Endokrynologia Polska
DOI: 10.5603/EP.2014.0050
Tom/Volume 65; Numer/Number 5/2014
ISSN 0423–104X

Semiquantitative assessment of hirsutism in 850 PCOS patients and 2,988 controls in China

Półilościowa ocena hirsutyzmu u 850 pacjentek z zespołem policystycznych jajników i 2988 kobiet z grupy kontrolnej w Chinach

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Abstract

Introduction: There is considerable individual and racial variation in the degree and pattern of body hair among PCOS patients. The purposes of this study were to define: 1) a suitable standard of hirsutism for Chinese women with PCOS and the general Chinese population; 2) the characteristics of hair distribution and degree in Chinese women with PCOS and the general population; and 3) the correlation of PCOS and FG score in Chinese women.

Material and methods: This retrospective study in Chinese women with PCOS in the reproductive centre of Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University, comprised 850 patients with PCOS and 2,988 members of the general population. It was conducted cross-sectionally by interview, physical examination, ultrasound scan, and modified Ferriman-Gallwey score. Eight hundred and fifty Chinese women with PCOS (aged 20–41) underwent an interview, blood drawing, physical and ultrasound examination. Body hair at nine sites (lip, chin, arm, thigh, chest, upper belly, lower belly, upper back and lower back) were evaluated using the scoring system described by Ferriman and Gallwey; 2,988 healthy women (aged 20–45) underwent an interview, physical examination, ultrasound scan and FG score evaluation by trained gynaecologists. Terminal body hair growth was assessed using the mFG scoring system in Chinese women with PCOS and the control group; nine body areas were scored from 0–4 for terminal hair growth distribution.

Results: Our findings showed that of the 850 patients, 367 had a FG score equal to or greater than 5 points [43.2% (367/850)], 282 patients had a FG score equal to or greater than 6 points [33.18% (282/850)], and 21% had a score of at least 8 points. Nobody's FG score was equal to or greater than 24 points. Hirsutism was significantly higher in PCOS patients (score≥ 5 = 43.2%) than in the general population (score ≥ 5 = 10%). The lip is the most common place (score 0–3) where terminal hair grows in 850 PCOS patients and the general population. Next came the upper back and chest, and the number of 4 points was only recorded for the region of the lip (16), thigh (3), lower belly (3), arm (1), chest (1), and lower back (1). None of the PCOS patients displayed a score of more than 4 points for the chin, upper belly and upper back.

Conclusions: Our data indicates that: 1) an mFG score of 5 or above is out of the norm for the general unselected population and forms almost half of the possibility of diagnosing PCOS in Chinese women; 2) lips and upper back are the most common places that hair grows (score 1–2), but in terms of the serious situation (score 3–4), lips and thighs are the most common places that hair grows; 3) there is a good predictive value to diagnose PCOS by FG score for Chinese people; and 4) hirsutism is more common in PCOS than in the general population in China. **(Endokrynol Pol 2014; 65 (5): 365–370)**

Key words: *hirsutism; hair growth; modified Ferriman-Gallwey score; polycystic ovary syndrome; Chinese women*

Streszczenie

Wstęp: Wśród pacjentek z zespołem policystycznych jajników (PCOS) obserwuje się znaczną indywidualną i rasową zmienność nasilenia i rozkładu owłosienia ciała. Cele tego badania obejmowały określenie: 1) odpowiedniego standardu hirsutyzmu u Chinek z PCOS i w populacji ogólnej; 2) charakterystyki rozkładu i nasilenia owłosienia u Chinek z PCOS i w populacji ogólnej; oraz 3) korelacji między PCOS a wynikiem w skali Ferrimana-Gallweya (FG) u Chinek.

Materiał i metody: Retrospektywnym badaniem w populacji Chinek z PCOS w ośrodku leczenia zaburzeń rozrodu w Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University, objęto 850 pacjentek z PCOS i 2988 kobiet z populacji ogólnej, u których dokonano oceny na podstawie wywiadów, badania przedmiotowego, oceny ultrasonograficznej oraz zmodyfikowanej skali FG. U 850 Chinek z PCOS (wiek 20-41 lat) zebrano wywiady, pobrano krew, przeprowadzono badanie fizykalne i ultrasonograficzne oraz oceniono owłosienie ciała w 9 miejscach (warga, podbródek, ramię, udo, klatka piersiowa, nadbrzusze, podbrzusze oraz górna i dolna część pleców), posługując się systemem punktowym opisanym przez Ferrimana i Gallweya, a u 2988 zdrowych kobiet (wiek 20–45 lat) zebrano wywiady, przeprowadzono badanie fizykalne i ultrasonograficzne oraz dokonano oceny w skali FG. Ocena była dokonywana przez wyszkolonych ginekologów. Wzrost i rozkład włosów końcowych na ciele oceniono za pomocą zmodyfikowanej skali FG u Chinek z PCOS oraz w grupie kontrolnej, określając wartości punktowe w skali od 0 do 4 dla dziewięciu okolic ciała.

