Original Research

Association of ethnicity, Fitzpatrick skin type, and hirsutism: A retrospective cross-sectional study of women with polycystic ovarian syndrome

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ABSTRACT

Background: The complex interplay between ethnicity, Fitzpatrick skin type (FST), and hirsutism in patients with polycystic ovarian syndrome (PCOS) is poorly understood.

Objective: In this cross-sectional, retrospective analysis, we examined the prevalence, severity, and distribution of hirsutism with clinician-rated site-specific and total modified Ferriman-Gallwey (mFG) visual scoring in a diverse cohort of American patients with PCOS.

Methods: Independent analyses were conducted on the basis of patient-reported FST ratings and ethnicity.

Results: In this PCOS cohort, a correlation was found between hirsutism and ethnicity and the highest prevalence of hirsutism and total mFG scores was observed in Hispanic, Middle Eastern, African American, and South Asian patients. A positive correlation between hirsutism and FST was also observed with an increasing prevalence of hirsutism in the group of patients with higher FSTs. Significant trends in the anatomic distribution of hirsutism were observed between ethnic groups as well. A higher facial mFG score was found in African American patients but higher mFG scores in the truncal and extremity regions were observed in Middle Eastern patients. Truncal hirsutism was also associated with higher FSTs.

Conclusions: Ethnicity and FST may be important variables in both the quantitative and qualitative presentations of hirsutism in women with PCOS and should be considered in the diagnostic evaluation of any patient who is suspected of having the condition. Previously published studies that examined ethnicity, FST, and hirsutism in homogeneous cohorts limited comparison and generalizability but the strength of this study lies in its detailed analysis within a single large and diverse PCOS cohort. Validated studies are needed to determine whether clinical criteria for hirsutism should be adjusted for ethnicity and FST in the PCOS population and particularly within diverse cohorts and patients of mixed ancestry.

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dermatology clinics (Sivayoganathan et al., 2011). A timely, accurate diagnosis of PCOS is paramount because it may lead to a number of long-term complications such as type 2 diabetes, obesity, hypertension, infertility, macrovascular disease, thrombosis, and cancer (Ehrmann, 2005). However, an accurate diagnosis of PCOS is challenging due to the number of heterogeneous phenotypes in this condition including the observed ethnic variations in the presentation of PCOS (Zhao and Qiao, 2013).

Hirsutism is defined as excessive terminal hair growth in an androgen-sensitive skin distribution in women and is a reliable cutaneous marker for hyperandrogenism, the most common cause of which is PCOS. The primary modality to evaluate and quantify hirsutism is the modified Ferriman-Gallwey (mFG) visual four-point scale, which scores hair growth in nine androgen-dependent body areas (Ferriman and Gallwey, 1961). The scale rates hirsutism on a scale from 0 to 36 and clinical hirsutism is typically defined as a total mFG score of 8 or greater. The development of the mFG scoring system was based on the evaluation of primarily Caucasian (Northern European) women, making application of the instrument controversial in the assessment of hirsutism in other ethnicities (Asuncion et al., 2000; Cheewadhanarak et al., 2004; DeUgarte et al., 2006; Ferriman and Gallwey, 1961; Kim et al., 2011; Moran et al., 2010; Sagsoz et al., 2004; Tellez and Frenkel, 1995; Wong et al., 2014; Zhao et al., 2007). The Androgen Excess-PCOS (AE-PCOS) Society has proposed the need for ethnic-specific mFG cutoff scores to define hirsutism in women with PCOS (Eschobar-Morreale et al., 2012; Fauser et al., 2012). How ethnic variation impacts hirsutism in the PCOS population requires further investigation because current evidence stems from limited studies that examined homogeneous cohorts and compared only two or three ethnicities or variable classifications of ethnic groups.

