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Invited Review

Body image concerns in women with polycystic ovary syndrome: a systematic review and meta-analysis

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Abstract

Objective: To assess differences in body image concerns among women with and without polycystic ovary syndrome (PCOS).

Design: This is a systematic review and meta-analysis.

Methods: Electronic databases (MEDLINE, EMBASE, APA PsychInfo, PUBMED, Web-of-Science Core Collection, and Cochrane Controlled Register of Trials [CENTRAL]) were searched from inception through July 2022. Outcome measures included validated questionnaires reporting on body image concerns. Methodological quality was assessed by the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) system, and included studies were assessed for risk of bias. Meta-analyses were performed using the inverse variance method based on random or fixed effects models (Review Manager, Version 5).

Results: A total of 918 women with PCOS and 865 women without PCOS from 9 studies were included. Meta-analysis of 3 studies using Multidimensional Body-Self Relations Questionnaire Appearance Scale (MBSRQ-AS) showed those with PCOS reported higher dissatisfaction with appearance evaluation and appearance orientation compared to those without PCOS (mean difference [MD] = −0.78, $I^2 = 0\%$, $P < .00001$, and MD = 0.22, $I^2 = 54\%$, $P = .004$, respectively). Meta-analysis of 2 studies showed higher dissatisfaction with overweight preoccupation, lower body area satisfaction, and body weight classification on MBSRQ-AS subscales in those with PCOS compared to those without PCOS (all $P < .001$). Meta-analysis of 2 studies using the Body Esteem Scale for Adolescents and Adults (BESAA) showed significantly lower scores for the weight subscale in those with PCOS compared to those without PCOS ($P = .03$).

Conclusions: Those with PCOS experience more significant body image concerns, emphasising the importance of awareness in the clinical care of PCOS. Considering the limited evidence, further studies are warranted to identify drivers and mitigating factors.

Keywords: polycystic ovary syndrome, body image concerns, body dysmorphia, body dissatisfaction

Significance

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder affecting women of reproductive age, with an estimated prevalence of 10% worldwide. Apart from its metabolic and reproductive burden, PCOS has been associated with a high prevalence of emotional ill-being. Considering the negative impact of body dissatisfaction on physical and psychological health, strategies must be implemented to address these in clinical practice. Our systematic review and meta-analysis show that women with PCOS experience greater body dissatisfaction than those without, denoting the importance of considering body image in assessing and managing PCOS. The role of psychosocial support for women with PCOS should be considered to provide individualised care.

M.D. and K.M. are joint first authors.

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Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder affecting women of reproductive age, with an estimated prevalence of 10%-15% worldwide.[1,2] Polycystic ovary syndrome is characterised by a wide array of clinical manifestations, including menstrual disturbances, weight gain, hyperandrogenism, and hirsutism, and is associated with a higher risk of obesity, type 2 diabetes mellitus, infertility, and pregnancy-related complications.[3,4] The burden of PCOS on the emotional well-being of those affected is also well-documented. Polycystic ovary syndrome is associated with depression and anxiety,[5,6] decreased quality of life and sexual satisfaction, and increased emotional distress.[5,7,8]

Body image is a multidimensional construct encompassing thoughts, behaviours, and evaluations of one's body with positive and negative features.[9] Body dissatisfaction is when people have unfavourable and negative feelings and opinions about their body components, such as weight, shape, and appearance.[9] Poor body image affects physical and psychological health and may influence self-esteem, mood, competence, and social and occupational functioning.[10] Body image dissatisfaction is also critical in developing and maintaining various eating disorders.[11] Furthermore, a recent systematic review and meta-analysis showed that PCOS is strongly associated with an increased prevalence of eating disorders.[12]

Body dissatisfaction and lower self-esteem appeared to be even more prominent among women with PCOS experiencing hirsutism and fertility issues compared to those women with PCOS without these features.[13] Additionally, a higher prevalence of depressive and anxiety symptoms may be attributed to increased body image dissatisfaction and eating disorders among women with PCOS.[3]

Considering the negative impact of body dissatisfaction on physical and psychological health, strategies must be implemented to address these in clinical practice. Therefore, we aimed to conduct a systematic review and meta-analysis (1) to evaluate the currently available evidence with regard to body image concerns in women with PCOS as compared to those without PCOS and (2) to inform the recommendations of the 2023 update of the International Guidelines on the assessment and management of PCOS.

Methods

The protocol was registered a priori on the National Institute of Health (NIH) Research Prospective Register of Systematic Reviews PROSPERO (CRD42021272367). The Population, Exposure, Comparison, and Outcome (PECO) for this search is developed in collaboration with the expert group involved in the international PCOS guidelines. We complied with the recommendations of the Declaration of Helsinki during this study.

