Systematic Review

Association between Preconception Hypertension in Women and Fecundability: A Systematic Review and Meta-Analysis

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Abstract

Objective: This study aimed to evaluate the association between preconception hypertension in women and fecundability.

Methods: A PRISMA-guided and PROSPERO-registered (CRD420261281401) systematic review and meta-analysis was conducted. Searches were performed across databases and manual reference. Outcomes included fecundability, time to pregnancy (TTP), and infertility (TTP > 12 months). Effect estimates were pooled and reported as fecundability odds ratios (FOR), time ratios (TR), and risk ratios (RR) with 95% CIs.

Results: Preconception hypertension was potentially associated with a 21% reduction in fecundability (FOR 0.79, 95% CI 0.78–0.80; P < 0.0001; I^2 = 0%) and pooled estimates for TTP and infertility risk were non-significant but directionally consistent, indicating a 29% longer TTP (TR 1.29, 95% CI 0.84–1.97; I^2 = 88%) and a 17% higher infertility risk (RR 1.17, 95% CI 0.94–1.47; I^2 = 34%), though these findings should be interpreted with caution given the heterogeneity and limited evidence.

Discussion: Plausible biological mechanisms underlying the association involve chronic inflammation and endothelial dysfunction, which may impair endometrial receptivity, implantation, and early embryo development. Further studies incorporating objective male reproductive measures are required.

Conclusion: Preconception hypertension may be associated with lower fecundability. In the interim, blood pressure optimization and fertility assessment before pregnancy are recommended.

Keywords: Preconception hypertension; fertility; meta-analysis

Hubungan antara Hipertensi Prakonsepsi pada Perempuan dan Fekundabilitas: Tinjauan Sistematis dan Meta-Analisis

Abstrak

Tujuan: Studi ini bertujuan mengevaluasi hubungan antara hipertensi prakonsepsi dan fekundabilitas pada wanita.

Metode: Penelitian ini menggunakan metode tinjauan sistematis dan meta-analisis yang dipandu oleh PRISMA serta terdaftar di PROSPERO (CRD420261281401). Pencarian dilakukan pada beberapa basis data dan penelusuran referensi secara manual. Luaran meliputi fekundabilitas, waktu hingga kehamilan (TTP), dan infertilitas (TTP>12 bulan). Estimasi efek digabungkan dan dilaporkan sebagai rasio peluang fekundabilitas (FOR), rasio waktu (TR), dan rasio risiko (RR) dengan interval kepercayaan 95%.

Hasil: Hipertensi prakonsepsi dikaitkan dengan potensi penurunan fekundabilitas sebesar 21% (FOR 0,79, 95% CI 0,78–0,80; P < 0,0001; I^2 = 0%). Estimasi gabungan TTP dan risiko infertilitas tidak signifikan secara statistik tetapi menunjukkan arah yang konsisten, yaitu TTP 29% lebih lama (TR 1,29, 95% CI 0,84–1,97; I^2 = 88%) dan risiko infertilitas 17% lebih tinggi (RR 1,17, 95% CI 0,94–1,47; I^2 = 34%). Meskipun demikian, temuan ini perlu diinterpretasikan secara hati-hati mengingat adanya heterogenitas dan keterbatasan bukti.

Diskusi: Mekanisme biologis yang mungkin mendasari hubungan ini melibatkan peradangan kronis dan disfungsi endotel yang dapat mengganggu reseptivitas endometrium, implantasi, dan perkembangan embrio dini. Diperlukan studi lebih lanjut yang memasukkan pengukuran reproduksi pria yang objektif.

Kesimpulan: Hipertensi prakonsepsi mungkin dikaitkan dengan fekundabilitas yang lebih rendah. Sementara itu, optimalisasi tekanan darah dan penilaian kesuburan sebelum kehamilan direkomendasikan.

Kata kunci: Hipertensi prakonsepsi; kesuburan; meta-analisis

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Introduction

Hypertension affects approximately 1.3 billion adults worldwide and 51.3 million in Indonesia.[1,2] Diagnostic thresholds vary across guidelines, with ISH and ESC defining hypertension as ≥ 140/90 mmHg and AHA defining it as ≥ 130/80 mmHg.[3–5] Beyond its established association with cardiovascular, renal, and neurologic disease, hypertension may also affect reproductive health through its systemic vascular effects.[6]

Preconception hypertension (PH) is a common condition affecting women of reproductive age. Existing research has focused primarily on male reproductive dysfunction and hypertensive disorders of pregnancy, while the potential impact of PH on female fertility remains underexplored.[5,7] Time-to-event fertility measures, such as fecundability and time to pregnancy (TTP), provide practical assessments that may inform early blood pressure optimization and fertility evaluation.