The Fitzpatrick skin type (FST) scale categorizes patients on the basis of skin color and response to sun exposure and has been used in the evaluation of photoaging, skin cancer risk assessment, and laser hair treatment (Fitzpatrick, 1988; Roberts, 2009; Sachdeva, 2009). Few studies have investigated an association between skin type and hirsutism and the generalizability of existing evidence is limited by mixed methodologies in non-PCOS cohorts (Döner and Ekmekçi, 2013; Javorsky et al., 2014). The aim of the current study is to characterize the relationship between ethnicity, FST, and the pattern and severity of hirsutism among an ethnically diverse cohort of American patients with PCOS.

Methods

Approval by the University of California, San Francisco (UCSF) Committee for Human Research was granted to perform this retrospective cross-sectional study. Participants were recruited consecutively from May 18, 2006 to October 25, 2012 from the UCSF multidisciplinary PCOS clinic. Any patient who was able to provide written consent was eligible to participate in the study. A diagnosis of PCOS was made by joint consultation between a dermatologist and reproductive endocrinologist using the 2003 Rotterdam criteria that require two of three signs or symptoms of the following: oligoovulation and/or anovulation, clinical or biochemical signs of hyperandrogenism, or presence of 12 or more antral follicles per ovary and/or ovarian volume greater than 10 ml by ultrasound (Rotterdam ESHRE/ASRM, 2004). Patients were asked to discontinue any hormonal medication at least 1 month prior to the clinic visit and refrain from any hair removal for at least 1 week before the clinic visit.

Ethnicity and Fitzpatrick skin type scoring

Self-reported ethnicity and FST information was collected with a demographic questionnaire. Ethnic groups were categorized in nine subgroups: Middle Eastern, Ashkenazi Jew, other Caucasian, East/Southeast Asian, South Asian, Hispanic, African American, Native American, and mixed/other. Skin type was determined on the basis of self-reported Fitzpatrick skin type including Type I (always burns, never tans), Type II (usually burns, tans minimally), Type III (sometimes mild burn, tans uniformly), Type IV (burns minimally, always tans well), Type V (very rarely burns, tans very easily), and Type VI (never burns, never tans). For the analysis, FSTs were classified into three skin type groups: FSTs I and II (Group 1), FSTs III and IV (Group 2), and FSTs V and VI (Group 3).

Clinician rating of hirsutism

The evaluation of hirsutism was conducted with the mFG visual scoring method that assesses androgen dependent hair growth in nine body areas: upper lip, chin, chest, upper and lower back, upper and lower abdomen, thighs, and upper arms. A dermatologist rated and recorded each site using the mFG visual scoring method on a scale of 0 (absence of hair) to 4 (extensive terminal hair growth).

Statistical analysis

All analyses were performed with SAS software (SAS Institute, Cary, NC). Kruskal-Wallis and χ² tests were used to compare demographics and mFG scores between the PCOS diagnosis status, and ethnic and FST groups.

Results

A total of 341 women met the study inclusion criteria and 276 patients met the Rotterdam criteria for PCOS. There was no difference in the ethnic backgrounds between women who were diagnosed with PCOS and those who failed to meet the diagnostic criteria or in the deferred diagnosis group (p = .250). Additional baseline characteristics are listed in Table 1. There were significant differences in the total mFG scores (p < .001) and rates of clinical hirsutism (p = .013) and women who were diagnosed with PCOS had greater severity and prevalence of hirsutism (Table 2).

A comparison between ethnic groups found a significant correlation between self-reported ethnicity and total mFG scores (p = .009) and prevalence of clinical hirsutism (p = .002). Patients of

![Table 1: Mean age, BMI and ethnicity in PCOS vs. non-PCOS groups](image)
Discussions

This analysis of a diverse cohort of American patients with PCOS revealed significant differences in prevalence, pattern, and severity of hirsutism between ethnic and FST subgroups. An increased prevalence of hirsutism and higher total mFG scores were found in patients of Hispanic, Middle Eastern, South Asian, African American, and mixed ethnicity. A lower prevalence in hirsutism and total mFG scores were found in Caucasian, Asian, Ashkenazi Jewish, and Native American women with PCOS.

