

**PUBLISHED ABSTRACT**

# Prevalence and Risk Factors of Polycystic Ovarian Syndrome Among an Ethnically Diverse Overweight/Obese Adolescent Population

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## Background

More remains to be known about polycystic ovary syndrome (PCOS) among overweight/obese adolescents across different ethnicity especially in regards to mental illness as an associated comorbidity.

## Hypothesis/Aim

To determine the prevalence of PCOS among overweight and obese adolescents, to further evaluate known risk factors for PCOS in a diverse population, and to discern cardiovascular risk and mental health comorbidity.

## Methods

Electronic medical records of patients at an Adolescent Clinic between April 1, 2016 and July 30, 2018 were filtered using the following: obese, overweight and BMI  $\geq 85\%$ . Charts were reviewed to identify the presence of PCOS using NIH criteria, race/ethnicity, and known risk factors for PCOS (lipid, BMI, HA1c, BP) and mental health conditions associated with PCOS (anxiety/depression and self-harm/suicidal ideation).

## Results

Of the 451 charts reviewed, 447 were analyzed. Of those, 47% of adolescents were overweight, 53% were obese and 10.5% were diagnosed with PCOS. Ages ranged from 14 to 22 years with a median of 17 years. Patients were predominantly Hispanic (76.1%), and the majority of non-Hispanic patients were from South Asia (Pakistan, Bangladesh, and India). Patients with PCOS were more likely to be hyperlipidemic (19% vs 9.9%,  $p = 0.04$ ) and obese (67.4% vs 50.9%) than those without PCOS and more likely to have acanthosis (68.9% vs 28.2%). Interestingly, PCOS was not more common among the Hispanic population – 57.8% of Hispanic ethnicity with PCOS versus 77.9% of non-Hispanics. Although we were able to identify a significant percentage of our population with depression and anxiety, there was no difference in the prevalence of depression and anxiety with or without PCOS (37% vs 33%, respectively,  $p = 0.590$ ). Reporting of self-harm and suicidal ideation were comparable in those with and without PCOS (17% vs 17%,  $p = 0.96$ ). In a logistic regression model, after adjusting for all demographics and clinical features of interest, ethnicity, acanthosis and BMI were all significant risk factors for PCOS.

## Conclusion

Patients with PCOS are more likely to be obese, have hyperlipidemia, have a diagnosis of acanthosis and be of Non-Hispanic ethnicity. However, there was no difference in the prevalence of depression/anxiety and self-harm/suicidal ideation among adolescents with or without PCOS.

**Table 1:** Demographics and Clinical Features of Obese and Overweight Adolescents.

	<b>Overweight and Obese Adolescents (N = 447)</b>	
	<b>No. Observed</b>	<b>n (%)</b>
<b>PCOS</b>	438	46 (10.5)
<b>Ethnicity (Hispanic)</b>	444	338 (76.1)
<b>Elevated Lipids</b>	439	49 (11.2)
<b>Acanthosis</b>	440	141 (32.0)
<b>Hemoglobin A1c</b>	386	
Normal		328 (85.0)
Elevated (Pre-DM)		51 (13.2)
Diabetes Mellitus		7 (1.8)
<b>Weight Status<sup>a</sup></b>	445	
Overweight		209 (47.0)
Obese		236 (53.0)
<b>Blood Pressure</b>	443	
Normal		390 (88.0)
Elevated BP		48 (10.8)
Hypertension		5 (1.1)
<b>Depression and/or Anxiety</b>	445	148 (33.3)
<b>Self-Harm and/or Suicidality</b>	446	77 (17.3)

<sup>a</sup>Average ( $\pm$ SD) for BMI was  $30.1 \pm 4.8$ ; Median [IQR] for BMI was 29.1 [26.9, 32.7].

