

## INPLASY

## Association of polycystic ovary syndrome with metabolic syndrome and its component in adolescents: A systematic review and meta-analysis

INPLASY2025100048

doi: 10.37766/inplasy2025.10.0048

Received: 14 October 2025

Published: 14 October 2025

Tu, Y; Chen, Y; Zhang, J; Bao, J; Lou, J.

**Corresponding author:**

Jianbo Lou

2009020290@alu.zcmu.edu.cn

**Author Affiliation:**

Shaoxing Maternity and Child Health Care Hospital.

**ADMINISTRATIVE INFORMATION****Support** - None.**Review Stage at time of this submission** - Data analysis.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2025100048**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 October 2025 and was last updated on 14 October 2025.**INTRODUCTION**

**Review question / Objective** This study aims to perform a systematic review and meta-analysis to clarify the risk of MetS and its individual metabolic abnormalities in adolescents with PCOS.

**Condition being studied** Polycystic ovary syndrome (PCOS) is a prevalent endocrine and metabolic disorder among adolescent females, while metabolic syndrome (MetS) represents a major precursor to cardiovascular disease and type 2 diabetes. However, the strength of the association between PCOS and MetS, as well as its core components, in adolescents remains unclear.

**METHODS****Search strategy**

PubMed:

#1 (polycystic ovary syndrome[MeSH Terms]) OR (polycystic ovar\* syndrome[Title/Abstract]) OR

(PCOS[Title/Abstract]) OR (Stein-Leventhal syndrome[Title/Abstract])

#2 (adolescent[MeSH Terms]) OR (adolescen\*[Title/Abstract]) OR (teen\*[Title/Abstract]) OR (girl\*[Title/Abstract]) OR (young women[Title/Abstract]) OR (pediatric[Title/Abstract]) OR (paediatric[Title/Abstract])

#3 (metabolic syndrome[MeSH Terms]) OR (metabolic syndrome[Title/Abstract]) OR (syndrome X[Title/Abstract]) OR (dysmetabolic syndrome[Title/Abstract])

#4 (insulin resistance[MeSH Terms]) OR (insulin resistanc\*[Title/Abstract]) OR (hyperinsulinism[Title/Abstract])

#5 (obesity[MeSH Terms]) OR (obes\*[Title/Abstract]) OR (overweight[Title/Abstract]) OR (body mass index[Title/Abstract]) OR (BMI[Title/Abstract]) OR (adipos\*[Title/Abstract])

#6 (dyslipidemias[MeSH Terms]) OR (dyslipidemia[Title/Abstract]) OR (hyperlipidemia[Title/Abstract]) OR (hypertriglyceridemia[Title/Abstract]) OR (lipid\*[Title/Abstract]) OR (cholesterol[Title/Abstract])

Abstract]) OR (triglyceride\*[Title/Abstract]) OR (HDL[Title/Abstract]) OR (LDL[Title/Abstract])  
 #7 (glucose intolerance[MeSH Terms]) OR (glucose intoleran\*[Title/Abstract]) OR (impaired fasting glucose[Title/Abstract]) OR (impaired glucose tolerance[Title/Abstract]) OR (hyperglycemia[Title/Abstract])  
 #8 (hypertension[MeSH Terms]) OR (hypertension[Title/Abstract]) OR (high blood pressure[Title/Abstract]) OR (blood pressure[Title/Abstract])  
 #9 #3 OR #4 OR #5 OR #6 OR #7 OR #8  
 #10 #1 AND #2 AND #9

#### EmBase:

#1 exp polycystic ovary syndrome/  
 #2 (polycystic ovar\* syndrome or PCOS or Stein-Leventhal syndrome).ti,ab,kf.  
 #3 1 or 2  
 #4 exp adolescent/  
 #5 (adolescen\* or teen\* or girl\* or "young wom?n" or pediatric or paediatric).ti,ab,kf.  
 #6 4 or 5  
 #7 exp metabolic syndrome/  
 #8 (metabolic syndrome or syndrome X or dysmetabolic syndrome).ti,ab,kf.  
 #9 exp insulin resistance/  
 #10 (insulin resistanc\* or insulin sensitiv\* or hyperinsulin?emi\*).ti,ab,kf.  
 #11 exp obesity/  
 #12 (obes\* or overweight or "body mass index" or BMI or adipos\*).ti,ab,kf.  
 #13 exp dyslipidemia/  
 #14 (dyslipid?emi\* or hyperlipid?emi\* or hypertriglycerid?emi\* or lipid\* or cholesterol or triglyceride\* or HDL or LDL or "high density lipoprotein" or "low density lipoprotein").ti,ab,kf.  
 #15 exp glucose intolerance/ or exp impaired glucose tolerance/ or exp hyperglycemia/  
 #16 ("glucose intoleran\*" or "impaired fasting glucose" or "impaired glucose tolerance" or hyperglyc?emi\*).ti,ab,kf.  
 #17 exp hypertension/  
 #18 (hypertension or "high blood pressure" or "blood pressure").ti,ab,kf.  
 #19 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18  
 #20 3 and 6 and 19