Wyniki: Wśród 850 pacjentek z PCOS wynik ≥ 5 punktów w skali FG uzyskano u 367 pacjentek [43,2% (367/850)], wynik ≥ 6 punktów u 282 pacjentek [33,18% (282/850)], a co najmniej 8 punktów u 21% pacjentek. U żadnej pacjentki nie uzyskano wyniku ≥ 24 punkty. Nasilenie hirsutyzmu było istotnie większe wśród pacjentek z PCOS (wynik ≥ 5 punktów u 43,2%) niż w populacji ogólnej (wynik ≥ 5 punktów u 10%). Warga była najczęstszym miejscem wzrostu włosów końcowych (wynik 0–3 pkt.) u 850 pacjentek z PCOS oraz w populacji ogólnej, a następne miejsca pod względem częstości wzrostu włosów zajęły górna część pleców i klatka piersiowa. Wzrost włosów oceniony na 4 punkty odnotowano tylko w okolicach wargi (n = 16), uda (n = 3), podbrzusza (n = 3), ramion (n = 1), klatki piersiowej (n = 1) oraz

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dolnej części pleców (n = 1). U żadnej z pacjentek z PCOS nie odnotowano wzrostu włosów ocenionego na 4 punkty w okolicach podbródka, nadbrzusza i górnej części pleców.
Wnioski: Nasze dane wskazują, że: 1) wynik w zmodyfikowanej skali FG wynoszący ≥ 5 punktów jest poza normą w nieselekcjonowanej populacji ogólnej i stwierdza się go u prawie połowy Chinek z rozpoznaniem PCOS; 2) warga i górna część pleców były najczęstszymi miejscami wzrostu włosów (wynik 1–2 pkt.), ale najbardziej nasilony wzrost (wynik 3–4 pkt.), stwierdzono w obrębie wargi i ud; 3) Rozpoznawanie PCOS na podstawie wyniku w skali FG u Chinek charakteryzuje się dobrą wartością predykcyjną; 4) hirsutyzm u Chinek jest częstszy wśród pacjentek z PCOS niż w populacji ogólnej. **(Endokrynol Pol 2014; 65 (5): 366–370)**

Słowa kluczowe: *hirsutyzm; wzrost włosów; zmodyfikowana skala Ferrimana-Gallweya; zespół policystycznych jajników; Chinki*

Introduction

Doctors frequently encounter hirsute patients. Quantification of hair growth may be useful for diagnosis and follow-up. It is very important to establish the reference range for distribution of hair in females, and to determine the regions yielding the best discrimination between normal and hirsute women.

Hirsutism is one of the important features of polycystic ovary syndrome (PCOS) [1–3], and PCOS is the most prevalent endocrine disorder of reproductive age women, affecting between 7% and 12% of unselected white or black women [4–8]. Several years ago, there was a domestic small-scale epidemiological survey in some areas of China, and the results indicated that the prevalence of PCOS in reproductive age women was 6.46–7.2% on the diagnosis of PCOS recommended in the 2003 Rotterdam criteria. In recent years, a nationwide, large sample, multicentre study in China has shown that the prevalence of PCOS in reproductive age women was 11.8% [9]. Given China's large population of 1.3 billion, and that females account for half of the total, according to the prevalence rate of the study the consequences could be disastrous. Some studies covering different races have reported that PCOS is associated with a greater degree of metabolic complications [10–11]. Because of this, we need to study and investigate the disease urgently.

The most common visual method of scoring the extent of body and facial terminal hair growth in use today is based on a modification of the method originally described by Ferriman and Gallwey in 1961. This originally regarded a total score of greater than 8 points as the cutoff value [12] but Ferriman himself later chose a cutoff score of 5 or more when defining hirsutism [13]. Knochenhauer revised the total score greater than 6 points as the diagnostic criteria and this is now the commonly-used scale [14]. Cewadhanaraks purposed a cutoff score to diagnose hirsutism of ≥ 3 among Thai women [15]. Rotterdam diagnostic hirsutism criteria indicate that there may be differences between races because there is still a lack of epidemiological information. Because of the differences between regions and races, the definition of hirsutism is still unclear, particularly in Chinese women [16].