Method

Study Design

This study was conducted as a systematic review and meta-analysis, prospectively registered in the PROSPERO (CRD420261281401), and performed in accordance with the PRISMA guidelines. The PECO framework comprised women with preconception hypertension as the exposure group, women without preconception hypertension as the comparator group, and reduced fecundability or failure to achieve pregnancy within a defined period of attempting conception as the outcome.

Eligibility Criteria

The eligibility criteria were as follows: (1) women of reproductive age attempting spontaneous conception through regular unprotected intercourse without known infertility, with studies involving assisted reproductive technologies excluded; (2) exposure to preconception essential hypertension according to study-specific diagnostic thresholds, with pregnancy-related hypertension and major reproductive or endocrine disorders affecting fertility excluded; (3) women without preconception hypertension as comparators; and (4) outcomes including fecundability, time to pregnancy (TTP), or infertility (TTP >12 months).

Studies were eligible if they were peer-reviewed analytical cohort studies published in English or Indonesian, with no restrictions on country, setting, recruitment context, or publication date. Studies were excluded if they evaluated incremental blood pressure changes, used non-analytical designs, consisted of descriptive reports or secondary evidence, or had inaccessible full texts.

Literature Search

A comprehensive literature search was conducted in Scopus, PubMed, EBSCOhost, Cochrane Library, and ScienceDirect from inception to April 22, 2026. The search strategy combined free-text terms and Medical Subject Headings (MeSH) related to women, hypertension, fecundability, and time to pregnancy using Boolean operators. Additional studies were identified through manual reference screening. Retrieved articles were screened independently by four reviewers in Rayyan, through deduplication, title/abstract screening, and full-text assessment based on predefined eligibility criteria.

Data Collection Process

Study characteristics, population, exposure, outcomes, confounders, and effect estimates were independently extracted from eligible articles by four reviewers. Risk of bias was

assessed using the ROBINS-E tool, while reporting bias was evaluated through funnel plot inspection. Certainty of evidence for each outcome was assessed using the GRADE approach. Corresponding authors were contacted when clarification or additional data were required.

Data Analysis and Statistical Tests

Effect estimates were pooled on the natural logarithmic scale using random-effects meta-analysis with the generic inverse variance method (REML estimation with Hartung–Knapp adjustment) in RStudio. Studies with insufficient quantitative data were described narratively, and unavailable variables were denoted as "ND".

Statistical heterogeneity was assessed using forest plot inspection, Cochran's Q test, I^2, and τ^2, with $I^2 > 50\%$ indicating substantial heterogeneity. Subgroup analyses were performed according to adjustment status, risk of bias, and exposure definition. Sensitivity analyses excluded high-risk or highly influential studies and compared random-effects with fixed-effect models. Exploratory meta-regression analyses were conducted when sufficient homogeneous data were available.

Results

Study Selection

The search identified 1,015 records across five databases, with one additional study identified through hand-searching. After removal of 79 duplicates, 936 records underwent title and abstract screening, of which 930 were excluded. Six reports underwent full-text review, and six studies ultimately met the inclusion criteria. The study selection process is summarized in the PRISMA flow diagram (**Figure 1**).

Study Characteristics

Table 1 summarizes the characteristics of the included studies. All studies used a cohort design and were conducted in China, Singapore, the United States, or multinational settings. Sample sizes varied substantially,

