



# Proceeding ICoHPS 2021

International Conference on Health Polytechnic Ministry of Health Surabaya

## Poltekkes Kemenkes Surabaya

Health Polytechnic of the Ministry of Health Surabaya - Indonesia

Surabaya, 6 - 7 October 2021



# PROCEEDING

## International Conference on Health Polytechnic Ministry of Health Surabaya Surabaya, 6-7 October 2021

### Editor:

ICoNPH

### Manager

Yohanes Kambaru Windy, SPd M.Kes MPH

### Editor in Chief :

Dr. Padoli, SKp, M.Kes

### Editor :

1. Dr. Supriyanto, SKp, M.Kes
2. Dr. Dhiana Setyorini, M.Kep.Sp.Mat
3. Minarti, M.Kep.Sp.Kom
4. Adin Mu'afiro, SST, M.Kes
5. Hepta Nur Anugraheni, S.Kep.Ns, M.Kep
6. Kusmini Suprihatin, SKp, M.Kep.Sp.A
7. Ach. Arfan Adinata, S,Kep,Ns., M.Kep

### ICoMid

### Manager:

Dr. Heru SWN, S.Kep., MM. Kes

### Editor:

1. Evi Pratami, SST., M. Keb
2. Kharisma Kusumaningtyas, SSiT., M. Keb
3. Titi Maharrani, SST., M. Keb
4. Suryaningsih, SSiT., M. Keb





# Proceeding International Conference on Health Polytechnic Ministry of Health Surabaya

ISBN: 978-623-97447-4-8

Copyright © 2021

The Proceeding of International Conference aim to disseminate ideas for information and discussion. Comments or arguments for improvement of their presentation are welcome. The Views expressed in the papers are those of the authors. Article can be used, modified, and redistributed freely for non-commercial purposes (non-profit), provided this does not remove or change the attributes of the writer, not allowed to rewrite unless obtain prior permission from the author.

## Reviewer

### ICoNPH

Dr. Anita Joelianina, S.Kep.,Ns., M.Kes.  
Dr. Jujuk Proboningsih, SKp., M.KES.  
Dr. Moch. Bahruddin, M.Kep.,Sp. KMB  
Nikmatul Fadila, M.Kep.  
Hasyim Asyari, S.Kep.,NS., M.Ked.  
Diyah Wijayanti, M.Kep.  
Inge Dhamanti, SKM., MPH., Ph.D

### ICoMid

Teta Puji Rahayu, SST., M. Keb  
Dwi Wahyu Wulan S, SST., M. Keb  
Queen Khoirun Nisa Mairo, SST., M. Keb  
Dwi Purwanti S.Kp., M. Kes  
Deasy Irawati, SST., M. Keb  
Esyuananik, SST., M. Keb  
Uswatun Khasanah, SST., M. Keb  
Ayesha Hendriana Ngestiningrum, SST., M. Keb  
Evi Yunita Nugrahini, SST., M. Keb  
Astuti Setiyani, SST., M. Kes

### ICoMLT

Dr. Anik Handayani, M.Kes  
Evy Diah Woelansari, S.Si.,M.Kes  
Ayu Puspitasari, ST.,M.Si  
Christ Kartika Rahayuningsih, ST., M.Si

### ICoEH

Dr.Aris Santjaka, SKM.,M.Kes  
Dr.Rico Januar Siitorus ,SKM.,M.Kes  
Irwan Sulistio,SKM.M,Kes  
Aries Prasetyo,SKM.MPH  
Narwati,SSi.,M.Kes  
Pratiwi Hermiyanti,SST.,M.KL  
Marlik,S.Si., M.S  
Suprijandani,SKM, MSc.PH  
Demes Nurmayanti,ST,M.Kes

### ICoN

Dr. Aripin Ahmad, S.Si.T, M.Kes  
Agus Hendra Al Rahmad, SKM, MPH  
Dr. Made Darawati, STP, M.Sc.  
Dr. Ir. Juliana Christyaningsih, M.Kes  
Taufiqurrahman, S.K.M., M.P.H  
Annas Buanasita, SKM., M. Gizi

### ICoDOH

Dr.Bejo Santoso.S.Si.T.,M.Kes  
Zaeni Dahlan,S.Si.T.,M.Ph

Published by Health Polytechnic Ministry of Health Surabaya Indonesia  
Jl. Pucang Jajar Tengah No. 56 Surabaya 60282, Indonesia  
Phone : +62-31-5027058  
[www.poltekkesdepkes-sby.ac.id](http://www.poltekkesdepkes-sby.ac.id)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the copyright holder for which application should be addressed in the first instance to the publisher.