Search strategy

We performed a systematic search of the following electronic databases: MEDLINE (via Ovid), EMBASE (via Ovid), APA PsychInfo (via Ovid), PubMed, Web-of-Science Core Collection, and Cochrane Controlled Register of Trials (CENTRAL) from inception until July 12, 2022. For each database, a broad Boolean search strategy consisting of various combinations of keywords and Medical Subject Headings (MeSH) concerning PCOS and body dysmorphic disorder was developed. The reference lists of all selected articles were also screened for relevance. MEDLINE search strategy is presented in Supplementary 1; a modified version was used for the other databases.

Study selection

The process of study selection is summarised in Figure 1. Two reviewers independently screened the titles and abstracts (H.K. and M.H.). H.K. and M.H. obtained and screened full texts against the eligibility criteria. Any conflicts were resolved upon discussion between the 2 reviewers and senior reviewers (P.K. and M.D.).

Inclusion and exclusion criteria

The inclusion criteria were developed using the PECO framework (Supplementary 2). Eligible studies must have included a diagnosis of PCOS based on the Rotterdam criteria, NIH criteria, or other diagnostic criteria and must have used a validated questionnaire to assess body image concerns. Additionally, studies must have had primary outcome measures reporting body image concerns. Only original research studies with appropriate ethical approval and written in English were included. No restrictions on participants' age, ethnicity, other health status information, or study setting were applied.

Studies including women with PCOS not fulfilling the inclusion criteria (Supplementary 2) were excluded from the systematic review. Non–evidence-based guidelines, non-systematic reviews, non-comparative cohort studies, case series, editorials, letters, and commentaries were excluded.

Data extraction

Data were extracted from selected studies using a pre-piloted standardised data extraction form by 2 independent reviewers (H.K. and M.H.). Any discrepancy was resolved by mutual consensus or consultation with senior reviewers (P.K. and M.D.). The following data were extracted: first author, year of publication, PCOS diagnostic criteria, study design, sample size, type of questionnaire, baseline characteristics (sex, age, ethnicity, education, occupational status, body mass index [BMI], Ferriman–Gallwey score, hirsutism, acne, oligomenorrhoea, amenorrhoea, and androgen concentrations), study setting, response or participation rate, and primary and secondary outcome measures.

Statistical analysis

Review Manager (version 5) was used for meta-analyses—summary tables and forest plots present differences between those with PCOS and controls. For studies reporting the medians and quartiles, the median was applied as the best estimate of the mean, and the SD was estimated at 234/40 of the interquartile range.[14] Data were pooled using fixed or random effects models, and heterogeneity between studies was determined using the I^2 statistic. An I^2 of more than 40% indicated significant heterogeneity.[15] If the I^2 was significant, we pooled the data using random effects models. The odds ratios (ORs) with 95% confidence intervals (CIs) were estimated for dichotomous outcomes. For continuous outcomes, we calculated the weighted mean difference (MD) in scores with a 95% CI if the mean and SD of the outcomes were presented in the original article or from the converted median and IQR