The results of this study are consistent with some but not all published studies that investigated ethnic variations in the prevalence and severity of hirsutism in women with PCOS. A comparison with existing literature was limited by differences in methodology, which precluded generalizability. Some studies focused on a single homogeneous ethnic cohort but many of the available studies focused on a comparison of hirsutism in limited subsets of ethnic groups rather than examining hirsutism across multiple ethnicities within a single PCOS cohort (Carmina et al., 1992; Clintborg et al., 2010; Guo et al., 2012; Kim et al., 2014; Legro et al., 2006; Welt et al., 2006; Wijeyaratne et al., 2002a; Wong et al., 2014).

Studies that identify ethnic differences in hirsutism in patients with PCOS have largely relied on a limited comparison of two or three ethnic subgroups. Several cross-sectional studies have found significantly higher mFG scores among migrant South Asian and Middle Eastern women with PCOS who live in Europe compared with their Caucasian European counterparts (Glintborg et al., 2010; Mani et al., 2015; Wijeyaratne et al., 2002b). Important differences may lie in the distinction of Asian subgroups because comparisons between European Caucasian and Chinese cohorts of patients with PCOS who live in their native countries found a lower prevalence of hirsutism and mFG scores in the East Asian group (Guo et al., 2012). Similarly, a multi-center cross-sectional study of women with PCOS found lower mFG scores in an East Asian (Japanese) cohort compared with Italian and Hispanic American cohorts with all patients living in their native countries (Carmina et al., 1992).

In contrast, multiple studies of American women with PCOS did not find ethnic differences in hirsutism prevalence and severity (Knochenhauer et al., 1998; Ladson et al., 2011; Legro et al., 2006; Welt et al., 2006). A study of a diverse cohort in Boston reported equal prevalence of hirsutism and mFG scores between Caucasian, African American, Hispanic, and Asian patients with PCOS (Welt et al., 2006). In the Pregnancy in Polycystic Ovarian Syndrome study, similar rates of hirsutism prevalence and severity were also reported among patients who were categorized by race in African American, Asian, Caucasian, and American Indian/Native American groups and in Latino versus non-Latino ethnic subgroups (Legro et al., 2006). In contrast to previous studies that identified ethnic differences in hirsutism between distinct Caucasian and East Asian cohorts of patients with PCOS who all lived in their native countries, a focused study that examined Caucasian (primarily of European ancestry) and East Asian

### Table 2

| mFG (mean ± SD) | No (does not meet diagnostic criteria) (N = 45) | Yes (meets diagnostic criteria for PCOS) (N = 242) | Diagnosis Deferred (N = 12) | p-value |
|-----------------|-----------------------------------------------|-----------------------------------------------|-------------------------------|---------|
| Upper arm       | 0.22 ± 0.47                                   | 0.51 ± 0.83                                   | 0.26 ± 0.45                   | .021    |
| Lower arm       | 0.22 ± 0.47                                   | 0.51 ± 0.83                                   | 0.26 ± 0.45                   | .021    |
| Upper back      | 0.22 ± 0.47                                   | 0.51 ± 0.83                                   | 0.26 ± 0.45                   | .021    |
| Lower back      | 0.22 ± 0.47                                   | 0.51 ± 0.83                                   | 0.26 ± 0.45                   | .021    |
| mFG (total)     | 5.62 ± 5.12                                   | 8.5 ± 6.27                                    | 5.62 ± 5.12                   | .005    |

BMI, body mass index; mFG, modified Ferriman-Gallwey; PCOS, polycystic ovarian syndrome.

