REVIEW ARTICLE

Prevalence of Polycystic Ovarian Syndrome in Iranian Adolescents: A Systematic Review and Meta-analysis

Ashraf Ghiasi

Abstract

Objective: Polycystic ovarian syndrome (PCOS) is an endocrine disorder that frequently manifests during adolescence. The studies performed in Iran have reported a different prevalence of PCOS in adolescents. Therefore, the aim of this systematic review and meta-analysis study was to estimate the pooled prevalence of PCOS in Iranian adolescents.

Materials and methods: An electronic search was performed using Web of Science, PubMed, Scopus, Magiran, SID, and also search engine of Google Scholar from inception until November 2018 to identify published papers on the prevalence of PCOS in Iranian adolescents. Of 458 articles that were assessed for eligibility with the PRISMA statement, a total of 8 studies met inclusion criteria. Data were analyzed using Review Manager Software (RevMan v5.3).

Results: The included studies in the review involved 12,796 participants, with a minimum of 895 and a maximum of 3,190. Pooled estimates revealed that the prevalence of PCOS in Iranian adolescents according to the NIH criteria and Rotterdam criteria were 3% (95% CI: 2–4%), and 7% (95% CI: 6–8%) respectively.

Conclusion: Considering the significant effect of PCOS on fertility and public health of women, interventions for prevention, diagnosis, and management of this syndrome from adolescence are necessary.

Keywords: Adolescence, Polycystic ovarian syndrome, Systematic review.

Journal of South Asian Federation of Obstetrics and Gynaecology (2019): 10.5005/jp-journals-10006-1681

Introduction

Polycystic ovarian syndrome (PCOS) is one of the most common endocrine disorders in reproductive-age women with an estimated prevalence of 6–10%.[1,2] It is a heterogeneous condition that is characterized by increased androgen levels (i.e., acne, hirsutism, and alopecia) and features of anovulation (i.e., oligomenorrhea, amenorrhea, and unexplained infertility).[3,4] Polycystic ovarian syndrome is a disease that frequently manifests during adolescence, but an overlap between PCOS symptoms and normal pubertal changes, utilize adult diagnostic criteria making the diagnosis of this syndrome complicated in adolescent age-group.[5–7] Despite these difficulties, early diagnosis of PCOS in adolescence has undeniable importance, because this syndrome is a significant risk factor for infertility, obesity, dyslipidemia, diabetes mellitus (type II), cardiovascular disease, and endometrial hyperplasia later in life.[8,9] Indeed, early diagnosis of PCOS in adolescence is the first step for the prevention and treatment of future complications and morbidity associated with this syndrome.[10] Furthermore, awareness about the prevalence of PCOS in adolescents facilitates other related studies. Today, few cross-sectional studies have assessed the prevalence of PCOS in adolescents. In Iran, a number of studies have investigated the prevalence of PCOS in adolescent girls, but none has systematically summarized them. Hence, the present systematic review and meta-analysis study aim to estimate the pooled prevalence of PCOS among Iranian adolescents.

Materials and Methods

A systematic search was performed up to November 2018 in national electronic databases including the Scientific Information Database (www.SID.ir), Magiran (www.magiran.com), Barakat Knowledge Network System (http://health.barakatkns.com), and international electronic databases including Web of Science, PubMed, and Scopus to identify relevant studies published in Farsi (Persian) or English. Key search terms used were as follows: "prevalence", "Iran", "Iranian", "adolescent", "polycystic ovarian syndrome", "PCOS". Reference lists of the most relevant articles were also hand-searched to identify any pertinent papers (snowball method).

Eligibility Criteria

All cross-sectional studies addressing the prevalence of PCOS according to the National Institutes of Health Criteria (NIH, 1990) or the Rotterdam (2003) criteria among Iranian adolescents were considered for inclusion. However, studies combining the prevalence of PCOS in adolescents with other reproductive-age women were excluded due to the inability to separate the results related to the adolescents.