## The analysis of the causes of PCOS (*Polycystic Ovary Syndrome*)

---

Faradila Elmi Sofiana<sup>1(CA)</sup>, Yuni Ginarsih<sup>2</sup>, Titi Maharrani<sup>2</sup>

<sup>1(CA)</sup>Department of Midwifery, Health Polytechnic Ministry of Health, Surabaya; [faradila.elmi77@gmail.com](mailto:faradila.elmi77@gmail.com)  
(Corresponding Author)

<sup>2</sup>Department of Midwifery, Health Polytechnic Ministry of Health, Surabaya; [yunig@poltekkesdepkes-sby.ac.id](mailto:yunig@poltekkesdepkes-sby.ac.id)

<sup>3</sup>Department of Midwifery, Health Polytechnic Ministry of Health, Surabaya; [titimaharrani@gmail.com](mailto:titimaharrani@gmail.com)

---

### ABSTRACT

**Introduction.** PCOS (Polycystic Ovary Syndrome) is an ovulation disorder that causes infertility in women of childbearing age. As many as 4-18% of them have PCOS which causes 5-10% of women of childbearing age to become infertile. The purpose of this literature review is to explain and analyze the factors that cause the incidence of PCOS based on empirical studies of the last five years. **Method.** This type of research is a literature review with a research design using the PRISMA approach. The search was conducted in five electronic databases (Google Scholar, PubMed, Willey, Cochrane, Elsevier and ProQuest) published in the last five years, from 2015- 2020 published in English and according to keywords. In the journal search, 4496 articles were found, then duplication was selected, the inclusion and exclusion criteria were eligible, and the full text was left, leaving 12 articles. **Result.** General characteristics in study selection were obtained mostly from PubMed (75%). The study design was almost partially Cross-Sectional (41.6%). Most (33.3%) years of publication were 2016 and 2018 and most (100%) journals were English. While the factors causing PCOS such as hyperinsulinemia/insulin resistance (n=7), obesity (n=5), and hyperandrogenism factors (n=3). **Analysis.** The results of this review state that hyperinsulinemia/insulin resistance, obesity, and hyperandrogenism can cause the incidence of PCOS. **Discussion.** Further research is needed on the factors that influence the incidence of PCOS.