1 On the basis of the Kruskal-Wallis test.
2 On the basis of the χ² test.
3 Facial mFG score: Summation of upper lip and chin mFG scores.
4 Truncal mFG score: Summation of chest, upper and lower back, and upper and lower abdomen mFG scores.
5 Extremity mFG score: Summation of thigh and upper arm mFG scores.
### Table 3
Relationship between ethnicity and hirsutism in women with PCOS

| Ethnicity                              | Caucasian Ethnic Subgroups | Asian Ethnic Subgroups | Additional Ethnic Groups |
|----------------------------------------|---------------------------|------------------------|-------------------------|
|                                        | Middle Eastern            | Ashkenazi Jewish       | East/Southeast Asian    | South Asian             | Hispanic | African American | Native American | Mixed/Other | p-value |
| Age (Mean ± SD)                        | 28.4 ± 7.55 (n = 10)      | 28 ± 5.4 (n = 17)      | 28.2 ± 6.05 (n = 123)   | 27.1 ± 5.44 (n = 37)    | 23 ± 6.27 (n = 4)      | 28.9 ± 6.43 (n = 30) | 309 ± 6.76 (n = 16) | 23 ± 6.27 (n = 4) | 28.3 ± 5.28 (n = 26) | .111    |
| BMI (Mean ± SD (N))                    | 35.8 ± 10.4 (n = 10)      | 29.1 ± 8.1 (n = 11)    | 29 ± 7.69 (n = 123)     | 29.7 ± 8.44 (n = 35)    | 23 ± 3.84 (n = 7)      | 342 ± 8.88 (n = 30)  | 31.4 ± 6.6 (n = 16)  | 38.8 ± 4.83 (n = 4) | 32 ± 7.85 (n = 26)    | <.001   |
| mFG score (mean +/-SD)                 |                           |                        |                         |                         |                      |                       |                        |                       |                        |        |
| Upper lip                              | 0.778 ± 1.09              | 0.875 ± 0.719         | 0.945 ± 0.947           | 1.36 ± 1.11             | 1 ± 0.707            | 1.31 ± 1.11           | 1.07 ± 0.704          | 0.5 ± 0.707            | 1.53 ± 1.17            | .191    |
| Chin                                   | 1.44 ± 1.42               | 0.938 ± 1.12          | 1.2 ± 1.3               | 1.12 ± 1.17             | 1.2 ± 0.837          | 1.97 ± 1.43           | 2.13 ± 1.06           | 0.5 ± 0.707            | 1.68 ± 1.29            | .015    |
| Chest                                  | 1.22 ± 1.2                | 0.375 ± 0.619         | 0.367 ± 0.835           | 0.333 ± 0.045           | 0.6 ± 0.548          | 0.571 ± 0.836         | 0.333 ± 0.017         | 0.0 ± 0.0             | 0.421 ± 0.007          | .081    |
| Upper abdomen                          | 1.22 ± 0.972              | 0.563 ± 0.814         | 0.491 ± 0.854           | 0.576 ± 0.751           | 1 ± 0.0             | 1.17 ± 1.11           | 0.667 ± 0.724         | 0.5 ± 0.707            | 0.684 ± 0.885          | .004    |
| Lower abdomen                          | 1.56 ± 1.01               | 1.5 ± 0.966           | 1.55 ± 1.2              | 1.36 ± 1.06             | 1.8 ± 0.447         | 2.31 ± 1.23           | 1.47 ± 0.915          | 1 ± 0.0               | 2.16 ± 1.21           | .050    |