Few studies have looked at China mainland women, either the distribution characteristics or the degree of body terminal hair growth. Therefore, there is still considerable disagreement as to the cutoff score for hirsutism in Chinese women with PCOS [13, 15, 17–19]. To gain insight into this, we conducted this retrospective study to define 1) a suitable standard of hirsutism for Chinese women with PCOS and the general population; 2) the characteristics and degree of hair distribution in Chinese women with PCOS and the general population; and 3) the correlation of PCOS and FG score in Chinese women. We attempted to compare the scoring of hirsutism in Chinese women with PCOS to that of the general population.

Material and methods

Study population

PCOS patients (n = 1,668) seeking medical advice for menstrual cycle abnormalities, hirsutism, acne, obesity or infertility were consecutively recruited from the outpatient clinic of the reproductive centre, the Department of Obstetrics and Gynaecology at the Sun Yat-Sen Hospital Zhongshan University between May 2007 and April 2010. Based on criteria derived from the 2003 Rotterdam criteria, a diagnosis of PCOS was established when either oligomenorrhea (cycles lasting longer than 35 days) or amenorrhea (less than two menstrual cycles in the past six months) and clinical signs of hyperandrogenism (hirsutism and/or obvious acne and/or alopecia) were found; hyperandrogenemia was not used for the diagnosis of PCOS. Other pituitary, adrenal or ovarian diseases were excluded in all women by laboratory analysis of LH, FSH, oestradiol, prolactin, cortisol, adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone (TSH) and androstendione. In addition, in all women with 17-hydroxyprogesterone (17-OHP) levels < 10 ng/mL, ACTH testing with measurement of 17-OHP was performed. When either the basal or stimulated value was < 10 ng/mL, genetic analysis (21-hydroxylase deficiency) was performed. Polycystic ovaries were defined according to the ESHRE/ASRM (European Society for Human Reproduction/American Society of Reproductive Medicine) criteria when either a volume of at least 10mL or more than 12 follicles (diameter 2–9 mm) were found in at least one ovary. PCOS subjects had taken no medica-

tion known to affect either carbohydrate metabolism or endocrine parameters for at least three months before entering the study. Women taking contraceptive pills were excluded from the study. NIH criteria were used to exclude PCOS in controls before entering the study.

The control group (2,988) was a cross-sectional epidemiological study using a stratified, multistage systematic cluster random sampling in 16 communities (a hospital, company, factory, or village) of two urban and two rural regions in the Guangdong province of China. Interventions included an interview, physical examination and ultrasound scan by pooled trained gynaecologists. Participants included a nationally representative sample of 2,988 Southern Chinese women aged 20–45 years.

Data collection

There were 1,668 PCOS patients originally, but some of them were excluded because of incomplete information; eventually, there were 850 patients left. All the doctors had been trained by a professor of gynaecology in conducting interviews, physical examinations, and ultrasound scans in a uniform manner. Physical examination, morning fasting blood drawing, and ultrasound scan were carried out. A complete physical examination, including the measurement of height (cm), weight (kg), and waist to hip circumference (cm); evaluation of body hair grading according to the modified Ferriman and Gallwey system, grading nine body areas including the upper lip, chin, chest, upper and lower abdomen, thighs, upper and lower back, arm, from 0 (no hair) to 4 (frankly virile); the presence of acne, oily skin, androgenic alopecia, and acanthosis nigricans; and the examination of thyroid and breast. All the patients underwent a transvaginal or transrectal ovarian ultrasound, Oligomenorrhea/amenorrhea was defined as a cycle length > 35 days and no cycles for six or more consecutive months, respectively. Polycystic ovaries were defined as having ≥ 12 follicles or an ovarian volume ≥ 10 cm^3 in at least one ovary. Other related disorders, such as hyperprolactinemia, nonclassic adrenal hyperplasia, or thyroid disease, were excluded.

The general population (2,988) were Southern Chinese women aged 20–45 years who conducted an epidemiological study using a stratified, multistage systematic cluster random sampling in 16 communities (a hospital, company, factory, or village) of two urban and two rural regions in the Guangdong province of China.