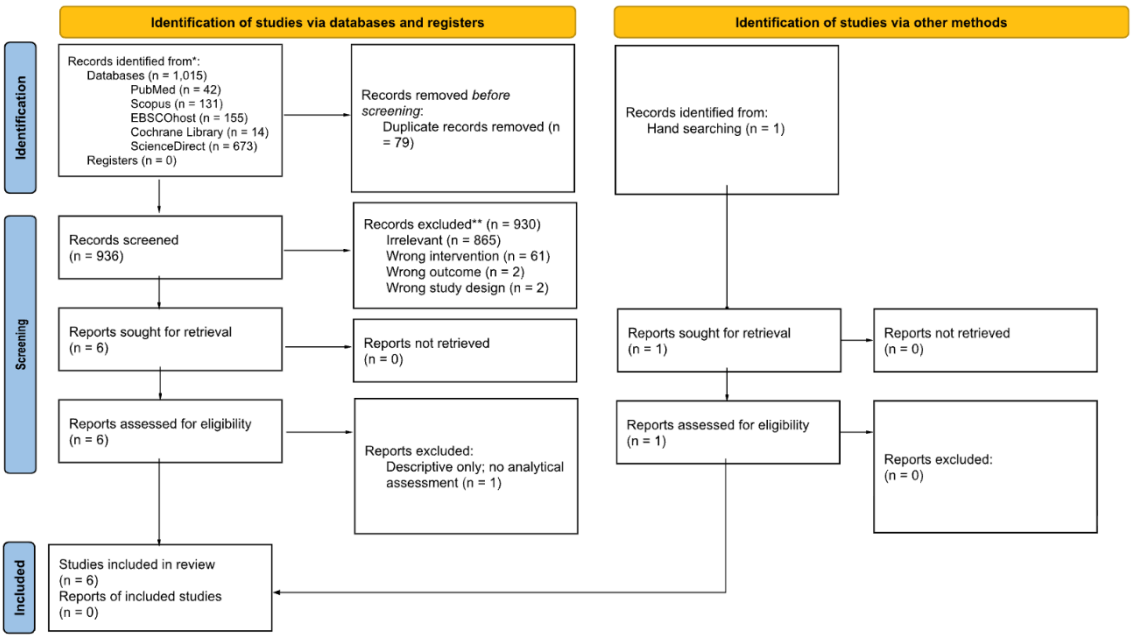


Figure 1 Article search flow diagram

Table 1 Study Characteristics

Author, Year, Country, Duration, Study Design	Population	Confounders	Exposure	Comparison	Measurement	Outcome	Analysis	Direction of Effect
Xiong et al., 2024[8] China January 1st, 2014-December 31st, 2018 Population-based, prospective cohort study	999,125 Female partners aged 20-49 attempting spontaneous conception in a national project	Maternal age, BMI, alcohol intake, tobacco use, passive smoking exposure, diabetes, menstrual cycle, gravidity, and paternal age	Hypertension, threshold of SBP ≥140 mmHg or DBP ≥90 mmHg	Without hypertension	Hypertension: Sphygmomanometer measurement ± prior diagnosis/ treatment Pregnancy: Self-reported ultrasound-confirmed pregnancy	TTP in months, Infertility (TTP >12 months), Cumulative pregnancy rate (CPR) in 12 months	TTP: Accelerated failure time models, Infertility: Modified Poisson regression with robust variance	↓
Grieger et al., 2019[9] Australia, Ireland, New Zealand, and the UK November 2004-February 2011 Population-based, retrospective cohort study	5,519 Nulliparous women pregnant with singletons who underwent a review of their preconception plans	Maternal ethnicity, socio-economic index, previous miscarriage, cigarette use, alcohol, fruit, vegetable, fish, and fast food intake, paternal age, and paternal BMI	Hypertension, threshold of SBP ≥130 mmHg or DBP ≥85 mmHg	Without hypertension	Hypertension: Sphygmomanometer measurement Pregnancy: Ultrasound or clinical confirmation			-
Loy et al., 2022[10] Singapore 2015-2017 Hospital-based, prospective cohort study	834 Women aged 18-45 attempting spontaneous conception in a hospital-based program	Maternal age, ethnicity, educational level, physical activity, smoking exposure, and alcohol intake	Hypertension, threshold of SBP ≥140 mmHg or DBP ≥90 mmHg	Without hypertension	Hypertension: Sphygmomanometer measurement Pregnancy: Self-reported positive urinary test with ultrasound confirmation			?

Author, Year, Country, Duration, Study Design	Population	Confounders	Exposure	Comparison	Measurement	Outcome	Analysis	Direction of Effect
Hong et al., 2019[11] China January 1st, 2015-December 31st, 2016 Population-based, prospective cohort study	2,234,350 Nulligravid Female partners aged 20-49 attempting spontaneous conception in a national project	Maternal and paternal age, ethnicity, educational level, occupation, household registration, marriage date, tobacco exposure, alcohol intake, BMI, and fasting plasma glucose	Hypertension, threshold of SBP ≥140 mmHg or DBP ≥90 mmHg	Without hypertension	Hypertension: Sphygmomanometer measurement Pregnancy: Self-reported ultrasound-confirmed pregnancy			↓
Nobles et al., 2018[12] United States 2007-2011 Clinic-based, prospective cohort study	1228 Women attempting spontaneous conception and participate in an RCT	Maternal age, race, marital status, cigarette smoking status, parity, time from last pregnancy to enrollment, number of prior pregnancy losses, number of cycles attempting pregnancy before enrollment, and BMI	Hypertension, threshold of SBP ≥130 mmHg or DBP ≥85 mmHg	Without hypertension	Hypertension: Sphygmomanometer measurement Pregnancy: Patient's self-reported results of positive urinary pregnancy test followed by ultrasound scan confirmation	Fecundability	Fecundability: Discrete-time proportional hazard models (Cox)	?