| Upper arm                              | 0.667 ± 1.0               | 0.0667 ± 0.258        | 0.3 ± 0.736             | 0.485 ± 0.972           | 0.8 ± 0.837         | 1.03 ± 1.21           | 0.467 ± 0.743         | 0.5 ± 0.707            | 0.158 ± 0.375          | <.001   |
| Thigh                                  | 2.44 ± 0.882              | 1.88 ± 0.885         | 1.6 ± 1.09              | 1.18 ± 1.07             | 1.4 ± 1.14          | 2.07 ± 1.05           | 1.73 ± 0.704          | 1 ± 1.41              | 1.68 ± 1.25            | .014    |
| Upper back                             | 1.33 ± 1.12               | 0.5 ± 0.73            | 0.291 ± 0.611           | 0.515 ± 0.87            | 0.8 ± 0.447         | 0.966 ± 0.944         | 0.8 ± 0.775           | 0.0 ± 0.0             | 0.421 ± 0.038          | <.001   |
| Lower back                             | 1.67 ± 1.22               | 0.688 ± 0.793         | 0.673 ± 0.94            | 0.97 ± 1.13             | 1 ± 0.707          | 1.69 ± 1.14           | 0.733 ± 0.799         | 0.0 ± 0.0             | 0.842 ± 1.17           | <.001   |
| Total (Mean ± SD (N))                  | 12.3 ± 8.57               | 7.38 ± 5.28           | 7.42 ± 5.7              | 7.91 ± 6.39             | 9.6 ± 1.52         | 12.6 ± 7.52           | 9.4 ± 4.4             | 4 ± 4.24              | 9.1 ± 6.62            | .009    |
| Regional mFG scores (mean +/-SD)       |                           |                        |                         |                         |                      |                       |                        |                       |                        |        |
| Facial**                               | 2.22 ± 2.39               | 1.81 ± 1.64           | 2.15 ± 2               | 2.48 ± 2.15             | 2.2 ± 1.3          | 3.28 ± 2.07           | 3.2 ± 1.42            | 1 ± 1.41              | 3.05 ± 2.06            | .031    |
| Trunk**                                | 7 ± 4.97                  | 3.63 ± 2.96           | 3.37 ± 3.31            | 3.76 ± 3.51             | 5.2 ± 0.447        | 6.69 ± 4.12           | 4 ± 2.67              | 1.5 ± 0.707            | 4.3 ± 3.7             | <.001   |
| Extremity***                           | 3.11 ± 1.76               | 1.94 ± 0.998         | 1.9 ± 1.4              | 1.67 ± 1.76             | 2.2 ± 1.64         | 3.03 ± 1.92           | 2.2 ± 1.15            | 1.5 ± 2.12            | 1.75 ± 1.41            | .017    |
| Clinical hirsutism                     |                           |                        |                         |                         |                      |                       |                        |                       |                        |        |
| No (mFG total = 8)                     | 3 (33.3%)                 | 10 (62.5%)            | 66 (60.0%)             | 19 (57.6%)              | 0 (0.0%)          | 8 (26.7%)             | 4 (26.7%)             | 2 (100.0%)             | 9 (45.0%)             | .002    |
| Yes (mFG total =/=8)                   | 6 (66.7%)                 | 6 (37.5%)             | 44 (40.0%)             | 14 (42.4%)              | 5 (100.0%)        | 22 (73.3%)           | 11 (73.3%)            | 0 (0.0%)              | 11 (55.0%)             |        |