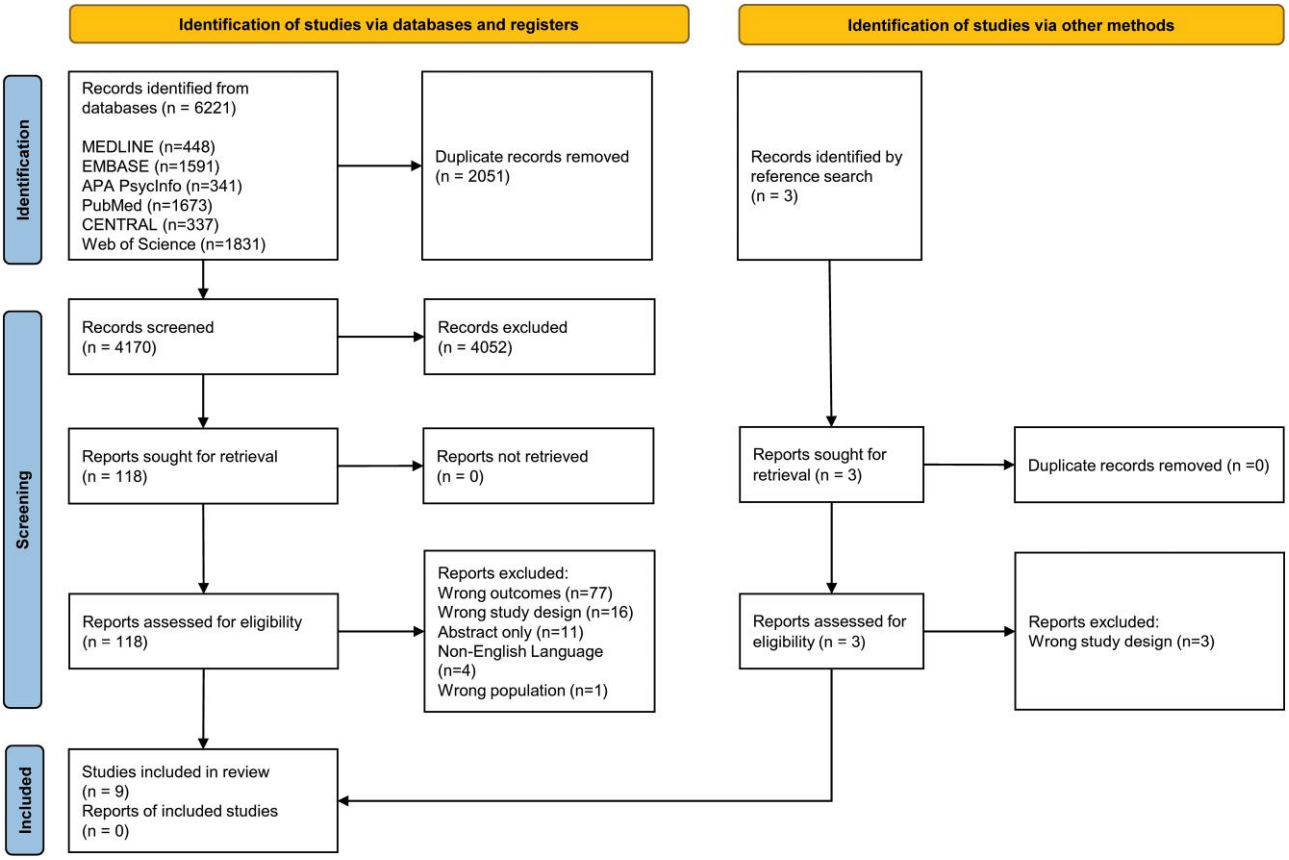

Figure 1. PRISMA flowchart.

where appropriate. Where meta-analysis was considered inappropriate, we used a narrative descriptive approach to summarise the evidence for those studies using different validated questionnaires or with incomplete reporting of outcome measures.

Results

The results of the systematic literature search are presented in Figure 1. After screening the titles and abstracts, removing duplicates, and analysing full texts, 9 articles[3,16–23] were included in the systematic review, of which 5[3,16–18,20] were included in the meta-analysis.

The 9 studies included cross-sectional or case–control designs comparing women with and without PCOS. A total of 918 women with PCOS and 865 women without PCOS were included, with sample sizes ranging from 33 to 201 for women with PCOS and 22 to 225 for women without PCOS. Characteristics of included studies are presented in Table 1.

Overall, studies used different validated scales, including Figure Rating Scale (FRS),[3,19] Body Esteem Scale for Adolescents and Adults (BESAA),[20] Body Esteem Scale (BES),[18] Body Image Scale (BIS),[21] Multidimensional Body-Self Relations Questionnaire Appearance Scale (MBSRQ-AS),[3,16,17] Body Uneasiness Test (BUT),[22] Body Features Satisfaction (BFS),[16] and Body Image Concern Inventory (BICI).[23] The most commonly validated scales used were MBSRQ and BESAA.

The MBSRQ measures the multidimensional construct of body image. A variation of the MBSRQ that evaluates the aspects of body image related to appearance is the MBSRQ-AS.[24] There are 5 subscales:

1. Appearance Evaluation is a 7-item measure of how satisfied a person feels with their physical appearance. High scores indicate positive and satisfied perceptions of physical appearance and attractiveness.
2. Appearance Orientation is a 12-item measure of personal investment in grooming and appearance presentation. High scores indicate high levels of attention to appearance and extensive grooming.
3. Overweight Preoccupation is a 4-item measure of fat anxiety, weight vigilance, dieting, and eating restraint. High scores indicate high-fat anxiety and high levels of dieting behaviour.
4. Self-Classified Weight consists of 2 items that indicate the individual's perception of their weight—"I think I am" and the label of their weight "others say I am". The scale ranges from 1—very underweight—to 5—very overweight. High scores indicate a high subjective and internalised perception of self as obese, while low scores indicate a high subjective and internalised view of self as thin.
5. Body Areas Satisfaction is a 9-item scale that measures the degree of satisfaction with specific body areas and attributes (eg, face, weight, and muscle tone). High scores indicate satisfaction with subjective body appearance.

Table 1. Study characteristics of the included studies.