Study Selection

All articles retrieved from the systematic search were imported into Endnote X7 and duplicates were removed. Then, remained articles were screened and selected based on title, abstract, and full-text screening.

Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran

Corresponding Author: Ashraf Ghiasi, Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran, Phone: +98 23 32395054 , e-mail: a.ghiasi25@gmail.com

How to cite this article: Ghiasi A. Prevalence of Polycystic Ovarian Syndrome in Iranian Adolescents: A Systematic Review and Meta-analysis. J South Asian Feder Obst Gynae 2019;11(3):194–197.

Source of support: Shahroud University of Medical Sciences

Conflict of interest: None

Data Extraction

The following data were extracted from each study that met the criteria for inclusion in the review: article title, first author's name, year of publication, the age of participants, sample size, study location, sampling method, criteria used to diagnose PCOS, and prevalence rates.

Quality Assessment

The methodological quality of the included studies was rated by using the STROBE (strengthening the reporting of observational studies in epidemiology) statement.[11] This checklist consists of 22 items with a score range of 0–44. Total scores below 23 points were considered of "low quality", studies with total scores between 23 and 33 were considered of "moderate quality" and those with total scores of 34 or greater were deemed of "high quality".

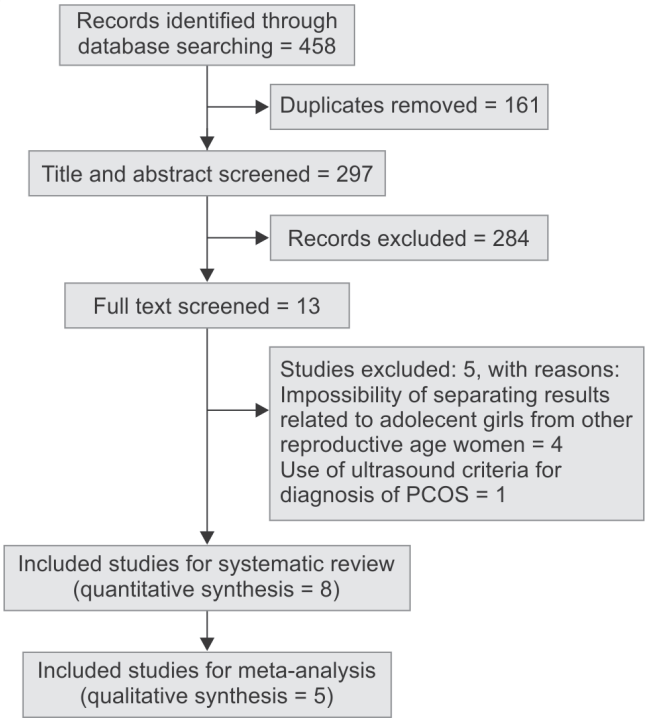
Statistical Analysis

The meta-analysis was performed with Review Manager, version 5.3.[12] The pooled estimates were calculated with random-effects model. In order to calculate the standard errors, the following formula was used: SEp = sqrt[$p(1 - p)/n$]. p is the proportion of successes in the sample and n is the number of observations in the sample.

Results

A total of 458 articles were retrieved on the initial search. After excluding 161 duplicates and 284 irrelevant articles, 13 full-text articles were retrieved, of which, 4 studies were excluded due to the impossibility of separating results related to adolescent girls from other reproductive-age women and 1 was excluded due to the use of ultrasound criteria for the diagnosis of PCOS. Finally, 8 studies (7 articles, 1 Master's thesis) were considered for the systematic review and 5 studies were eligible to be included in the meta-analysis (Flowchart 1).

Flowchart 1: PRISMA flow diagram of literature search and selection process



The included studies were conducted in Esfahan, Kerman, Zanjan, Tehran, Shiraz, Yazd, Rasht, and Babol.[13–20] The 8 studies selected for quantitative analysis consisted of 12,796 participants, with a range of between 895 and 3,190 per study.