Statistical analysis

Statistical analysis was done with SPSS 11.0 (SPSS, Chicago, IL, USA). In the study group, we used numbers and percentiles to describe all the results. In the control group, we use K-means to statistise.

Results and discussion

The results are shown in Tables I–III and in Figure 1.

Table I. *850 PCOS patients' FG score (0–4) in nine body areas*

Tabela I. *Liczba pacjentek z PCOS (n = 850) z poszczególnymi wynikami w zmodyfikowanej skali Ferrimana-Gallweya (0–4 pkt.) w dziewięciu okolicach ciała*

Region/score	0 (%)	1 (%)	2 (%)	3 (%)	4 (%)
Lip	113 (13.29)	364 (42.82)	251 (29.53)	106 (12.47)	16 (1.88)
Chin	750 (88.24)	82 (9.65)	15 (1.76)	3 (0.35)	0 (0)
Arm	677 (79.65)	118 (13.88)	43 (5.06)	11 (1.29)	1 (0.12)
Thigh	590 (69.41)	150 (17.65)	82 (9.65)	25 (2.94)	3 (0.35)
Chest	469 (55.18)	331 (38.94)	45 (5.29)	4 (0.47)	1 (0.12)
Upper belly	659 (77.53)	160 (18.82)	29 (3.41)	2 (0.24)	0 (0)
Lower belly	511 (60.12)	258 (30.35)	66 (7.76)	12 (1.41)	3 (0.35)
Upper back	367 (43.18)	314 (36.94)	147 (17.29)	22 (2.59)	0 (0)
Lower back	587 (69.06)	184 (21.65)	64 (7.53)	14 (1.65)	1 (0.12)

1. The order of the number scoring 0 points from most to least: chin (88.24%) > arm (79.65%) > upper belly (77.53%) > thigh (69.41%) > lower back > (69.06%) > lower belly (60.12%) > chest (55.18%) > upper back (43.18%) > lip (13.29%).

2. The order of the number scoring 1 point from most to least: Lip (42.82%) > chest (38.94%) > upper back (36.94%) > lower belly (30.35%) > lower back > (21.65%) > upper belly (18.82%) > thigh (17.65%) > arm (13.88%) > chin (9.65%).

3. The order of the number scoring 2 points from most to least: Lip (29.53%) > upper back (17.29%) > thigh (9.65%) > lower belly (7.76%) > lower back (7.53%) > chest (5.29%) > arm (5.06%) > upper belly (3.41%) > chin (1.76%).

4. The order of the number scoring 3 points from most to least: Lip (12.47%) > thigh (2.94%) > upper back (2.59%) > lower back (1.65%) > lower belly (1.41%) > arm (1.29%) > chest (0.47%) > chin (0.35%) > upper belly (0.24%).

5. The order of the number scored 4 points from most to least: Lip (1.88%) > thigh (0.35%) = lower belly (0.35%) > lower back (0.12%) = arm (0.12%) = chest (0.12%1) > upper back (0%) = chin (0%) = upper belly (0%)

Table II. *The mFG score, number and percentile in nine regions of 850 PCOS patients*

Tabela II. *Wyniki w zmodyfikowanej skali Ferriman-Gallweya (liczba punktów i procenty) w dziewięciu okolicach ciała u 850 pacjentek z PCOS*

FG score	Number	Percentile (%)
0	35	4.1
1	102	12.0
2	131	15.4
3	116	13.6
4	99	11.6
5	85	10.0
6	53	6.2
7	51	6.0
8	39	4.6
9	36	4.2
10	30	3.5
11	19	2.2
12	20	2.4
13	7	0.8
14	6	0.7
15	6	0.7
16	6	0.7
17	2	0.2
18	1	0.1
19	3	0.4
20	1	0.1
21	0	0.0
22	1	0.1
23	1	0.1
24 or above	0	0

In this study, we reported the degree and the distribution of facial and body terminal hair in 850 Chinese women with PCOS, and 2,988 members of the general population. Table I shows the 850 PCOS patients' FG scores (0–4)in nine body areas.

According to the data above, using the Rotterdam criteria, from 0 to 4 points, the lip is the most common place (score 0–3) but the chin is not a common place that terminal hair grows in 850 PCOS patients. Next to the upper back and chest, and the number of 4 points was only recorded for region lip (16), thigh (3), lower belly (3), arm (1), chest (1), and lower back (1). None of the PCOS patients displayed a score of more than 4 points for chin, upper belly and upper back.