No.	Author, year, country	Population/ setting	Study design	Sample size per group	Intervention/exposure details	Comparison/ control details	Follow-up duration	Outcomes	Summary of findings
1	Himelein and Thatcher, 2006, United States	Women diagnosed with PCOS	Case–control	PCOS ($n = 40$); non-PCOS ($n = 60$)	Multidimensional Body-Self Relations Questionnaire Appearance Scale; Body Features Satisfaction	None	None	Women with PCOS reported higher depression scores and greater body dissatisfaction ($P < .001$) than comparison group women. Body image was strongly associated with depression overall, even after controlling body mass.	Among women with PCOS, body dissatisfaction measures and education explained 66% of the variance in depression, suggesting explanations of the PCOS–depression link should consider the role of potentially mediating psychosocial variables.
2	Deeks et al., 2011, Australia	Women diagnosed with PCOS	Case–control	PCOS ($n = 177$); non-PCOS ($n = 109$)	Multidimensional Body-Self Relations Questionnaire Appearance Scale	Healthy volunteers	None	Women with PCOS had lower appearance evaluation, fitness orientation, health evaluation, health orientation, body area satisfaction, higher overweight preoccupation, and higher self-classified weight than women without PCOS.	In women with or without PCOS, body image and self-worth are predictors of both anxiety and depression, while QOL also predicts only depression.
3	Pastore et al., 2011, USA	Women diagnosed with PCOS	Case–control	PCOS ($n = 94$); non-PCOS ($n = 96$)	Body Esteem Scale	Healthy volunteers	None	Body dissatisfaction (especially perception of physical conditioning) was strongly associated with more severe depression symptoms in non-obese PCOS women (BMI < 30, $P < .04$) before and after controlling for age, testosterone, and free testosterone.	Among non-obese women with PCOS, their subjective body image was strongly associated with the severity of their depression symptoms. Most of the obese PCOS cohort had low body satisfaction and depression symptoms; therefore, individual differences in the body dissatisfaction scores were not helpful in identifying depression symptom severity.
4	Morotti et al., 2013, Italy	Women diagnosed with PCOS	Case–control	PCOS ($n = 33$); non-PCOS ($n = 22$)	Stunkard Figure Rating Scale	Healthy volunteers	None	Two-factor Italian MFSQ, the FRS, and the BDI were similar in both groups.	Moderate hirsutism and hyperandrogenism do not have any important influence on body image and self-esteem and, as a consequence, on sexual function.
5	Karacan et al., 2014, Turkey	Women diagnosed with PCOS	Case–control	PCOS ($n = 42$); non-PCOS ($n = 52$)	Stunkard Figure Rating Scale; Body Esteem Scale	None	None	Women with PCOS viewed their actual body as significantly larger ($M = 4.14$, SD = 1.37) than their own ideal body. Similarly, participants in control group viewed also their actual body as significantly larger ($M = 3.59$, SD = 1.49) than their own ideal body.	Body esteem was important for predicting eating attitudes in both groups, and sociocultural internalisation of thinness ideal and body dissatisfaction were also significant factors in the PCOS group.
6	Annagür et al., 2014, Turkey	Women diagnosed with PCOS	Case–control	PCOS ($n = 83$); non-PCOS ($n = 64$)	Body Image Scale	Healthy volunteers	None	The mean ± SD BMIs of PCOS and control groups were 23.85 ± 4.67 and 22.00 ± 2.43 kg/m^2, respectively. Body mass index values of the PCOS group were	No significant difference in body image concerns between women with and without PCOS.

(*continued*)

Table 1. Continued

No.	Author, year, country	Population/ setting	Study design	Sample size per group	Intervention/exposure details	Comparison/ control details	Follow-up duration	Outcomes	Summary of findings
								significantly higher than the controls ($P < .05$). There was no significant difference between the PCOS group and healthy controls for Body Image Scale scores.	
7	Scaruffi et al., 2019, Italy	Women diagnosed with PCOS	Case–control	PCOS ($n = 59$); non-PCOS ($n = 38$)	Body Uneasiness Test	Healthy volunteers	None	The PCOS group showed higher body uneasiness.	Physical appearance and bodily function have a central place in the minds of women with PCOS, as well as in their relationships.
8	Alur-Gupta et al., 2019, USA	Women diagnosed with PCOS	Case–control	PCOS ($n = 189$); non-PCOS ($n = 225$)	Multidimensional Body-Self Relations Questionnaire Appearance Scale; Stunkard Figure Rating Scale	Healthy volunteers	None	Women with PCOS had worse body image distress scores on all 5 MBSRQ-AS subscales adjusted for age, body mass index, race, pregnancy history, income, and employment, and larger differences on the FRS compared with the control women. Most MBSRQ-AS subscale scores statistically significantly correlated with depression, anxiety, and quality of life scores.	Women with PCOS have increased body image distress and depressive and anxiety symptoms.
9	Kutenaee et al., 2020, Iran	Women diagnosed with PCOS	Case–control	PCOS ($n = 201$); non-PCOS ($n = 199$)	Body Image Concern Inventory	Healthy volunteers	None	Mean BICI score for PCOS group: 39.17 (±32.23), and mean body image score for non-PCOS group: 32.61 (±11.11). The strongest effect from a psychological variable on sleep quality was body image, which had negative impact on sleep quality of patients with PCOS.	Body image plays an important role in the sleep quality of women with PCOS.