**Keywords:** factors, PCOS, polycystic ovary syndrome.

---

### INTRODUCTION

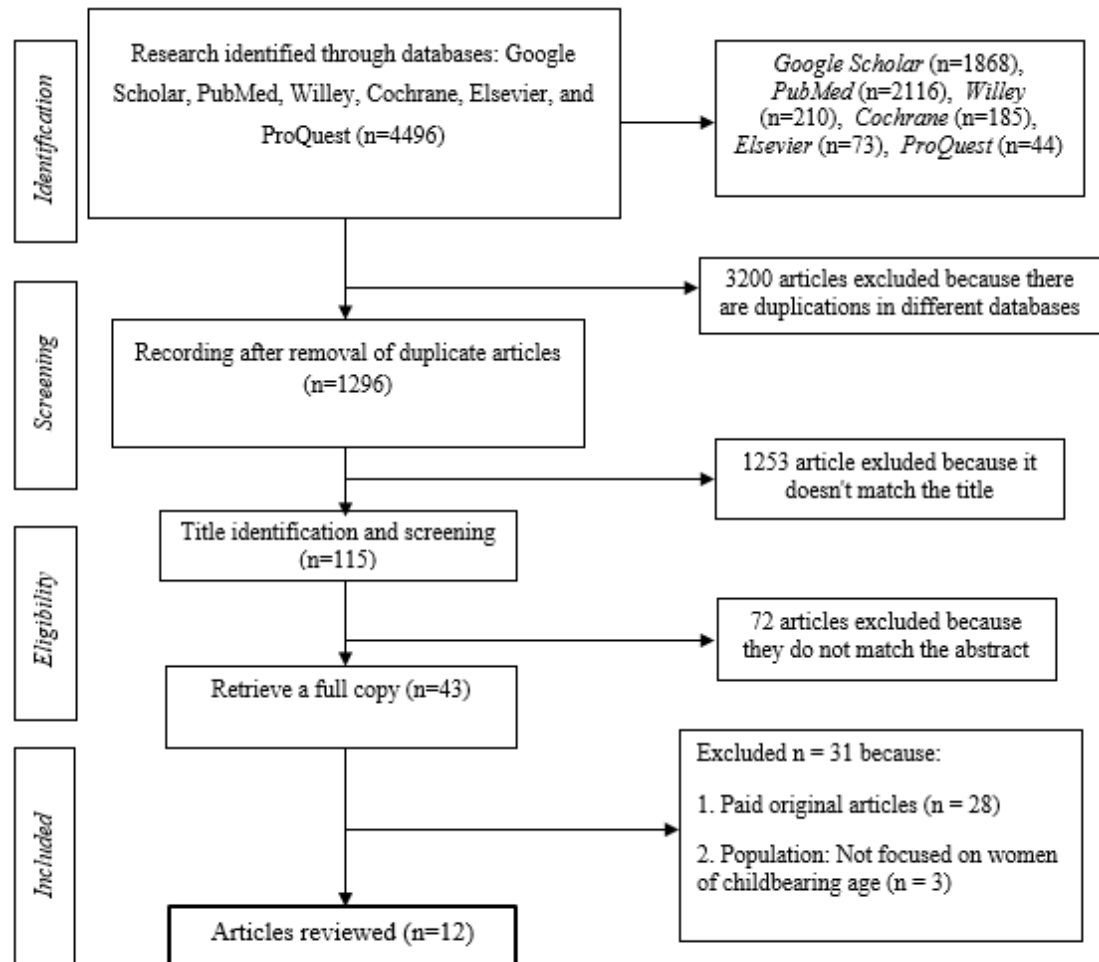
Infertility is the inability to produce offspring. Infertility cases that occur in women occur in 40% -50% of cases while men are 30% and other causes are about 20% -30% of couples<sup>1</sup> (Henriyanita, 2019). In 1990 the incidence of infertility reached 42 million and increased in 2010 as many as 48.5 million cases<sup>2,3</sup>. According to WHO (World Health Organization) the incidence of Infertility cases are increasing every year<sup>4</sup>. The cause of infertility in men is easier to know by checking their sperm. In women, it is necessary to examine the eggs and the number of eggs produced, to check the fallopian tubes, the condition of the uterus, the ability of the cervix to distribute sperm cells, and ovulation disorders or PCOS (Polycystic Ovary Syndrome)<sup>1</sup>. Syndrome is caused by hyperandrogenemia (HA), hyperinsulinemia/insulin resistance (IR), hormonal imbalance, cardiovascular disease, obesity, and other health problems<sup>4</sup>. PCOS develops when the ovaries are stimulated to produce too many androgens, especially testosterone, which releases large amounts of the hormone LH in the anterior pituitary gland<sup>7</sup>. Increased growth factors cause an increase in ovarian response to Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH), so that ovarian follicle development increases and androgen production also increases. Excessive follicle development will have an impact on the number of cystic follicles. There is a relationship between obesity and an increased risk of polycystic ovaries, from increased insulin resistance which causes theca cells to produce androgens and inhibits Sex Hormone Binding Globulin (SHBG) so that free androgens increase. This causes many androgens to be aromatized into estrogen which then produces LH and triggers follicular maturation<sup>6</sup>. The prevalence of PCOS varies widely from 2.2% to 26% globally. In some Asian countries, prevalence rates range from 2% to 7.5% in China and 6.3% in Sri Lanka<sup>7</sup>. A total of 8,612 women between the ages of 28-33 years, 5.8% of them experienced PCOS and 309 or 72% of women with PCOS experienced infertility<sup>8</sup>. In dealing with PCOS, pharmacological therapies can be used, including ovulatory dysfunction-related infertility (clomiphene citrate, aromatase inhibitors, and glucocorticoids, metformin), menstrual cycle disorders (cyclic progestins and combined oral contraceptives such as estrogen and progestins), androgen related symptoms (anti-androgens), glucocorticoids, gonadotropin-releasing hormone agonists, oral contraceptives such as ethinyl estradiol) and vitamin D therapy<sup>9,21</sup>.

### METHODS

The method used in this research is Literature Review. This Rivew literature shows the relationship between writing and research statements that have been formulated. The protocol and evaluation of the literature review will use the PRISMA Checklist to determine the selection of studies that have been found and adapted to the objectives of the literature review. The purpose of this literature is to provide a complete and structured summary of previous research using secondary data. In the initial step, 4496 articles were obtained from 2015-2020 with the

**THE 4<sup>th</sup> INTERNATIONAL CONFERENCE ON HEALTH POLYTECHNICS OF SURABAYA  
(ICOHPS)  
1<sup>st</sup> International Conference of Midwifery (ICoMid)**

keywords: factors, polycystic ovary syndrome, women of childbearing age, causes of PCOS in women, factors of polycystic ovary syndrome in women, analysis of factors for PCOS reproductive aged women. This research was conducted using 5 databases, namely Google Scholar, PubMed, Willey, Cochrane, Elsevier,