BMI, body mass index; mFG, modified Ferriman-Gallwey; PCOS, polycystic ovarian syndrome.

Notes: The South Asian subgroup includes individuals who reported ancestry of Afghanistan, Bangladesh, Nepal, India, Pakistan, and Sri Lanka. The East Asian subgroup includes individuals who reported ancestry of China, Japan, North Korea, South Korea, and Taiwan. The Southeast Asian subgroup includes individuals who reported ancestry of Indonesia, Singapore, Philippines, Thailand, Vietnam, Cambodia, and Laos. The Middle Eastern subgroup includes individuals who reported ancestry of Turkey, Cyprus, Syria, Lebanon, Iraq, Iran, Israel, Jordan, Egypt, Sudan, Libya, and others.

1. On the basis of the Kruskal-Wallis test.
2. On the basis of the χ² test.
3. Facial mFG score: Summation of upper lip and chin mFG scores.
4. Truncal mFG score: Summation of chest, upper and lower back, and upper and lower abdomen mFG scores.
5. Extremity mFG score: Summation of thigh and upper arm mFG scores.
subgroups within a cohort of American patients with PCOS (same cohort used in this study) found no difference in prevalence and severity of hirsutism between the two groups (Wang et al., 2013).

An important consideration for the disparate findings among studies lies in the differences in methodology. Studies have utilized subgroups on the basis of race, ethnicity, or a combination of the two, which makes comparisons between studies challenging. Broad racial grouping, for example of Caucasian and Asian subjects, may have masked important differences between ethnic subgroups that were revealed in the present study, which utilized more granular categories on the basis of ethnicity such as Middle Eastern, Hispanic, South Asian, and East/Southeast Asian. Discrepancies in the criteria used to diagnose PCOS may also contribute to discordant findings among studies. The current study provides important evidence for the correlation of ethnicity and FST on the presentation of hirsutism in patients with PCOS and offers additional support for a reconsideration of the basis of ethnicity in warrants requires validation.

In this study, there was a positive correlation between hirsutism and higher FST. Patients with FSTs V and VI had greater total mFG scores and a higher prevalence of clinical hirsutism than those with other skin types. Increased prevalence of truncal hirsutism was also noted in higher FSTs. Few studies have investigated the relationship between skin type and hirsutism, none in patients with PCOS, and among the few studies the methodologies differ. A cross-sectional Turkish study of 1034 premenopausal women (excluding women with a complaint of hirsutism) found that women with higher FSTs (FSTs IV and V) had higher total mFG scores compared with groups of patients with lower FSTs (Döner and Ekmekçi, 2013). Additionally, a multi-center cross-sectional study of 2895 women who were recruited from Los Angeles, Rome, London, and Akita (Japan) reported that upper lip mFG score was influenced by ethnicity but not skin color as assessed by a chromometer (Javorský et al., 2014). In the present study, upper lip mFG scores were also not associated with higher FST.

The current study provides important evidence for the correlation of ethnicity and FST on the presentation of hirsutism in patients with PCOS and offers additional support for a reconsideration of the current criteria to diagnose hirsutism on the basis of these factors (Escobar-Morreale et al., 2012; Fauser et al., 2012). Although the original study by Ferriman and Gallwey (1961) defined hirsutism as a total score of 8 or higher, the proposal to adjust mFG criteria on the basis of ethnicity has already been implemented through the use of distinct mFG criteria by different research groups (Cheewadhanaraks et al., 2004; Guo et al., 2012; Ichikawa et al., 1988; Kim et al., 2014; Li et al., 2013; Welt et al., 2006; Zhang et al., 2013; Zhao et al., 2011; Zhao et al., 2010). Studies within the general population (not necessarily patients with PCOS) have provided

Table 4

| Age (Mean ± SD) | 28.3 ± 5.7 | 28.1 ± 1.4 | 26.7 ± 6.9 |
|----------------|------------|------------|------------|
| BMI (Mean ± SD (N)) | 31.5 ± 8.99 (n = 61) | 29.4 ± 8.03 (n = 126) | 31.2 ± 6.89 (n = 33) |
| mFG score (mean +/-SD) | | | |
| Upper lip | 1.11 ± 1.07 | 1.02 ± 0.99 | 1.33 ± 0.957 |
| Chin | 1.49 ± 1.39 | 1.3 ± 1.29 | 1.61 ± 1.22 |
| Chest | 0.361 ± 0.876 | 0.406 ± 0.736 | 0.636 ± 0.822 |
| Upper abdomen | 0.541 ± 0.923 | 0.641 ± 0.858 | 0.97 ± 0.883 |
| Lower abdomen | 1.56 ± 1.15 | 1.69 ± 1.18 | 1.73 ± 1.1 |
| Upper arm | 0.41 ± 0.883 | 0.32 ± 0.742 | 0.848 ± 1.09 |
| Thigh | 1.61 ± 1.1 | 1.66 ± 1.09 | 1.73 ± 1.01 |
| Upper back | 0.393 ± 0.737 | 0.484 ± 0.784 | 0.97 ± 0.918 |
| Lower back | 0.721 ± 0.951 | 0.938 ± 1.11 | 1.36 ± 1.06 |
| Total (Mean ± SD (N)) | 8.2 ± 6.45 | 8.46 ± 6.34 | 11.2 ± 6.13 |
| Regional mFG scores (mean +/-SD) | | | |
| Facial | 2.61 ± 2.26 | 2.32 ± 1.96 | 2.94 ± 1.92 |
| Trunk** | 3.57 ± 3.58 | 4.16 ± 3.62 | 5.67 ± 3.71 |
| Extremity*** | 2.02 ± 1.59 | 1.98 ± 1.54 | 2.58 ± 1.66 |
| Clinical hirsutism | | | |
| Yes (mFG total >8) | 36 (59.0%) | 65 (50.8%) | 9 (27.3%) |
| No (mFG total <=8) | 25 (41.0%) | 63 (49.2%) | 24 (72.7%) |