Author, Year, Country, Duration, Study Design	Population	Confounders	Exposure	Comparison	Measurement	Outcome	Analysis	Direction of Effect
Eisenberg et al., 2016[13] United States 2005-2009 Population-based, prospective cohort study	501 Women aged 18-44 attempting spontaneous conception	Maternal and paternal age, BMI, race, education level, parity, smoking status, alcohol intake, physical activity, blood thyroid hormone level, and blood cholesterol level	Medical history of hypertension through questionnaire response	Medical history of without hypertension through questionnaire response	Hypertension: Patient's self-reported history of hypertension diagnosis by a doctor Pregnancy: Patient's self-reported results of positive urinary pregnancy test provided by the study			-

with a total of 3,241,557 women included. Outcomes assessed included fecundability, time to pregnancy, and infertility risk. Most analyses adjusted for maternal age, BMI, alcohol use, and smoking, while some also adjusted for paternal age and BMI. Findings were mixed, with studies reporting positive associations, attenuation after confounder adjustment, or no association.

Critical Appraisal

The risk of bias of the included studies ranged from low to moderate (**Figure 2**). The two largest studies were rated as low risk of bias, whereas in the remaining studies, concerns were mainly related to missing data, selective reporting, and selective population inclusion. Overall, the certainty of evidence was rated as low because all included studies were observational.

Statistical Analysis

Preconception hypertension was associated with reduced fecundability **Figure 3 [A.]**, corresponding to a 21% lower probability of conception per cycle (FOR 0.79, 95% CI 0.78–0.80; $P < 0.0001$) with negligible heterogeneity ($I^2 = 0.0\%$). The pooled estimate was largely driven by Hong et al. (2019).

Sensitivity analysis excluding the highest-weight study (Hong et al., 2019) yielded an approximately 25% reduction in fecundability (**Figure 3 [B.]**). Heterogeneity remained low, but the association was no longer statistically significant (FOR 0.75, 95% CI 0.48–1.17; $P = 0.1101$; $I^2 = 0.0\%$).

Subgroup analysis of hypertension definition was performed only for the ≥140/90 mmHg threshold (**Figure 3 [C.]**) because it was the most frequently reported definition, whereas studies using other definitions (≥130/85 mmHg and self-reported hypertension) were insufficient. The analysis estimated a 21% reduction of fecundability,

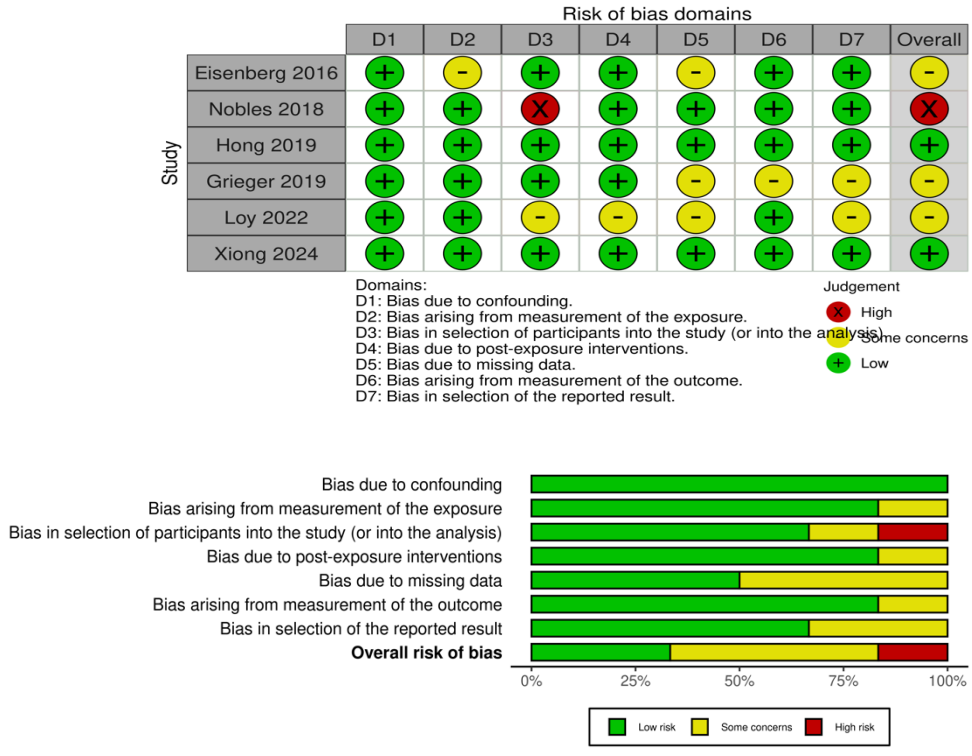


Figure 2 Risk of bias assessment using ROBINS-E tool

with no substantial heterogeneity (FOR 0.79, 95% CI 0.71–0.88; P = 0.0232; I^2 = 0.0%).