**Table 2:** Demographics and Clinical Features of Obese and Overweight Adolescents Stratified by PCOS status.

	<b>No PCOS (N = 392)</b>		<b>PCOS (N = 46)</b>		<b>p-value</b>
	<b>No. Observed</b>	<b>n (%)</b>	<b>No. Observed</b>	<b>n (%)</b>	
<b>Ethnicity</b>	390		45		0.003
Hispanic		304 (77.9)		26 (57.8)	
Non-Hispanic		85 (21.8)		19 (42.2)	
<b>Elevated Lipids</b>	384	38 (9.9)	46	9 (19.6)	0.05
<b>Acanthosis</b>	387	109 (28.2)	45	31 (68.9)	<0.001
<b>Hemoglobin A1c</b>	337		42		0.02
Normal		291 (86.4)		31 (73.8)	
Elevated (Pre-DM)		39 (11.6)		11 (26.2)	
Diabetes Mellitus		7 (2.1)		0 (0.0)	
<b>Weight Status<sup>ab</sup></b>	391		46		0.03
Overweight		192 (49.1)		15 (32.6)	
Obese		199 (50.9)		31 (67.4)	
<b>Blood Pressure</b>	389		46		0.70
Normal		343 (88.2)		39 (84.8)	
Elevated BP		42 (10.8)		6 (13.0)	
Hypertension		4 (1.0)		1 (2.2)	
<b>Depression and/or Anxiety</b>	391	129 (33.0)	46	17 (37.0)	0.59
<b>Self-Harm and/or Suicidality</b>	391	67 (17.1)	46	8 (17.4)	0.97

<sup>a</sup>Average ( $\pm$ SD) for BMI was  $29.8 \pm 4.4$  and  $33.3 \pm 6.6$  in the no PCOS and PCOS group, respectively (t-test p-value < 0.001).

<sup>b</sup>Median [IQR] for BMI was 29.0 [26.7, 32.2] and 32.7 [28.6, 36.4] in the no PCOS and PCOS group, respectively (Wilcoxon rank-sum test p-value < 0.001).

**Table 3:** Logistic Regression Model Results for PCOS (Yes v. No).

Clinical Features	OR (95% CI)	p-value
<b>Ethnicity<sup>a</sup> (Hispanic)</b>	0.31 (0.15, 0.66)	0.002
<b>Elevated Lipids</b>	1.33 (0.50, 3.54)	0.57
<b>Acanthosis</b>	2.84 (1.28, 6.29)	0.01
<b>Hemoglobin A1c<sup>b</sup> (Pre-DM/DM)</b>	1.49 (0.64, 3.47)	0.35
<b>BMI</b>	1.10 (1.02, 1.19)	0.01
<b>Blood Pressure<sup>c</sup></b>		
Elevated BP	0.33 (0.10, 1.15)	0.08
Hypertension	0.38 (0.03, 5.18)	0.47
<b>Depression and/or Anxiety</b>	1.79 (0.79, 4.06)	0.16
<b>Self-Harm and/or Suicidality</b>	0.86 (0.32, 2.31)	0.76

<sup>a</sup>Reference set to “Non-Hispanic”.

<sup>b</sup>Reference set to “Normal”; note that Pre-DM and DM were combined due to the lack of DM cases in the PCOS group.

<sup>c</sup>Reference set to “Normal”.

**Table 4:** PCOS, Metabolic Abnormalities, Psychiatric Diagnosis Stratified by Ethnicity Status.

	Hispanics	Non Hispanics	p-value
	n (%)	n (%)	
<b>PCOS</b>	26 (7.8)	19 (18.2)	0.003
<b>Obesity</b>	18 (69.2)	12 (63.2)	0.670
<b>Elevated Lipids</b>	7 (26.9)	2 (10.5)	0.264
<b>Acanthosis Nigricans</b>	14 (56.0)	16 (84.2)	0.05
<b>Depression and/or Anxiety</b>	11 (42.3)	6 (31.6)	0.543
<b>Self-Harm and/or Suicidality</b>	6 (23.1)	2 (10.5)	0.435

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