NIH criteria in three studies[13,15,19] and Rotterdam criteria in five studies[14,16–18,20] were used to assess the prevalence rate of PCOS. The lowest (2.9%) and highest (13.4%) prevalence rates of PCOS were found in the studies performed by Rahmanpour et al. (Zanjan), and Naghash Hoseini (Kerman), respectively[15,14] (Table 1).

According to the STROBE checklist criteria, the eight included articles had moderate quality (Table 2).

The prevalence of PCOS using the NIH diagnostic criteria and after removal results of the study by Asgharnia et al.[19] due to large difference in the prevalence of PCOS in this study compared with other two studies, was estimated to be 3% (95% confidence interval: 2–4) (Fig. 1).

The prevalence of PCOS using the Rotterdam diagnostic criteria and after removal results of studies by Naghash Hoseini,[14] and Salehpour et al.,[16] due to a large difference in the prevalence of PCOS in these studies compared with the other relevant studies, was estimated to be 7% (95% confidence interval: 6–8) (Fig. 2).

Discussion

This systematic review and meta-analysis study was conducted to estimate the prevalence of PCOS exclusively in Iranian adolescents. According to the National Institute of Health (NIH) definition, clinical and/or biochemical hyperandrogenism (hyperandrogenemia), and clinical manifestations of ovulation disorders as oligomenorrhea, amenorrhea, or infertility in the absence of non-classical congenital adrenal hyperplasia ovulation disorders are diagnostic criteria for PCOS.[21] In the meta-analysis, the prevalence of PCOS according to the NIH criteria was found to be 3% (95% CI: 2–4%). The Rotterdam criteria need the presence of at least 2 of the following 3 criteria: hyperandrogenism, oligo/or anovulation, or presence of polycystic ovaries on pelvic ultrasound.[24] In the meta-analysis, the prevalence of PCOS according to the Rotterdam criteria was estimated to be 7% (95% CI: 7–8%). Hence, the prevalence of PCOS when diagnosed by the Rotterdam criteria is estimated to be approximately 2.3 times greater than the prevalence of this disorder when diagnosed by the NIH criteria. In a study by Jalilian et al. that assessed prevalence of PCOS and its related complications in Iranian women via meta-analysis method, the prevalence of this syndrome according to NIH criteria was 6.8% (95% CI: 5.8–11.4%), and according to the Rotterdam criteria was 19.5% (95% CI: 14.8–24.2%).[23] In their meta-analysis study, the prevalence of PCOS according to Rotterdam criteria was estimated to be approximately 2.8 times greater than the prevalence of this disorder according to NIH criteria, which is in agreement with results of our study. In a study conducted on Indian adolescents, the prevalence rate of PCOS according to Rotterdam criteria was 9.1%.[24] In a study by Kaewnin et al., PCOS prevalence in Thai University adolescents using the Rotterdam criteria was estimated to be 5.29%.[25] In a study conducted by Christensen et al., the prevalence PCOS in adolescents aged 15–19 years according to the NIH criteria was 0.56%.[26] The present study has some limitations. The most recent study on the prevalence of polycystic ovarian syndrome in Iranian adolescent girls was an article published in 2014; hence, due to limited number of studies on Iranian adolescent girls, further research in this area is needed.

In conclusion, although diagnosis of PCOS in adolescence is a challenge, due to the significant effect of PCOS on long-term health

Table 1: Characteristics of included studies

First author—publication year	*Study location*	*Sampling procedure*	*Sample size*	*Age ranges*	*Diagnosis criteria*	*Prevalence*	*Confidence interval*
Hashemipour et al. (2004)[13]	Esfahan	Multi stage random sampling	1,000	14–18	NIH	3	1.9–4.1
Naghash Hoseini (2008)[14]	Kerman		1,000	15–18	RTM	13.4	11.3–15.5
Rahmanpour et al. (2009)[15]	Zanjan	Systematic randomization	1,882	14–18	NIH*	2.9	2.2–3.6
Salehpour et al. (2010)[16]	Tehran	Multi stage random sampling	1,430	15–18	RTM	3.42	2.5–4.4
Nadri et al. (2010)[17]	Shiraz	Cluster sampling	3,190	14–18	RTM**	6.97	5.7–8.3
Noorbala and Kefaie (2010)[18]	Yazd	Cluster sampling	895	15–19	RTM	6.5	5–8.2
Asgharnia et al. (2011)[19]	Rasht	Multi-stage cluster sampling	1,850	17–18	NIH	11.3	9.9–12.8
Esmaeilzadeh et al. (2014)[20]	Babol	Cluster sampling	1,549	16–20	RTM	8.3	4–12