Exploratory meta-regression analyses demonstrated slight negative slopes for both mean age and smoking prevalence (**Figure 3 [D.]**), suggesting lower fecundability effect estimates with increasing covariate values. However, interpretation should be performed cautiously because of the small number of included studies (<10) and wide uncertainty intervals.

In contrast, hypertension was not significantly associated with time to pregnancy (TTP) or infertility risk (TTP > 12 months). Across two studies, hypertension showed a non-significant trend toward longer TTP (TR 1.29, 95% CI 0.84–1.97; I^2 = 88%) and higher infertility risk (RR 1.17, 95% CI 0.94–1.47; I^2 = 34%) (**Supplementary Figures 1 and 2**).

Sensitivity and subgroup analyses showed consistent findings for fecundability, although potential confounding and heterogeneity were observed for time to pregnancy and infertility risk outcomes. Funnel plot inspection demonstrated mild asymmetry among smaller studies (**Supplementary Figure 3**). Supplementary figures are available at: https://bit.ly/SupplementaryFigures

Discussion

This systematic review and meta-analysis

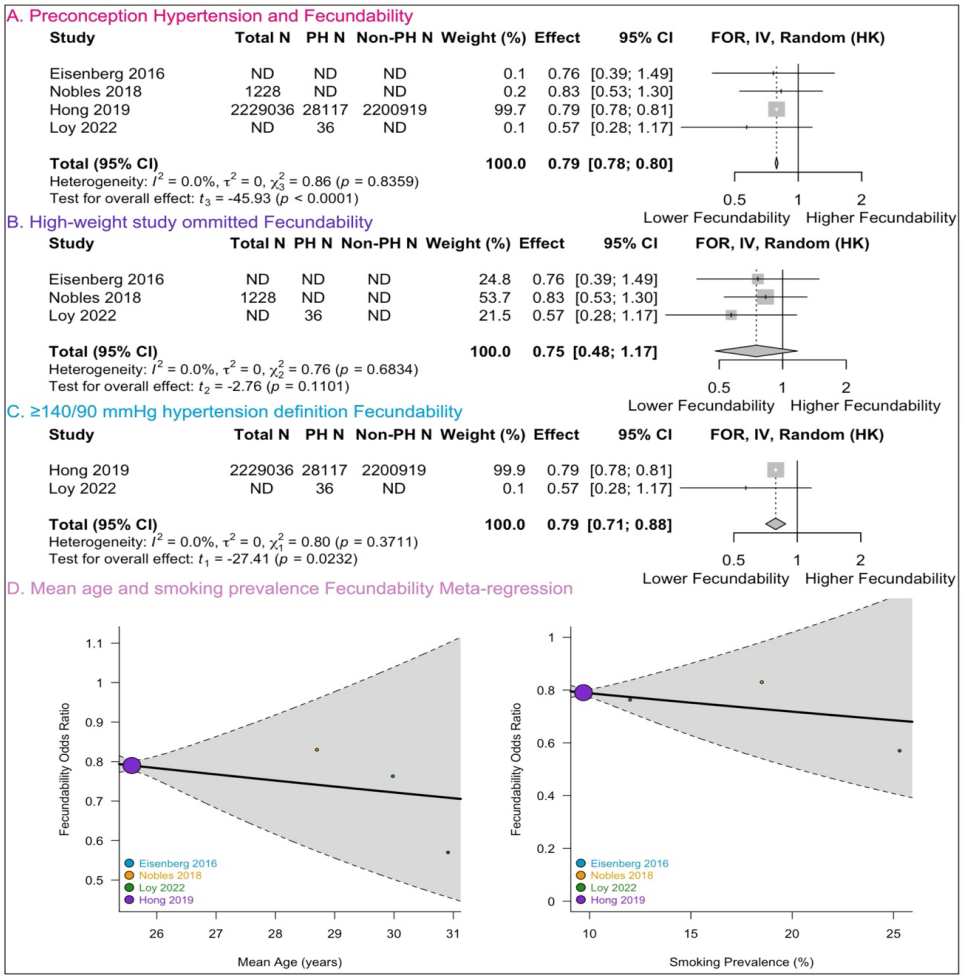


Figure 3 Meta-Analysis Plots

demonstrated that preconception hypertension may potentially be associated with reduced fecundability among women attempting spontaneous conception. Pooled estimates for time to pregnancy and infertility risk showed directionally consistent trends despite lacking statistical significance. However, interpretation should be cautious because only a limited number of studies were included, and the analyses were predominantly influenced by large studies with highly precise effect estimates, particularly Hong et al. (2019)[11] for fecundability and Xiong et al. (2024)[8] for time to pregnancy and infertility risk.