Abbreviations: BMI, body mass index; BDI, Beck's depression inventory; FRS, figure rating scale; MBSRQ-AS, multidimensional body-self relations questionnaire appearance scales; MFSQ, McCoy female sexuality questionnaire; PCOS, polycystic ovary syndrome; QOL, quality of life.

The BESAA is an easy-to-administer, psychometrically sound instrument that taps 3 aspects of body esteem in adolescents and adults: general feelings about appearance, weight satisfaction, and others' evaluations of one's body and appearance. It has 23 questions that are divided into 3 subscales: appearance (general feelings about appearance), weight (weight satisfaction), and attribution (evaluations attributed to others about one's body and appearance). The subscales have high internal consistency and 3-month test–retest reliability.[25]

Meta-analysis

Meta-analysis of 3 case–control studies[3,16,17] using MBSRQ-AS showed women with PCOS scored lower for appearance evaluation (Figure 2A1) and higher for appearance orientation (Figure 2A2), indicating worse body image concerns, compared to women without PCOS (MD = −0.78, $I^2 = 0\%$, $P < .001$, and MD = +0.22, $I^2 = 54\%$, $P = .004$, respectively). Meta-analysis of 2 studies[3,17] using MBSRQ-AS also showed women with PCOS scored higher for overweight preoccupation (Figure 2A3) and body weight classification (Figure 2A4) and lower for body area satisfaction (Figure 2A5), indicating higher body image concerns (MD 0.60, $I^2 = 0\%$, $P < .001$; MD = 0.54, $I^2 = 83\%$, $P < .001$; and MD = −0.55, $I^2 = 0\%$, $P < .001$, respectively), compared to women without PCOS.

Meta-analysis of 2 studies[18,20] using BESAA showed significantly lower scores for the weight subscale (Figure 2B1), indicating higher body image concerns in women with PCOS than in controls ($P = .03$). In contrast, in BESAA appearance (Figure 2B2) and attribution subscales (Figure 2B3), the difference was not statistically significant between groups ($P = .73$ and $P = .36$, respectively).

Other questionnaire scoring

Six studies used other validated questionnaires to assess body image concerns among women with PCOS compared to those without.[16,19–23] All these studies showed greater dissatisfaction with body image in women with PCOS than those without PCOS. The following validated questionnaires were used:

1. BFS score: Examines the dissatisfaction people experienced with 24 aspects of their bodies. Lower scores indicate worse body image concerns.
2. Stunkard FRS: It comprises 9 schematic silhouettes ranging from very thin to very obese, requiring participants to self-select a figure rating. Higher scores indicate worse body image concerns.
3. BIS: The total score ranges from 0 to 30 and can be calculated by summing up the 10 items. A higher score means a higher level of body image disturbance.
4. Sociocultural Attitudes Toward Appearance Questionnaire: The measure of internalisation of appearance ideals (ie, personal acceptance of societal ideals) and appearance pressures (ie, pressures to achieve the societal ideal). Lower scores indicate worse body image concerns.
5. BUT: Each item is rated on a 6-point Likert-type scale (range 0-5, from "never" to "always", high rates indicating greater body uneasiness)
6. Rosenberg Self-Esteem Scale (RSES): Scores between 15 and 25 are within the normal range; scores below 15 suggest low self-esteem.
7. BICI: The total score of the questionnaire can vary between 19 and 95, and the highest score indicates more dissatisfaction with the body image or appearance.

The detailed results of these studies are shown in Supplementary 3.

Quality assessment

The quality assessment using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) system is presented in Supplementary 4. The evidence certainty was low from all outcomes assessed in this systematic review, downgraded once for serious risk of bias due to the moderate risk of bias of included studies (as detailed in Supplementary 5), and was further downgraded due to the observational nature of the studies from which the data were derived.

Discussion

Women with PCOS had worse body image concerns than those without, suggesting women with PCOS experience greater dissatisfaction with their body image, irrespective of the tool used for assessment. To our knowledge, our study represents the first systematic quantitative analysis of body dissatisfaction and PCOS.