Appendix: NIH, National Institutes of Health Criteria; RTM, Rotterdam criteria

Table 2: Quality assessment of studies according to STROBE criteria

		STROBE items																					
S. no.	*Study details*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*Total score*
1	Hashemipour et al.[13]	□	□	□	□	□	□	⊖	□	⊖	⊖	⊖	⊖	□	◇	□	⊖	⊖	□	⊖	◇	◇	⊖	23
2	Naghash Hoseini[14]	□	□	□	□	□	□	⊖	□	⊖	◇	⊖	□	□	□	□	⊖	⊖	◇	□	◇	◇	□	30
3	Rahmanpour et al.[15]	□	□	□	□	□	□	⊖	□	⊖	◇	⊖	⊖	□	□	□	◇	⊖	□	⊖	◇	◇	□	28
4	Salehpour et al.[16]	□	□	□	□	□	□	⊖	□	⊖	□	⊖	□	□	□	□	⊖	⊖	□	⊖	◇	◇	□	30
5	Nadri et al.[17]	□	□	□	□	□	□	⊖	□	⊖	◇	⊖	□	□	◇	□	⊖	⊖	□	◇	◇	◇	□	29
6	Noorbala and Kefaie[18]	□	□	□	□	□	□	⊖	□	⊖	□	⊖	□	□	⊖	□	◇	⊖	□	⊖	◇	◇	⊖	27
7	Asgharnia et al.[19]	□	□	□	◇	□	□	⊖	◇	⊖	⊖	⊖	⊖	□	◇	□	⊖	⊖	□	⊖	◇	◇	□	23
8	Esmaeilzadeh et al.[20]	□	□	□	□	□	□	⊖	□	⊖	□	⊖	□	□	□	□	◇	⊖	□	⊖	◇	◇	⊖	29

1, title, and abstract; 2, background/rationale; 3, objectives; 4, study design; 5, setting; 6, participants; 7, variables; 8, data sources/ measurement; 9, bias; 10, study size; 11, quantitative variables; 12, statistical methods; 13, participants (groups); 14, descriptive data; 15, outcome data; 16, main results; 17, other analyses, discussion; 18, key results; 19, limitations; 20, interpretation; 21, generalizability, other information; 22, funding
2 (□), good description; 1 (◇), partial description; 0 (⊖), no description