Hypertension definitions varied across studies, with some using the ACC/AHA threshold (≥130/80 mmHg)[5] and others using the traditional ≥140/90 mmHg threshold, consistent with major Indonesian hypertension guidelines.[14,15] This heterogeneity may have introduced misclassification bias, and standardization was not feasible because of insufficient reporting; therefore, subgroup analysis was restricted to studies using the ≥140/90 mmHg definition.

The mechanisms linking maternal hypertension to reduced fecundability remain incompletely understood. Hypertension has been associated with poorer sexual function in women, impaired reproductive parameters in animal models, and chronic inflammation with increased oxidative stress, which may adversely affect oocyte quality, embryo development, implantation, and endometrial receptivity.[16–19] Further research is needed to clarify these underlying pathways.

Adjustment for confounders attenuated several associations to non-significance (**Figure 4**).[10,12] Important confounders included age, body mass index (BMI), smoking exposure, parity, physical activity, and alcohol intake. Higher BMI and older age may partly explain the observed association between hypertension and reduced fecundability because both are associated with impaired reproductive capacity.[8,20,21]

Time to pregnancy (TTP) is also a couple-based outcome influenced by both female and male reproductive factors (**Figure 4**). Although included studies excluded male partners with known infertility and some adjusted for paternal characteristics such as age and BMI,[8,9] none assessed semen parameters, leaving the possibility of residual partner-related confounding. Previous studies have shown that increasing paternal age and obesity may adversely affect semen quality and fertility.[22,23]

Existing studies varied in recruitment settings and population characteristics. Even in large population-based cohorts, the prevalence of hypertension was low, which may limit external validity.[8,11] Additionally, several studies predominantly included White or Chinese participants, potentially limiting the generalizability of findings to Southeast Asian populations.[8–13]

Although reduced fecundability is nonfatal, it may cause substantial psychological and social distress. Infertility affects over 180 million couples in low- and middle-income countries (LMICs), where a woman's social value may be closely linked to her ability to conceive. In some settings, infertility is associated with stigma, discrimination, gender-based violence, social exclusion, and abandonment.[24]

Current guidelines for women with hypertension who are planning pregnancy primarily focus on preventing maternal and foetal complications rather than improving fertility. Recommended management includes switching to pregnancy-safe antihypertensives, avoiding teratogenic agents such as ACEIs, ARBs, and direct renin inhibitors, optimizing lifestyle factors, and providing low-dose aspirin and folic acid supplementation.[5] Early fertility evaluation may also be considered, including assessment of ovulatory function, ovarian reserve, pelvic anatomy, and semen parameters.[25]