Table II shows the FG total score, the number as well as its percentiles of 850 PCOS patients, each number of the FG total score accounts for the total number of the percentage. Our findings showed that of the 850 patients, 367 had a FG score equal to or greater than 5 points [43.2% (367/850)], 282 patients had a FG score equal to or greater than 6 points [33.18% (282/850)], and 21% had scores of at least 8. Nobody's FG score was equal to or greater than 24 points.

Table III shows the general population: among the nine body areas, the most frequent areas with an mFG score of at least 1 were the upper lip (418 of 2988, 13.99%) > upper back (8.03%) > thighs (7.03%) > lower abdomen (6.46%); whereas for serious hair growth with an mFG score of at least 3, the most frequent areas were thighs (1.87%) > upper lip (1.07%) > forearm (0.57%) > lower back (0.47%). Among subjects with an mFG ≥ 5 (n=314), the areas most often presenting with terminal hair growth were the upper lip (68.2%) > thighs (62.1%) > lower abdomen (54.5%) > upper back (52.2%).

Figure 1 describes a scoring example of terminal hair growth using the mFG system in a Chinese woman with polycystic ovary syndrome (PCOS). We should note that in some women, an mFG score of 1 might be just present with several pieces of long, black terminal hair growing, such as around areola, in lower abdomen, and chin. The data of the control group indicated that the mFG scores were normally distributed in the population. Overall, an mFG score of at least 5 was observed in 10%, and of at least 2 in 25%, of all subjects. An mFG score of 5 or greater is out of the norm for Chinese women from the general unselected population. By using a score of 5 as the cutoff value for hirsutism [9] and according to Table II, the incidence of PCOS is 43.2% in Chinese women.

Concerning the degree of hair growth among the nine body areas in our PCOS patients, a significant amount of hair was found on the lips and upper back in most subjects (score 1–2), but in terms of the serious situation (score 3–4)the lips and thighs were the most common places that hair grew. For the general population, we very often gave an mFG score of 1 in the upper lip, and for those with excess hair growth. Compared to previous studies, our study represents the largest study of women with PCOS and the general population and is large enough to display the distribution of mFG score present in these two groups of people.

There are a number of strengths in our present report. Firstly, the study and cohort are two large groups of women aged 20–45; secondly, the study group consisted of typical PCOS patients all diagnosed according to the 2003 Rotterdam criteria. The control group was selected by multistage systematic cluster sampling randomly from the general population in different regions of South China. Secondly, statistically defining the cut-off value for hirsutism either by cluster or related analyses or by the relative distribution (e.g. percentile) was used, and the results are reasonable and credible.

Table III. *The degree of hair growth among the nine body areas assessed by mFG score system in normal controls*

Tabela III. *Nasilenie wzrostu włosów w dziewięciu okolicach ciała w ocenie za pomocą zmodyfikowanej skali Ferrimana-Gallweya u zdrowych kobiet z grupy kontrolnej*

	Upper lip	Upper back	Thighs	Lower abdomen	Chest	Upper abdomen	Forearm	Lower back	Chin
	An mFG score of at least 1								
N	418	240	210	193	177	152	148	142	32
%	13.99	8.03	7.03	6.46	5.92	5.09	4.95	4.75	1.07
	An mFG score of at least 3								
N	32	5	56	4	2	4	17	14	1
%	1.07	0.17	1.87	0.13	0.07	0.13	0.57	0.47	0.03
An mFG score of at least 1 among the subjects with mFG score ≥ 5 (n = 314)									
N	214	164	195	171	149	137	134	128	29
%	68.2	52.2	62.1	54.5	47.5	43.6	42.7	40.8	9.2
Nine areas of mFG scoring (total number = 2,988)									

	Upper lip	Upper back	Thighs	Lower abdomen	Chest	Upper abdomen	Forearm	Lower back	Chin
	An mFG score of at least 1								
N	418	240	210	193	177	152	148	142	32
%	13.99	8.03	7.03	6.46	5.92	5.09	4.95	4.75	1.07
	An mFG score of at least 3								
N	32	5	56	4	2	4	17	14	1
%	1.07	0.17	1.87	0.13	0.07	0.13	0.57	0.47	0.03
An mFG score of at least 1 among the subjects with mFG score ≥ 5 (n = 314)									
N	214	164	195	171	149	137	134	128	29
%	68.2	52.2	62.1	54.5	47.5	43.6	42.7	40.8	9.2
Nine areas of mFG scoring (total number = 2,988)									