## RESULTS

No	Judul, Author, Tahun, Volume	Metode (Desain, Sampel, Variabel, Instrumen, Analisis)	Hasil Penelitian	Database
1	<p><i>Inter-related effects of insulin resistance, hyperandrogenism, sympathetic dysfunction and chronic inflammation in PCOS</i></p> <p>Article type: 3 Original Article-Australia, Japan, SE Asia</p> <p>doi: 10.1111 / cen.13808</p> <p><a href="https://onlinelibrary.wiley.com/doi/abs/10.1111/cen.13808">https://onlinelibrary.wiley.com/doi/abs/10.1111/cen.13808</a></p> <p>Tahun 2018</p>	<p>D : Cross sectional</p> <p>S : 49 women with PCOS and 23 controls total 72</p> <p>V: insulin resistance, hyperandrogenism, sympathetic dysfunction and chronic inflammation</p> <p>I : community data</p> <p>A : Pearson test</p>	<p>Testosterone stages had been most importantly related to PCOS, after adjustment for age and BMI. In women with PCOS, testosterone and FAI had been each good sized with insulin resistance in PCOS women.</p>	PubMed
2	<p><i>Association between Insulin Resistance and Cardiovascular Risk Factors in Polycystic Ovary Syndrome Patients</i></p> <p>Rev Bras Ginecol Obstet Vol. 40 No. 4/2018</p> <p>DOI <a href="https://doi.org/10.1055/s-0038-1642634">https://doi.org/10.1055/s-0038-1642634</a>. ISSN 0100-7203.</p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/29747212/">https://pubmed.ncbi.nlm.nih.gov/29747212/</a></p> <p>Tahun 2018</p>	<p>D : Cross sectional</p> <p>S : 83 PCOS patients</p> <p>V : age, weight, height, Ferriman-Gallwey score, body mass index, waist circumference, systolic, diastolic, cholesterol, high density lipoprotein, low density lipoprotein, Non-HDL lipoprotein, triglycerides, glucose (fasting)</p> <p>I: medical record</p> <p>A : Proportion test, Chisquare test, and Fisher's exact test</p>	<p>IR turned into statistically better in overweight women and consequently extra susceptible to growing PCOS than women with everyday BMI. No affiliation turned into discovered among IR and WC, BMI, LAP.</p>	PubMed
3	<p><i>Polycystic Ovary Morphology Is Associated with Insulin Resistance in Women with Polycystic Ovary Syndrome</i></p> <p>DR SO-HYEON HONG (Orcid ID : 0000-0001-5194-8924). Article type : 3 Original Article - Australia, Japan, SE Asia</p> <p>doi: 10.1111/cen.13380</p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/28543550/#:~:text=Results%3A%20Polycystic%20ovary%20morphology%20was,01">https://pubmed.ncbi.nlm.nih.gov/28543550/#:~:text=Results%3A%20Polycystic%20ovary%20morphology%20was,01</a>).</p> <p>Tahun 2017</p>	<p>D : Cross sectional</p> <p>S : 679 women with PCOS and 272 control women, a total of 951</p> <p>V: glucose and insulin levels, testosterone levels, ovarian volume, and follicle number</p> <p>I: medical record</p> <p>A : Multiple regression</p>	<p>PCOS women had drastically better overall testosterone stages and decrease wide variety of menstrual durations according to 12 months and ovarian follicle rely related to IR in women with PCOS after adjusting for age, BMI, and overall testosterone.</p>	PubMed
4	<p><i>Association of leptin and insulin resistance in PCOS: a case-controlled study</i></p> <p><i>Int J Reprod BioMed Vol. 15. No. 7. pp: 423-428, July 2017</i></p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/29177243/">https://pubmed.ncbi.nlm.nih.gov/29177243/</a></p> <p>Tahun 2017</p>	<p>D : Case control</p> <p>S : 378 women</p> <p>V : Serum leptin, body mass index (BMI), several hormones,</p> <p>I: medical record</p> <p>A: Pearson's test</p>	<p>Leptin degrees had been substantially correlated with frame weight and BMI in women, suggest FSH degrees had been substantially decrease in PCOS patients, LH and testosterone degrees had been generally better in PCOS women.</p>	PubMed
5	<p><i>Insulin resistance and obesity among infertile women with different polycystic ovary syndrome phenotypes</i></p> <p><i>Scientific RepoRts   7: 5339   DOI:10.1038/s41598-017-05717-y</i></p> <p><a href="https://www.nature.com/articles/s41598-017-05717-y">https://www.nature.com/articles/s41598-017-05717-y</a></p> <p>Tahun 2017</p>	<p>D : Cross sectional</p> <p>S : 213 women</p> <p>V : age, age of menarche, IR</p> <p>I : database</p> <p>A : Chi-square tests, ANOVA, t-test</p>	<p>No relationship was observed between BMI and waist circumference, women had a significant phenotype of PCOS with insulin resistance, and age and menstrual age were not significant for PCOS.</p>	Proquest