Studies have shown that negative body image in PCOS may increase depression[3] and poorer quality of life.[23,26] Therefore, body image assessment in women with PCOS should be considered as part of the comprehensive assessment and management plan. Approaches for screening and assessment that are easy to use and widely applicable are needed, keeping in mind that unnecessary use of comprehensive screening tools may be burdensome for women and health professionals. Detection of negative body image provides the opportunity to address both psychological aspects, such as self-esteem and self-acceptance, and work on the physical aspects of the condition, such as hirsutism, overweight, and acne, if appropriate. It was acknowledged that screening women with PCOS for negative body image is not usual, and an individualised approach focusing on individual priorities is needed. Screening may have resource implications, including length of consultation. Available BISs should also be considered in all clinical, health services, and population health research in PCOS.

Body dissatisfaction has also been recognised as contributing to developing eating disorders such as anorexia nervosa and bulimia.[27] A study in Turkey comparing adolescent girls and young women with PCOS to those without PCOS concluded that body dissatisfaction was an essential predictor for eating disorders; however, the difference between those with PCOS and without was not significant.[20]

Limitations

This study was limited by the significant clinical heterogeneity across studies, and, therefore, a relatively low number of studies could be used for meta-analysis. We could not conduct additional meta-analyses for studies using questionnaires apart from MBSRQ-AS and BESAA due to the limited number of studies with complete outcomes reporting. However, our meta-analyses represent diverse ethnic groups from pooled cohorts of women from South America, Europe, the Middle East, and Asia and provide a broader understanding of the