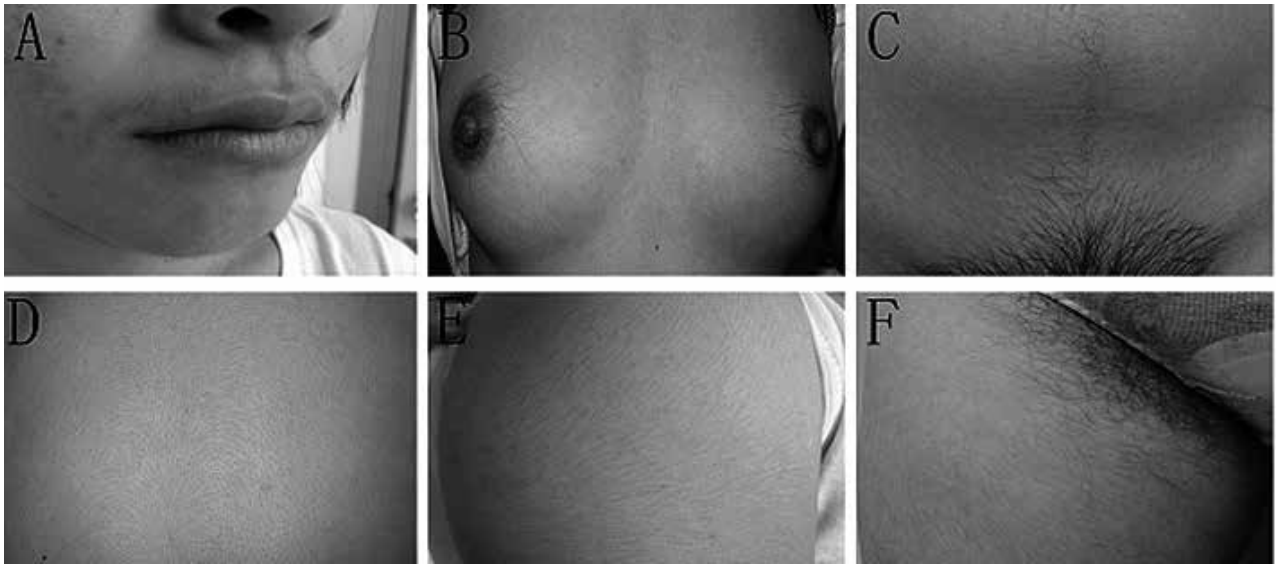

Figure 1. *Figure describes the scoring example of terminal hair growth using the mFG system in a Chinese woman with polycystic ovary syndrome (PCOS). **A** — upper lip, score 2; **B** — chest, score 1; **C** — lower abdomen, score 1; **D** — upper back, score 2; **E** — arm, score 3; **F** — thighs, score 3*

Rycina 1. *Na rycinie przedstawiono przykład punktowej oceny wzrostu włosów końcowych za pomocą zmodyfikowanej skali Ferrimana-Gallweya u Chinki z zespołem policystycznych jajników. **A** — górna warga, wynik 2 pkt.; **B** — klatka piersiowa, wynik 1 pkt.; **C** — podbrzusze, wynik 1 pkt.; **D** — górna część pleców, wynik 2 pkt; **E** — ramię, wynik 3 pkt; **F** — uda, wynik 3 pkt*

Conclusions

In conclusion, our data indicates that among 2,988 women aged 20–45 randomly selected from the general population by multistage systematic cluster sampling, the normative cutoff value of mFG score for hirsutism is 5 in the total population. Studying PCOS patients, according to Tab 2, using this data we went on to define hirsutism by a global cutoff value for mFG of 5 or alternatively according to the various cutoff values. Defining hirsutism by a mFG score ≥ 5, 367/850 (43.3%) of subjects studied were diagnosable with PCOS according to the Rotterdam 2003 criteria [10]. For PCOS patients and the general population, using the Rotterdam criteria, hirsutism is more common in PCOS than in the general population. From 0 to 4 points, the lip is the most common place, and the upper back in most subjects (score 1–2), but as to the serious situation (score 3–4), the lips and thighs are the most common places that hair grows. We very often gave an mFG score of 1 in the upper lip, and for those with excess hair growth. There is a good predictive value to diagnose PCOS by FG score for Chinese women.

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