogenism identified at the point of primary care correlating with the presence of polycystic ovaries. The prevalences of oligo/amenorrhea and hirsutism reported by other investigators were even higher than those found in the present study (6–8). Ethnic variation, differences in assessment of oligo/amenorrhea and hyperandrogenism, and this study’s being community-based could be possible explanations for the low prevalence observed. Knochenhauer et al. (5), Azziz et al. (7), and Diamanti-Kandarakis et al. (8) defined oligomenorrhea as eight or fewer menstrual cycles in a year and defined hirsutism as an FG score of 6 or higher, whereas Asuncion et al. (6) used six or fewer menstrual cycles in a year and an FG score of 8 or higher. Patients of Asian descent in the United States have shown lower degrees of hirsutism (21), but hirsutism is higher among women of Pakistani descent in the United Kingdom (22), which might explain possible racial variations causing a lower degree of hirsutism among indigenous Sri Lankans.

Among “probable cases” with oligo/amenorrhea, 91.2 percent had PCOS. This supports the conclusion that oligo/amenorrhea among women of reproductive age in the community can be largely explained by PCOS (1, 23). In the absence of a defined cutoff value for normal Sri Lankan women, we determined a total testosterone level 2 standard deviations above the mean in “probable controls” to be the applicable cutoff. It is indeed surprising that the proportion of “probable cases” with testosterone levels 2 standard deviations above the mean of “probable controls” was similar to that among “definite controls.” Although the total testosterone level of women with PCOS was significantly greater, we found that only 6 percent had a testosterone level 2 standard deviations above the mean. This might be reflected in our clinical finding of significant hirsutism affecting approximately half of the women with “definite PCOS.” This warrants further study to define possible ethnic variations in androgenic manifestations of PCOS. The observation that “definite cases” were significantly more obese than “definite controls” warrants long-term follow-up for metabolic disease. It is also recognized that many women with polycystic ovaries alone are endocrinologically normal (1). However, the prevalences of polycystic ovaries cannot be compared, since researchers in the United States, Spain, and Greece did not assess ovaries by ultrasound scanning. When subgroup analysis of women with PCOS was carried out on the basis of symptoms used for community screening (table 2), it was possible to identify relations between different phenotypes of PCOS among Sri Lankan women. Our data highlight the fact that community-based women in the Gampaha District of Sri Lanka appear to have a predominantly reproductive rather than androgenic phenotype of PCOS. This is similar to findings reported by Taponen et al. (23), who reported a dose-response pattern in the typical endocrine profile of PCOS by simply adding up the number of symptoms. However, the prevalence of polycystic ovaries in this study based on the Rotterdam criteria (3) was higher than that reported by Franks and White (1).

To our knowledge, this is the first report on a community-based approach to estimating the prevalence of PCOS. Over 90 percent of women with self-reported symptoms of oligo/amenorrhea and/or hirsutism were found to have PCOS. This supports the use of a simple questionnaire-based survey as an appropriate tool for community screening in South Asia. Referral of women with these symptoms to ultrasound scanning, which is available in most hospitals, would facilitate identification. This provides a rational basis for early detection and referral that can be translated to standard primary health care in a community setting.

ACKNOWLEDGMENTS

The National Science Foundation (grant HS/2005/05) and the National Research Council (grant 2006/05) of Sri Lanka and the Special Trustees of Leeds General Infirmary (Leeds, United Kingdom) provided financial assistance for this study.

The authors thank Amara Wijeyrathne and Ayesha Gunawardana of the Reproductive Biology and Endocrinology Laboratory at the University of Colombo for analyzing blood samples and the Medical Officers of Health, Public Health Nursing Sisters, and Public Health Midwives of the Medical Officer of Health areas Dompe, Biyagama, Kelaniya, and Wattala for their cooperation. Conflict of interest: none declared.

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