**THE 4<sup>th</sup> INTERNATIONAL CONFERENCE ON HEALTH POLYTECHNICS OF SURABAYA  
(ICOHPS)**

***1<sup>st</sup> International Conference of Midwifery (ICoMid)***

6	<p><i>Insulin resistance and oxidative marker in women with PCOS</i></p> <p>ARCHIVES OF PHYSIOLOGY AND BIOCHEMISTRY</p> <p>DOI:10.1080/13813455.2018.1499120</p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/30450993/#:~:text=Conclusion%3A%20Our%20study%20suggests%20that,grade%20inflammation%20and%20cardiovascular%20diseases.">https://pubmed.ncbi.nlm.nih.gov/30450993/#:~:text=Conclusion%3A%20Our%20study%20suggests%20that,grade%20inflammation%20and%20cardiovascular%20diseases.</a></p> <p>Tahun 2018</p>	<p>D : case control study</p> <p>S : 200 women</p> <p>V : BMI, insulin levels, PCOS</p> <p>I : measurement of weight and TB then calculate BMI, measurement of glucose levels in fasting and non-fasting conditions</p> <p>A : t-test, Kruskal-Wallis test</p>	<p>Fasting blood glucose, serum insulin, and IR are elevated in overweight and non-obese women with PCOS; Obese women with PCOS have an increased risk of moderate inflammatory and cardiovascular diseases.</p>	PubMed
7	<p><i>A case-control observational study of insulin resistance and metabolic syndrome among the four phenotypes of polycystic ovary syndrome based on Rotterdam criteria</i></p> <p>Jamil et al. Reproductive Health 2015, 12:7 <a href="http://www.reproductive-health-journal.com/content/12/1/7">http://www.reproductive-health-journal.com/content/12/1/7</a></p>	<p>D : Case control</p> <p>S : 526 women</p> <p>V : IR, Oligo-anovulation, Hyperandrogenism</p> <p>I: medical record</p> <p>A : t-test, post-hoc test</p>	<p>In women with oligoanovulation (O) and PCO (P) morphology, levels were significantly lower than in women with OP and HA phenotypes. BMI, waist circumference, triglycerides (cardiovascular risk), HOMAIR, and type 2 diabetes are associated with an increased risk of metabolic disorders.</p>	PubMed
8	<p><i>Overweight and obese but not normal weight women with PCOS are at increased risk of Type 2 diabetes mellitus a prospective, population-based cohort study</i></p> <p>Human Reproduction, pp. 1–9, 2016</p> <p>doi:10.1093/humrep/dew329</p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/28031324">https://pubmed.ncbi.nlm.nih.gov/28031324</a></p> <p>Tahun 2016</p>	<p>D: cohort study</p> <p>S: 1836 women</p> <p>V: PCOS, obesity, overweight</p> <p>I: questionnaire</p> <p>A: t-test, Mann-Whitney U-test</p>	<p>Polycystic ovary syndrome significantly increases the risk of DM2 in obese and overweight women; Normal weight women with PCOS are not at increased risk of prediabetes or type 2 diabetes.</p>	Google scholar
9	<p>Relationship between hyperandrogenism, obesity, inflammation and polycystic ovary syndrome</p> <p>Asli Nehir Aytan, Ercan Bastu, Irem Demiral, Huri Bulut, Murat Dogan &amp; Faruk Buyru (2016):</p> <p>Gynecological Endocrinology,</p> <p>DOI:10.3109/09513590.2016.1155208</p> <p><a href="https://pubmed.ncbi.nlm.nih.gov/26951881/#:~:text=Body%20mass%20index%20had%20a,the%20inflammatory%20status%20and%20hyperandrogenism.">https://pubmed.ncbi.nlm.nih.gov/26951881/#:~:text=Body%20mass%20index%20had%20a,the%20inflammatory%20status%20and%20hyperandrogenism.</a></p> <p>Tahun 2016</p>	<p>D : prospective study</p> <p>S : 88 women</p> <p>V: hyperandrogenism, obesity, inflammation and polycystic ovary syndrome</p> <p>I: medical record</p> <p>A : t test, ANOVA</p>	<p>FAI values were significantly higher in PCOS patients, inflammation and hyperandrogenism increased in obese PCOS patients, weight gain in women with a genetic predisposition to PCOS.</p>	PubMed
10	<p><i>Association of obesity and overweight with the prevalence of insulin resistance, pre-diabetes and clinical biochemical characteristics among infertile Mexican women with polycystic ovary syndrome</i></p> <p>BMJ Open 2016;6:e012107.</p> <p>doi:10.1136/bmjopen-2016-012107</p> <p><a href="https://bmjopen.bmj.com/content/6/7/e012107">https://bmjopen.bmj.com/content/6/7/e012107</a></p> <p>Tahun 2016</p>	<p>D : Cross sectional</p> <p>S : 20,906 women</p> <p>V : infertile with PCOS diagnosis, normal weight (body mass index (BMI) (18,5 - 24,9), overweight (BMI 25 - 29,9), and obesity (BMI 30)</p> <p>I: medical record</p> <p>A : Kruskal-Wallis test, Fisher's exact test</p>	<p>Infertile women with PCOS who are obese or overweight are dominated by IR and prediabetes.</p>	PubMed
11	<p><i>Vitamin D in polycystic ovary syndrome: Relationship to obesity and insulin resistance</i></p> <p>DOI 10.1002/mnfr.201500259 Mol.</p> <p>Nutr. Food Res. 2016, 60, 110–118</p>	<p>D : Cross sectional</p> <p>S : 76 women</p> <p>V : PCOS, obesity, IR, vitamin D</p>	<p>Vitamin D levels were lower in obese women with PCOS than in overweight controls, and vitamin D was associated with IR in the PCOS group.</p>	PubMed