This is the first review to evaluate the

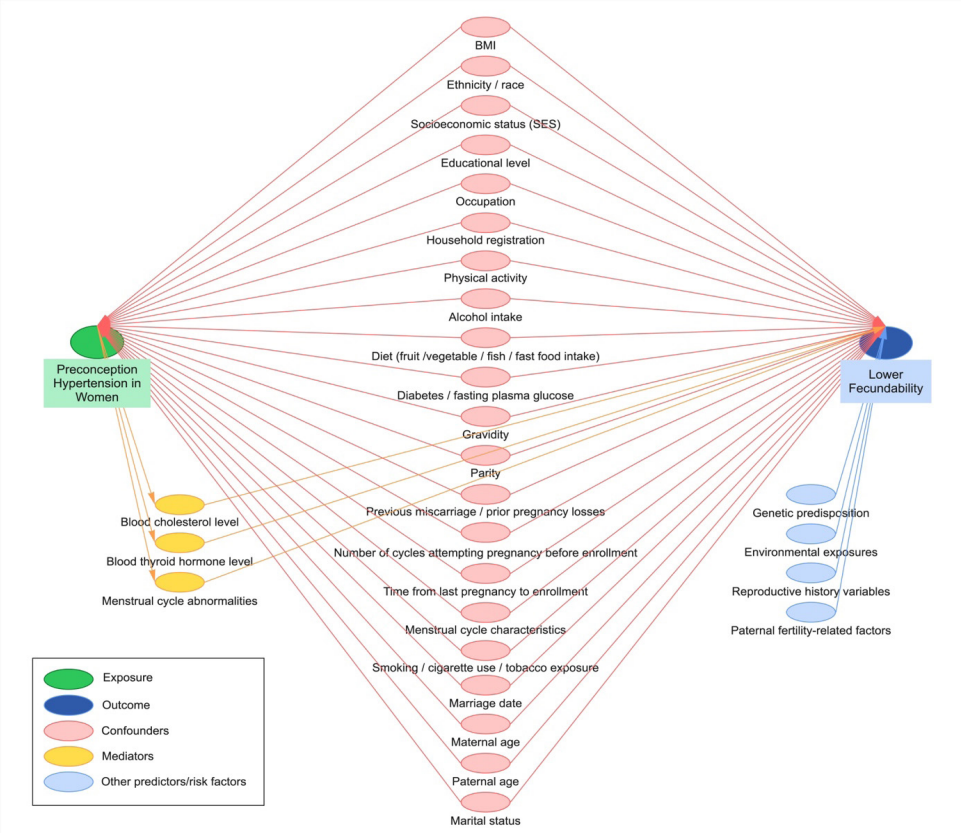


Figure 4 Directed Acyclic Graph of Association between Preconception Hypertension in Women and Lower Fecundability

link between preconception hypertension and reduced fecundability, and no other meta-analyses currently address this topic. This gap underscores the need for future population-based prospective cohort studies, particularly in more representative populations such as Southeast Asians, to better define this association.

Conclusion

Preconception hypertension may be associated with lower fecundability, whereas associations with infertility risk and time to pregnancy remain exploratory rather than definitive due to heterogeneity and a limited number of studies. Further studies are required to confirm plausible biological pathways, incorporating objective male reproductive measures and more diverse and larger populations. In the interim, blood pressure optimization and fertility assessment before pregnancy are recommended.

References

1. Liu F, Lu X. Hypertension and human health: Evidence and prospects [Internet]. 2024 May. doi:10.1002/cdt3.129
2. Muharram FR, Widyahening IS, Danaei G. Hypertension care performance in Indonesia: evidence from three waves of nationally representative cross-sectional surveys. BMJ Open. 2025 Dec 31;15(12):e109588. doi:10.1136/bmjopen-2025-109588 PubMed PMID: 41475816; PubMed Central PMCID: PMC12766852.
3. 2020InternationalSocietyofHypertension Global Hypertension Practice Guidelines

| Hypertension [Internet]. [cited 2025 Nov 18]. Available from: https://www.ahajournals.org/doi/10.1161/HYPERTENSIONAHA.120.15026
4. Arbelo E, Protonotarios A, Gimeno JR, Arbustini E, Barriales-Villa R, Basso C, et al. 2023 ESC Guidelines for the management of cardiomyopathies: Developed by the task force on the management of cardiomyopathies of the European Society of Cardiology (ESC). Eur Heart J. 2023;44(37):3503–626. Located at: Scopus. doi:10.1093/eurheartj/ehad194
5. 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines | Circulation [Internet]. [cited 2025 Nov 18]. Available from: https://www.ahajournals.org/doi/10.1161/CIR.0000000000001356
6. Harrison DG, Coffman TM, Wilcox CS. Pathophysiology of Hypertension. Circ Res. 2021 Apr 2;128(7):847–63. doi:10.1161/CIRCRESAHA.121.318082
7. Lakatos E, Szigeti JF, Ujma PP, Sexty R, Balog P. Anxiety and depression among infertile women: a cross-sectional survey from Hungary. BMC Womens Health. 2017 Jul 24;17(1):48. doi:10.1186/s12905-017-0410-2 PubMed PMID: 28738833; PubMed Central PMCID: PMC5525318.
8. Xiong W, Han L, Tang X, Li R, Chen W, Liu X, et al. Maternal Hypertension and Fecundability: A Population-Based Cohort Study. Hypertension. 2024 Dec;81(12):e173–84. doi:10.1161/HYPERTENSIONAHA.124.23562
9. Grieger JA, Grzeskowiak LE, Smithers LG, Bianco-Miotto T, Leemaqz SY, Andraweera P, et al. Metabolic syndrome and time to pregnancy: a retrospective study of nulliparous women. BJOG Int J Obstet Gynaecol. 2019 Jun;126(7):852–62. doi:10.1111/1471-0528.15647 PubMed PMID: 30734474.
10. Loy SL, Chan DWK, Ku CW, Cheung YB, Godfrey KM, Tan KML, et al. Metabolic health status and fecundability in a Singapore preconception cohort study. Am J Obstet Gynecol. 2022 May;226(5):714.e1-714.e16. doi:10.1016/j.ajog.2021.11.1374 PubMed PMID: 34921802; PubMed Central PMCID: PMC7612690.
11. Hong X, Zhao J, Huang K, Dai Q, Zhang H, Xuan Y, et al. Preconception blood pressure and time to pregnancy among couples attempting to conceive their first pregnancy - PubMed [Internet]. 2019 [cited 2025 Dec 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/31152709/
12. Nobles CJ, Mendola P, Mumford SL, Naimi AI, Yeung EH, Kim K, et al. Preconception Blood Pressure Levels and Reproductive Outcomes in a Prospective Cohort of Women Attempting Pregnancy. Hypertens Dallas Tex 1979. 2018 May;71(5):904–10. doi:10.1161/HYPERTENSIONAHA.117.10705 PubMed PMID: 29610265; PubMed Central PMCID: PMC5897130.
13. Eisenberg ML, Sundaram R, Maisog J, Buck Louis GM. Diabetes, medical comorbidities and couple fecundity. Hum Reprod Oxf Engl. 2016 Oct;31(10):2369–76. doi:10.1093/humrep/dew200 PubMed PMID: 27591240; PubMed Central PMCID: PMC5027928.
14. Kementerian Kesehatan Republik Indonesia. PEDOMAN NASIONAL PELAYANAN KEDOKTERAN TATA LAKSANA HIPERTENSI DEWASA [Internet]. Jakarta; 2021. Available from: https://kemkes.go.id/id/pnpk-2021---