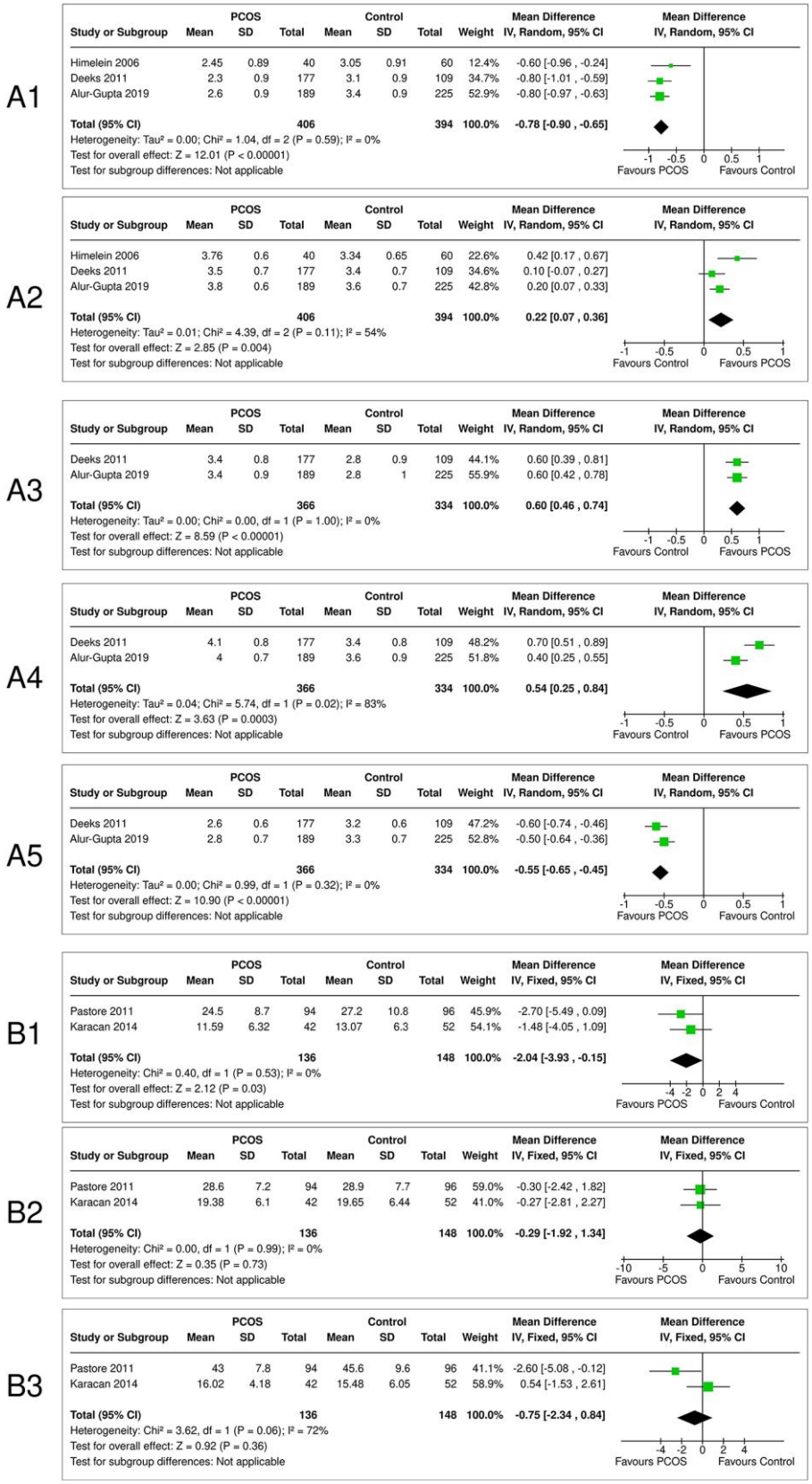

Figure 2. Forest plots showing that women with PCOS had higher body image concerns compared to healthy controls. (A) MBSRQ-AS tool (A1) appearance evaluation subdomain score (high score indicates satisfaction, low score- dissatisfaction), (A2) appearance orientation subdomain score (high score - dissatisfaction, low score -satisfaction), (A3) Overweight Preoccupation subdomain score (high score - dissatisfaction, low score -satisfaction), (A4) Weight Classification subdomain score (high score - dissatisfaction, low score -satisfaction), (A5) Body Areas Satisfaction subdomain score (high score - satisfaction, low score -dissatisfaction). (B) BESAA tool (B1) Weight subdomain score, (B2) Appearance subdomain score, (B3) Attribution subdomain score.

differences between women with PCOS and without across various regions and cultures.

Conclusion

Our findings show that women with PCOS experience greater body dissatisfaction than those without PCOS, denoting the importance of considering body image in assessing and managing women with PCOS. The role of psychosocial support for women with PCOS should be considered to provide holistic and individualised care. Given the greater dissatisfaction with physical appearance among those with PCOS compared to those without and the limited evidence in this area, further studies are warranted to understand better the body image concerns in the PCOS community to facilitate the development of targeted interventions.

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Supplementary material

Supplementary material is available at *European Journal of Endocrinology* online.

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Conflict of interest: None declared.

Data availability

The data will be available upon reasonable request.

References

1. Teede HJ, Misso ML, Costello MF, *et al.* Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. *Hum Reprod*. 2018;33(9):1602-1618. https://doi.org/10.1093/humrep/dey256
2. Yildiz BO, Bozdag G, Yapici Z, Esinler I, Yarali H. Prevalence, phenotype and cardiometabolic risk of polycystic ovary syndrome under different diagnostic criteria. *Hum Reprod*. 2012;27(10):3067-3073. https://doi.org/10.1093/humrep/des232
3. Alur-Gupta S, Chemerinski A, Liu C, *et al.* Body-image distress is increased in women with polycystic ovary syndrome and mediates depression and anxiety. *Fertil Steril*. 2019;112(5):930-938.e1. https://doi.org/10.1016/j.fertnstert.2019.06.018
4. Kempegowda P, Melson E, Manolopoulos KN, Arlt W, O'Reilly MW. Implicating androgen excess in propagating metabolic disease in polycystic ovary syndrome. *Ther Adv Endocrinol Metab*. 2020;11:2042018820934319. https://doi.org/10.1177/2042018820934319
5. Laggari V, Diareme S, Christogiorgos S, *et al.* Anxiety and depression in adolescents with polycystic ovary syndrome and Mayer-Rokitansky-Küster-Hauser syndrome. *J Psychosom Obstet Gynaecol*. 2009;30(2):83-88. https://doi.org/10.1080/01674820802546204
6. Scaruffi E, Gambineri A, Cattaneo S, Turra J, Vettor R, Mioni R. Personality and psychiatric disorders in women affected by polycystic ovary syndrome. *Front Endocrinol (Lausanne)*. 2014;5:185. https://doi.org/10.3389/fendo.2014.00185
7. Hahn S, Janssen OE, Tan S, *et al.* Clinical and psychological correlates of quality-of-life in polycystic ovary syndrome. *Eur J Endocrinol*. 2005;153(6):853-860. https://doi.org/10.1530/eje.1.02024
8. Guidi J, Gambineri A, Zanotti L, Fanelli F, Fava GA, Pasquali R. Psychological aspects of hyperandrogenic states in late adolescent and young women. *Clin Endocrinol (Oxf)*. 2015;83(6):872-878. https://doi.org/10.1111/cen.12783
9. Baker C, Wertheim EH. *Body Image: A Handbook of Theory, Research, and Clinical Practice*. New York: Guilford Press; 2002. edited byThomas F. Cash, Thomas Pruzinsky. 530 pages.
10. Hosseini SA, Padhy RK. Body Image Distortion. StatPearls [Internet]. 2022 Sep 5 [cited 2022 Dec 11]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK546582/
11. von Spreckelsen P, Glashouwer KA, Bennik EC, Wessel I, De Jong PJ. Negative body image: relationships with heightened disgust propensity, disgust sensitivity, and self-directed disgust. *PLoS One*. 2018;13(6):e0198532. https://doi.org/10.1371/journal.pone.0198532
12. Thannickal A, Brutocao C, Alsawas M, *et al.* Eating, sleeping and sexual function disorders in women with polycystic ovary syndrome (PCOS): a systematic review and meta-analysis. *Clin Endocrinol (Oxf)*. 2020;92(4):338-349. https://doi.org/10.1111/cen.14153
13. Bazarganipour F, Ziaei S, Montazeri A, Foroozanfard F, Kazemnejad A, Faghihzadeh S. Health-related quality of life in patients with polycystic ovary syndrome (PCOS): a model-based study of predictive factors. *J Sex Med*. 2014;11(4):1023-1032. https://doi.org/10.1111/jsm.12405
14. Wan X, Wang W, Liu J, Tong T. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. *BMC Med Res Methodol*. 2014;14(1):135. https://doi.org/10.1186/1471-2288-14-135
15. Lin L. Comparison of four heterogeneity measures for meta-analysis. *J Eval Clin Pract*. 2020;26(1):376-384. https://doi.org/10.1111/jep.13159
16. Himelein MJ, Thatcher SS. Depression and body image among women with polycystic ovary syndrome. *J Health Psychol*. 2006;11(4):613-625. https://doi.org/10.1177/1359105306065021
17. Deeks AA, Gibson-Helm ME, Paul E, Teede HJ. Is having polycystic ovary syndrome a predictor of poor psychological function including anxiety and depression? *Hum Reprod*. 2011;26(6):1399-1407. https://doi.org/10.1093/humrep/der071
18. Pastore LM, Patrie JT, Morris WL, Dalal P, Bray MJ. Depression symptoms and body dissatisfaction association among polycystic