	<a href="https://pubmed.ncbi.nlm.nih.gov/26255991/">https://pubmed.ncbi.nlm.nih.gov/26255991/</a> Tahun 2016	I: medical record A : linear multivariate analysis		
12	<i>Close correlation between hyperandrogenism and insulin resistance in women with polycystic ovary syndrome-Basedmon liquid chromatography with tandem mass spectrometry measurements</i> <i>J Clin Lab Anal.</i> 2018;e22699 DOI: 10.1002/jcla.22699 <a href="https://onlinelibrary.wiley.com/doi/epdf/10.1002/jcla.22699">https://onlinelibrary.wiley.com/doi/epdf/10.1002/jcla.22699</a> Tahun 2018	D: cohort study S: 671 women V: hyperandrogenism, insulin resistance, PCOS I: medical record A: Kolmogorov- Smirnov test, chi square, ANOVA	Higher IR and risk of HA elevation among PCOS women	Wiley

## DISCUSSION

The 12 related articles, then analyze the factors that cause PCOS (Polycystic Ovary Syndrome). These factors were found to be hyperinsulinemia/insulin resistance, obesity, and hyperandrogen. There are 7 articles that have been reviewed in which hyperinsulinemia/insulin resistance is the cause of PCOS. This result is in line with the opinion of several researchers, which states that respondents who have hyperinsulinemia/insulin resistance cause PCOS<sup>10</sup>. Insulin resistance affects the ovulatory cycle of women of reproductive age. Insulin resistance can cause insulin levels to rise in the blood (hyperinsulinemia). In a study conducted by Wanderley (2018), 50-80% of PCOS women with hyperinsulinemia/insulin resistance experienced menstrual cycle disturbances of more than 35 days (55.43%), women who experienced amenorrhea (40.96%), and most PCOS patients suffer from this condition with the severity of PCOS related to the IR condition<sup>12</sup>. According to other research that women with PCOS are overweight and have high fasting glucose and insulin levels and higher total testosterone levels and the number of menstruations is less frequent during the year this affects the number of ovarian follicles associated with IR in women with PCOS<sup>13,14</sup>. Al-Jefout's research showed that 133 or 83.6% of PCOS women experienced insulin resistance in 159 samples and showed a high FAI (Free Androgen Index), namely abnormal testosterone levels in PCOS women's bodies<sup>15</sup>. According to research (Jamil et al., 2015) high insulin resistance is found in women with PCOS which can cause Metabolic Syndrome, namely hyperinsulinemia and hyperandrogens<sup>16</sup>. Research conducted by (Joham et al., 2016) BMI and IR are positively related to serum leptin in infertile PCOS women, in the PCOS group, 9 out of 99 women were obese with a BMI 30 and 31 women were overweight with  $25 \leq \text{BMI} < 30$ <sup>17</sup>.

There are 5 articles discussed about obesity factors, it was found that respondents who were obese were the cause of PCOS. The results of the study are in line with several researchers, according to Al-Jefout (2017) measurement of BMI in the obesity category of 39.9% and waist circumference in the obese category of 25.9% in the study experiencing insulin resistance and hyperandrogen, which causes hirutism symptoms. According to Ollila's research (2017), it shows that the risk of T2DM in women with PCOS is mainly due to being overweight/obese and normal weight women with PCOS do not experience an increased risk<sup>18</sup>. According to research by Nehir Aytan (2016) obese PCOS women have higher androgen levels than lean PCOS women<sup>19</sup>. According to research by Reyes-Muñoz (2016), it was found that obese women found high glucose and insulin hormone levels which had an impact on increasing FAI (Free Androgen Index)<sup>20</sup>. Research conducted by Joham (2016) low vitamin D levels in women with PCOS with obesity around 27-56%<sup>21</sup>.