#### Cochrane library:

#1 (polycystic ovar\* syndrome OR PCOS) AND (adolescen\* OR teen\* OR girl\* OR pediatric)  
 #2 (metabolic syndrome OR "insulin resistanc\*" OR obes\* OR dyslipidemia OR hypertensi\*)  
 #3 #1 AND #2

#### Web of Science:

#1 TS=((polycystic ovar\* syndrome) OR PCOS OR "Stein-Leventhal syndrome")  
 #2 TS=((adolescen\*) OR teen\* OR girl\* OR "young women" OR pediatric OR paediatric)  
 #3 TS=((metabolic syndrome) OR "syndrome X" OR "insulin resistanc\*" OR obes\* OR overweight OR BMI OR dyslipidemia OR cholesterol OR triglyceride\* OR "glucose intoleran\*" OR hypertension)  
 #4 #1 AND #2 AND #3.

**Participant or population** Female adolescents aged 10-20 years, with the PCOS group diagnosed according to internationally recognized criteria such as the Rotterdam Criteria, NIH criteria, ESHRE/ASRM guidelines, the 2023 International Evidence-based Guideline, or AE-PCOS Society Criteria for Adolescents.

**Intervention** PCOS group.

**Comparator** Non-PCOS group.

**Study designs to be included** Published observational studies, including cross-sectional, case-control, or cohort designs.

**Eligibility criteria** Studies were included if they met the following criteria: (1) Population: female adolescents aged 10-20 years, with the PCOS group diagnosed according to internationally recognized criteria such as the Rotterdam Criteria, NIH criteria, ESHRE/ASRM guidelines, the 2023 International Evidence-based Guideline, or AE-PCOS Society Criteria for Adolescents; (2) Study design: published observational studies, including cross-sectional, case-control, or cohort designs; and (3) Outcomes: the primary outcome was the incidence of MetS; secondary outcomes included incidence or association measures for individual MetS components.

**Information sources** PubMed, Embase, the Cochrane Library, and Web of Science.

**Main outcome(s)** the primary outcome was the incidence of MetS.

**Additional outcome(s)** Incidence or association measures for individual MetS components.

**Quality assessment / Risk of bias analysis** The quality of included studies was assessed using the Newcastle-Ottawa Scale (NOS) across three domains: "selection of study subjects" (4 items), "comparability between groups" (2 items), and "outcome/exposure measurement" (3 items).

---

**Strategy of data synthesis** Given that the included studies were primarily cross-sectional and case-control in design, odds ratios (ORs) with 95% confidence intervals (CIs) were used to express the association between PCOS and MetS. Weighted mean differences (WMDs) with 95% CIs were applied for comparisons of continuous variables between groups. All meta-analyses were performed using random-effects models to account for potential heterogeneity among studies.

**Subgroup analysis** Subgroup analyses were performed based on study design, geographical region, PCOS diagnostic criteria, MetS diagnostic criteria, and study quality. Differences in association strength across subgroups were tested using an interaction t-test, which assumes normal distribution of the data.

**Sensitivity analysis** Sensitivity analysis was conducted by sequentially excluding each study and re-pooling the effect sizes to evaluate the stability of the results.

**Language restriction** No restriction.

**Country(ies) involved** China.

**Keywords** polycystic ovary syndrome; metabolic syndrome; adolescents; systematic review; meta-analysis.

#### **Contributions of each author**

Author 1 - Yuhui Tu.

Author 2 - Yafei Chen.

Author 3 - Jianwei Zhang.

Author 4 - Jiaping Bao.

Author 5 - Jianbo Lou.