tata-laksana-hipertensi-dewasa
15. Tiksnadi A, Mumpuni SA, Dewi PP, Suling RF, Hustrini N, Hidayat R, et al. PANDUAN PENGENALAN DAN TATALAKSANA HIPERTENSI RESISTEN DI INDONESIA 2024 [Internet]. Jakarta: INASH; 2024. Available from: https://admin.inash.or.id/cdn/File/Konsensus%20InaSH%202024.pdf
16. Doumas M, Tsiodras S, Tsakiris A, Douma S, Chounta A, Papadopoulos A, et al. Female sexual dysfunction in essential hypertension: a common problem being uncovered. J Hypertens. 2006 Dec;24(12):2387–92. doi:10.1097/01.hjh.0000251898.40002.5b PubMed PMID: 17082720.
17. Ribeiro RA, Raineki C, Gonçalves O, Franci CR, Lucion AB, Sanvitto GL. Reproductive Dysfunction in Female Rats With Renovascular Hypertension. Am J Hypertens. 2013 Jan 1;26(1):104–10. doi:10.1093/ajh/hps026
18. Verit FF, Zeyrek FY, Zebitay AG, Akyol H. Cardiovascular risk may be increased in women with unexplained infertility. Clin Exp Reprod Med. 2017 Mar 31;44(1):28–32. doi:10.5653/cerm.2017.44.1.28
19. Gkaliagkousi E, Passacquale G, Douma S, Zamboulis C, Ferro A. Platelet activation in essential hypertension: implications for antiplatelet treatment. Am J Hypertens. 2010 Mar;23(3):229–36. doi:10.1038/ajh.2009.247 PubMed PMID: 20094035.
20. Talmor A, Dunphy B. Female obesity and infertility. Best Pract Res Clin Obstet Gynaecol. 2015 May;29(4):498–506. doi:10.1016/j.bpobgyn.2014.10.014 PubMed PMID: 25619586.
21. Rowe T. Fertility and a woman's age. J Reprod Med. 2006 Mar;51(3):157–63. PubMed PMID: 16674009.
22. Kidd SA, Eskenazi B, Wyrobek AJ. Effects of male age on semen quality and fertility: a review of the literature. Fertil Steril. 2001 Feb;75(2):237–48. doi:10.1016/s0015-0282(00)01679-4 PubMed PMID: 11172821.
23. Eisenberg ML, Kim S, Chen Z, Sundaram R, Schisterman EF, Buck Louis GM. The relationship between male BMI and waist circumference on semen quality: data from the LIFE study. Hum Reprod Oxf Engl. 2014 Feb;29(2):193–200. doi:10.1093/humrep/det428 PubMed PMID: 24306102; PubMed Central PMCID: PMC3896223.
24. Ombelet W, Lopes F. FERTILITY CARE IN LOW AND MIDDLE INCOME COUNTRIES: Fertility care in low- and middle-income countries. Reprod Fertil. 2024 Jul 4;5(3):e240042. doi:10.1530/RAF-24-0042 PubMed PMID: 38833569; PubMed Central PMCID: PMC11301530.
25. Hendarto H, Wiweko B, Santoso B, Harzif KA. Konsensus Penanganan Infertilitas 2019 HIFERI dan POGI [Internet]. Jakarta: HIFERI dan POGI; 2019 [cited 2025 Dec 23]. Available from: https://www.pogi.id/document/6/detail.html