There are 3 articles that discuss hyperandrogen factors, all of which state that hyperandrogen factors affect the incidence of PCOS. These results are in line with the other studies in women with PCOS who are obese with low FSH hormones, increased LH, and increased FAI due to impaired production of Sex hormone binding globulin (SHGB) in the liver<sup>10,19</sup>. Research conducted by Yang (2019) that women with PCOS experienced hyperandrogen as much as 80.99%, IR with HA was strongly associated in this case because FAI levels increased<sup>14</sup>.

## CONCLUSION

The results of this review reported 7 out of 12 journals discussing the PCOS incident factor, namely hyperinsulinemia/insulin resistance, the review results reported 5 out of 12 journals discussing the PCOS incident factor, namely obesity, and the review results reported 3 out of 12 journals discussing the PCOS incident factor, namely hyperandrogen.

## REFERENCES



THE 4<sup>th</sup> INTERNATIONAL CONFERENCE ON HEALTH POLYTECHNICS OF SURABAYA  
(ICOHPS)

*1<sup>st</sup> International Conference of Midwifery (ICoMid)*

---

Henriyanita, M. Sistem Pakar Diagnosa Infertilitas Pada Wanita Menggunakan Metode Teorema Bayes. *Institut Teknologi Padang*, 7(1), 67–72. (2019).

Mascarenhas, M. N., Flaxman, S. R., Boerma, T., Vanderpoel, S., & Stevens, G. A. National, Regional, and Global Trends in Infertility Prevalence Since 1990: A Systematic Analysis of 277 Health Surveys. *PLoS Medicine*, 9(12), 1–12. <https://doi.org/10.1371/journal.pmed.1001356>(2012).

Indarwati, I., Budihastuti, U. R., & Dewi, Y. L. R. Analysis of Factors Influencing Female Infertility. *Journal of Maternal and Child Health*, 02(02), 150–161. <https://doi.org/10.26911/thejmch.2017.02.02.06>(2017)

Yan Li, Changye Chen, Yan Ma, Jiao Xiao, Guifang Luo, Yukun Li, Daichao Wu. Multi-system reproductive metabolic disorder: significance for the pathogenesis and therapy of polycystic ovary syndrome (PCOS). *Life Sciences*. <https://doi.org/10.1016/j.lfs.2019.04.046>. (2019)

Treatment, N., & Kabel, A. M. Journal of Pharmacological Reports Polycystic Ovarian Syndrome : Insights into Pathogenesis , Diagnosis ., *American Society of Radiologic Radiologists*, 1(1), 1–5. (2016).

Saftarina, F., & Putri, I. N. W. Pengaruh Sindrom Polikistik Ovarium terhadap Peningkatan Faktor Risiko Infertilitas. *Jurnal Majority*, 5(2), 43–48. <http://juke.kedokteran.unila.ac.id/index.php/majority/article/viewFile/10%0A76/916>. (2016).

Zahid. *Polycystic ovary syndrome (PCOS)*. [Www.Nhp.Gov.In. https://www.nhp.gov.in/disease/endocrinal/ovaries/polycystic-ovary-syndrome](http://www.nhp.gov.in/disease/endocrinal/ovaries/polycystic-ovary-syndrome) pcos(2016).

Barbosa, G., de Sá, L. B. P. C., Rocha, D. R. T. W., & Arbex, A. K. Polycystic Ovary Syndrome (PCOS) and Fertility. *Open Journal of Endocrine and Metabolic Diseases*, 06(01), 58–65. <https://doi.org/10.4236/ojemd.2016.61008>(2016).

Voulgaris, N., Papanastasiou, L., Piaditis, G., Angelousi, A., Kaltsas, G., Mastorakos, G., & Kassi, E. Vitamin D and aspects of female fertility. *Hormones*, 16(1), 5–21. <https://doi.org/10.14310/horm.2002.1715>. (2017).

Shorakae, S., Ranasinha, S., Abell, S., Lambert, G., Lambert, E., de Courten, B., & Teede, H. Inter-related effects of insulin resistance, hyperandrogenism, sympathetic dysfunction and chronic inflammation in PCOS. *Clinical Endocrinology*, 89(5), 628–633. <https://doi.org/10.1111/cen.13808>. (2018).