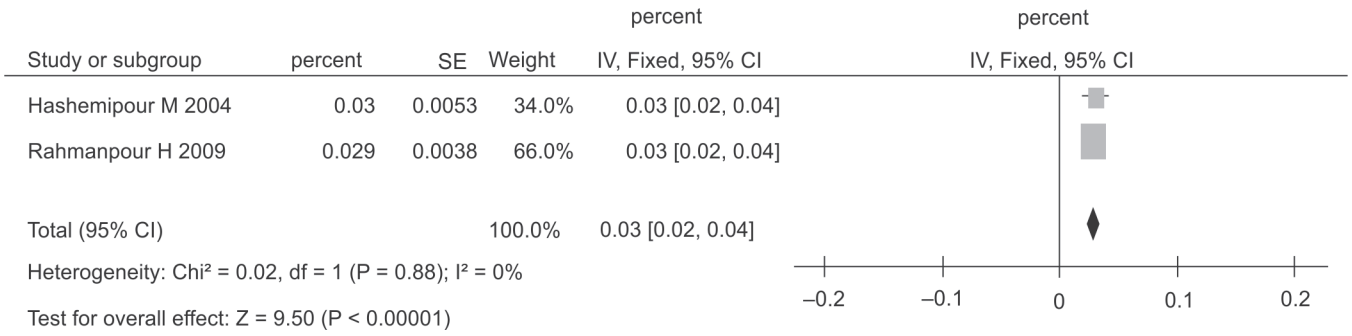


Fig. 1: Prevalence of polycystic ovarian syndrome according to the NIH criteria

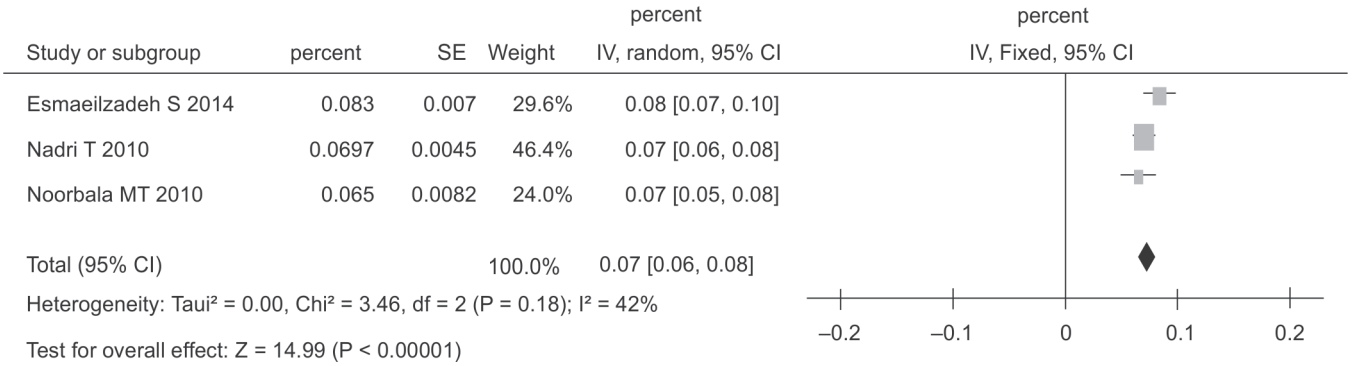


Fig. 2: Prevalence of polycystic ovarian syndrome according to the Rotterdam criteria

consequences, it is necessary to detect and manage adolescents with this syndrome.

Acknowledgments

The study was financially supported by Shahroud University of Medical Sciences (grant number 97141). The author would like to thank the student research committee at Shahroud University of Medical Sciences.