^1 On the basis of the Kruskal-Wallis test.
^2 On the basis of the t-test.
* Facial mFG score: Summation of upper lip and chin mFG scores.
** Truncal mFG score: Summation of chest, upper and lower back, and upper and lower abdomen mFG scores.
*** Extremity mFG score: Summation of thigh and upper arm mFG scores.

BMI, body mass index; mFG, modified Ferriman-Gallwey; PCOS, polycystic ovarian syndrome.
validation for this practice and suggest distinct ethnic-specific mFG di-
agnostic criteria for clinical hirsutism on the basis of the 95th percen-
tile of the ethnic population (Asuncion et al., 2000; Cheewadhanarakas et al., 2004; DelUgarte et al., 2006; Kim et al., 2011; Moran et al., 2010; Tellez and Frenkel, 1995; Zhao et al., 2007). On the basis of these stud-
ies, lower diagnostic cutoff points for East Asian women (mFG > 2 to
> 5) and higher cutoff points for Middle Eastern (mFG > 8 to 10), Mediterranean (mFG > 7 to > 10), and Mexican (> 11) women have been recommended (Api et al., 2009; Asuncion et al., 2000; Cheewadhanarakas et al., 2004; Kim et al., 2011; Moran et al., 2010; Noorbalah and Kefaei, 2010; Sagsoz et al., 2004; Zhao et al., 2007). Given the complex interplay of ethnicity and FST on the presentation of hirsutism, additional studies are needed to validate mFG criteria for each ethnic subgroup and especially to assess individuals of mixed ethnic backgrounds.

Limitations

One of the limitations of this study is the small sample size. Addi-
tionally, self-reported ethnicity and FST data are subject to reporting
bias and misinterpretation of the classifications. The relationship
between ethnicity and skin type is complex and a subanalysis of
FST and ethnicity in this study found a significant positive correlation
between ethnicity and skin type (p < 0.001; data not shown) although
a wide range of skin types can be found in patients of certain
categories.

Hirsutism is more prevalent in obese individuals with PCOS; how-
ever, this relationship may differ between ethnic groups and further
 limits the interpretation of the study findings (Glintborg et al., 2010;
Mani et al., 2015; Schmidt et al., 2016; Yuan et al., 2016). Middle
Eastern and Hispanic patients had the highest BMI, followed by
African American patients. These groups also had some of the highest
mFG scores and prevalence of clinical hirsutism. Whether these
ethnicities have genetic or environmental risk factors predisposing
to both weight gain and hirsutism or whether there is a direct effect
of obesity on the manifestation of hirsutism is not known.

Conclusions

Ethnicity and FST have an important impact on the presentation of
hirsutism in patients with PCOS. Because of the distinct patterns of
hirsutism presentation in patients with PCOS, understanding a
distribution and quantitative criteria (mFG) for hirsutism

Acknowledgements

The authors would like to acknowledge L. Elaine Allen, PhD and
Chengshi Jin, PhD of the UCSF CTSI for their statistical assistance
under CTSI grant #UL1 TR000004. Kanade Shinkai, MD, PhD was sup-
ported by a Dermatology Foundation Medical Dermatology Career
Development Award (2010-2013).

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