Silvestris, E., de Pergola, G., Rosania, R., & Loverro, G. Obesity as disruptor of the female fertility. *Reproductive Biology and Endocrinology*, 16(1), 1–13. <https://doi.org/10.1186/s12958-018-0336-z>. (2018).

Wanderley, M. da S., Pereira, L. C. R., Santos, C. B., Da Cunha, V. S., & Neves, M. V. J. Association between insulin resistance and cardiovascular risk factors in polycystic ovary syndrome patients. *Revista Brasileira de Ginecologia e Obstetricia*, 40(4), 188–195.

<https://doi.org/10.1055/s-0038-1642634>. (2018).

So-hyeon Hong , Yeon-Ah Sung , Young Sun Hong , Kyungah Jeong , Hyewon Chung, Hyejin Lee. Polycystic Ovary Morphology Is Associated with Insulin Resistance in Women with Polycystic Ovary Syndrome. 3 Original Article - Australia, Japan, SE Asia. <https://doi.org/10.1111/cen.13380>. (2017)

Yang, Y., Ding, M., Di, N., Azziz, R., Yang, D., & Zhao, X. Close correlation between hyperandrogenism and insulin resistance in women with polycystic ovary syndrome—Based on liquid chromatography with tandem mass spectrometry measurements. *Journal of Clinical Laboratory Analysis*, 33(3), 1–7. <https://doi.org/10.1002/jcla.22699>. (2019).

Al-Jefout, M., Alnawaiseh, N., & Al-Qtaitat, A. Insulin resistance and obesity among infertile women with different polycystic ovary syndrome phenotypes. *Scientific Reports*, 7(1), 1–9. <https://doi.org/10.1038/s41598-017-05717-y>. (2017).

Jamil, A. S., Alalaf, S. K., Al-Tawil, N. G., & Al-Shawaf, T. A case-control observational study of insulin resistance and metabolic syndrome among the four phenotypes of polycystic ovary syndrome based on Rotterdam criteria Female Fertility. *Reproductive Health*, 12(1), 1–9. <https://doi.org/10.1186/1742-4755-12-7>. (2015).

Joham, A. E., Teede, H. J., Cassar, S., Stepto, N. K., Strauss, B. J., Harrison, C. L., Boyle, J., & de Courten, B. Vitamin D in polycystic ovary syndrome: Relationship to obesity and insulin resistance. *Molecular Nutrition and Food Research*, 60(1), 110–118. <https://doi.org/10.1002/mnfr.201500259>. (2016).

Ollila, M. M. E., West, S., Keinänen-Kiukaanniemi, S., Jokelainen, J., Auvinen, J., Puukka, K., Ruokonen, A., Järvelin, M. R., Tapanainen, J. S., Franks, S., Piltonen, T. T., & Morin-Papunen, L. C. Overweight and obese but not normal weight women with PCOS are at increased risk of Type 2 diabetes mellitus - A prospective, populationbased cohort study. *Human Reproduction*, 32(2), 423–431. <https://doi.org/10.1093/humrep/dew329>  
Pasquali, R., Pelusi, C., Genghini, S., Cacciari, M., & Gambineri, A. (2003). Obesity and reproductive disorders in women. *Human Reproduction Update*, 9(4), 359–372. <https://doi.org/10.1093/humupd/dmg024>. (2017).

Nehir Aytan, A., Bastu, E., Demiral, I., Bulut, H., Dogan, M., & Buyru, F. Relationship between hyperandrogenism, obesity, inflammation and polycystic ovary syndrome. *Gynecological Endocrinology*, 32(9), 709–713. <https://doi.org/10.3109/09513590.2016.1155208>. (2016).

Reyes-Muñoz, E., Ortega-González, C., Martínez-Cruz, N., Arce-Sánchez, L., EstradaGutierrez, G., Moran, C., Sánchez-Serrano, A. P., Higareda-Sánchez, R., & De La JaraDíaz, J. F. Association of obesity and overweight with the prevalence of insulin resistance, pre-diabetes and clinical-biochemical characteristics among infertile Mexican women with polycystic ovary syndrome: A cross-sectional study. *BMJ Open*, 6(7). <https://doi.org/10.1136/bmjopen-2016-012107>. (2016).

THE 4<sup>th</sup> INTERNATIONAL CONFERENCE ON HEALTH POLYTECHNICS OF SURABAYA  
(ICOHPS)

*1<sup>st</sup> International Conference of Midwifery (ICoMid)*

---

Badawy, A., & Elnashar, A. Treatment options for polycystic ovary syndrome. *International Journal of Women's Health*, 3(1), 25–35. <https://doi.org/10.2147/IJWH.S11304>. (2011).