ovary syndrome women. *J Psychosom Res*. 2011;71(4):270-276. https://doi.org/10.1016/j.jpsychores.2011.02.005
19. Morotti E, Persico N, Battaglia B, *et al*. Body imaging and sexual behavior in lean women with polycystic ovary syndrome. *J Sex Med*. 2013;10(11):2752-2760. https://doi.org/10.1111/jsm.12284
20. Karacan E, Caglar GS, Gürsoy AY, Yilmaz MB. Body satisfaction and eating attitudes among girls and young women with and without polycystic ovary syndrome. *J Pediatr Adolesc Gynecol*. 2014;27(2):72-77. https://doi.org/10.1016/j.jpag.2013.08.003
21. Annagür BB, Tazegül A, Akbaba N. Body image, self-esteem and depressive symptomatology in women with polycystic ovary syndrome. *Noro Psikiyatr Ars*. 2014;51(2):129-132. https://doi.org/10.4274/npa.y6778
22. Scaruffi E, Franzoi IG, Civilotti C, *et al*. Body image, personality profiles and alexithymia in patients with polycystic ovary syndrome (PCOS). *J Psychosom Obstet Gynaecol*. 2019;40(4):294-303. https://doi.org/10.1080/0167482X.2018.1530210
23. Azizi Kutenaee M, Amirjani S, Asemi Z, *et al*. The impact of depression, self-esteem, and body image on sleep quality in patients with PCOS: a cross-sectional study. *Sleep Breath*. 2020;24(3):1027-1034. https://doi.org/10.1007/s11325-019-01946-9
24. Caltabiano ML. Translational aspects of body image research for obesity-related quality of life and weight loss maintenance post-bariatric surgery. *Ann Transl Med*. 2020;8(S1):S2. https://doi.org/10.21037/atm.2019.09.63
25. Mendelson BK, Mendelson MJ, White DR. Body-esteem scale for adolescents and adults. *J Pers Assess*. 2001;76(1):90-106. https://doi.org/10.1207/S15327752JPA7601_6
26. Bazarganipour F, Ziaei S, Montazeri A, Foroozanfard F, Kazemnejad A, Faghihzadeh S. Body image satisfaction and self-esteem status among the patients with polycystic ovary syndrome. *Int J Reprod Biomed*. 2013;11(10):829-836.
27. Polivy J, Herman CP. Causes of eating disorders. *Annu Rev Psychol*. 2002;53(1):187-213. https://doi.org/10.1146/annurev.psych.53.100901.135103