References

1. Brady C, Mousa SS, et al. Polycystic ovary syndrome and its impact on women's quality of life: More than just an endocrine disorder. Drug Healthc Patient Saf 2009;1:9–15. DOI: 10.2147/DHPS.S4388.
2. McCartney CR, Marshall JC. Clinical practice. Polycystic ovary syndrome. N Engl J Med 2016;375(1):54–64. DOI: 10.1056/NEJMcp1514916.
3. Mohammad MB, Majdi Seghinsara A. Polycystic Ovary Syndrome (PCOS), Diagnostic Criteria, and AMH. Asian Pac J Cancer Prev 2017;18(1):17–21. DOI: 10.22034/APJCP.2017.18.1.17.
4. Sermons SM, Pate KA. Epidemiology, diagnosis, and management of polycystic ovary syndrome. Clin Epidemiol 2013;6:1–13. DOI: 10.2147/CLEP.S37559.
5. Roe AH, Dokras A. The diagnosis of polycystic ovary syndrome in adolescents. Rev Obstet Gynecol 2011;4(2):45–51.
6. Singh A, Vijaya K, et al. Prevalence of polycystic ovarian syndrome among adolescent girls: a prospective study. Int J Reprod Contracept Obstet Gynecol 2018;7(11):4375–4378. DOI: 10.18203/2320-1770.ijrcog20184230.
7. Kamboj MK, Bonny AE. Polycystic ovary syndrome in adolescence: diagnostic and therapeutic strategies. Transl Pediatr 2017;6(4):248–255. DOI: 10.21037/tp.2017.09.11.
8. American Association of Clinical Endocrinologists Polycystic Ovary Syndrome Writing Committee. American Association of Clinical Endocrinologists Position Statement on Metabolic and Cardiovascular Consequences of Polycystic Ovary Syndrome. Endocr Pract 2005;11(2):126–134.
9. Moran LJ, Misso ML, et al. Impaired glucose tolerance, type 2 diabetes and metabolic syndrome in polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod Update 2010;16(4):347–363. DOI: 10.1093/humupd/dmq001.
10. Buggs C, Rosenfield RL. Polycystic ovary syndrome in adolescence. Endocrinol Metab Clin North Am 2005;34(3):677–705. DOI: 10.1016/j.ecl.2005.04.005.
11. Vandenbroucke JP, von Elm E, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Epidemiology 2007;18(6):805–835. DOI: 10.1097/EDE.0b013e3181577511.
12. Review Manager (RevMan) [Computer program]. Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.
13. Hashemipour M, Faghihimani S, et al. Prevalence of Polycystic Ovary Syndrome in Girls Aged 14–18 Years in Esfahan, Iran. Horm Res 2004;62(6):278–282.
14. Naghash Hoseini SH. The prevalence of PCOS in Kerman final high school 1000 girls 18–15 years old. School of Medicine, Kerman University of Medical Sciences and Health Services; 2008;1(4):112–116.
15. Rahmanpour H, Heidari R, et al. The prevalence of polycystic ovarian syndrome in 14–18 year old girls of Zanjan High Schools, 2008. J Zanjan Univ Med Sci 2009;67(17):79–87.
16. Salehpour S, Esmaeilnia Shirvani H, et al. Evaluation of the Prevalence of Polycystic Ovarian Syndrome among Adolescent (15–18 Years Old) Girls in Tehran during 2005–2006. Int J Fertil Steril 2010;4(3):122–127.
17. Nadri T, Akbarzadeh M, et al. The prevalence of polycystic ovary syndrome phenotypes in girls' high school (2009). J Qazvin Univ Med Sci 2010;4(61):61–67.
18. Noorbala MT, Kefaie P. The Prevalence of Hirsutism in Adolescent Girls in Yazd, Central Iran. Iran Red Crescent Med J 2010;12(2):111–117.
19. Asgharnia M, Mirblook F, et al. The Prevalence of Polycystic Ovary Syndrome (PCOS) in High School Students in Rasht in 2009 According to NIH Criteria. Int J Fertil Steril 2011;4(4):156–159.
20. Esmaeilzadeh S, Delavar MA, et al. Polycystic ovary syndrome in Iranian adolescents. Int J Adolesc Med Health 2014;26(4):559–565. DOI: 10.1515/ijamh-2013-0335.
21. Zawadski JK, Dunaif A. Diagnostic criteria for polycystic ovary syndrome: towards a rational approach. Dunaif A, Givens JR, et al. Polycystic Ovary Syndrome. Boston: Blackwell Scientific Publications;1992. pp. 377–384.
22. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril 2004;81:19–25. DOI: 10.1016/j.fertnstert.2003.10.004.
23. Jalilian A, Kiani F, et al. Prevalence of polycystic ovary syndrome and its associated complications in Iranian women: a meta-analysis. Iran J Reprod Med 2015;13(10):591–604.
24. Nidhi R, Padmalatha V, et al. Prevalence of polycystic ovarian syndrome in Indian adolescents. J Pediatr Adolesc Gynecol 2011;24(4):223–227. DOI: 10.1016/j.jpag.2011.03.002.
25. Kaewnin J, Vallibhakara O, et al. Prevalence of polycystic ovary syndrome in Thai University adolescents. Gynecol Endocrinol 2018;34(6):476–480. DOI: 10.1080/09513590.2017.1409716.
26. Christensen SB, Black MH, et al. Prevalence of polycystic ovary syndrome in adolescents. Fertil Steril 2013;100(2):470–477. DOI: 10.1016/j.fertnstert.2013.04.001.