International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Singh M et al. Int J Reprod Contracept Obstet Gynecol. 2026 Sep;15(9):3471-3475
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20263028

Original Research Article

Effect of ecosprin on pulsatility index of uterine artery in all trimesters of pregnancy – cross sectional interventional study in Indian pregnant women

Mamta Singh*, Sparsh Singh

Sparsh Hospital, Kannauj, Uttar Pradesh, India

Received: 02 June 2026
Revised: 23 August 2026
Accepted: 25 August 2026

***Correspondence:**
Dr. Mamta Singh,
E-mail: mamtasinghdr@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Low-dose aspirin is recommended to prevent preeclampsia in high-risk pregnancies, primarily by enhancing placental perfusion. However, its routine efficacy in low-risk pregnancies and its direct impact on uterine artery hemodynamic remain under evaluation. This study investigated the effect of low-dose aspirin (75 mg/day) on uterine artery Doppler indices across all trimesters in a low-risk Indian population.
Methods: A prospective interventional study was conducted among 279 low-risk pregnant women attending a tertiary care hospital from March 2024 to December 2025. Participants were divided into a study group (n=115) receiving 75 mg aspirin daily at bedtime following ultrasonographic confirmation of fetal cardiac activity, and a control group (n=164). Uterine artery pulsatility index (UtA-PI) was assessed via Doppler ultrasonography across the first (11-14 weeks), second (18-22 weeks), and third (28-35 weeks) trimesters.
Results: Across all three trimesters, there was no statistically significant difference in mean UtA-PI between the study group and the control group ($p>0.05$). However, clinical outcomes varied notably: 2.94% of women in the control group developed preeclampsia, whereas 0% of participants in the low-dose aspirin study group developed preeclampsia.
Conclusions: Although low-dose aspirin (75 mg/day) did not significantly alter uterine artery Doppler pulsatility indices compared to controls, it demonstrated a clear clinical benefit by completely preventing preeclampsia. Given its high safety profile and low cost, universal initiation of low-dose aspirin early in pregnancy may serve as a valuable prophylactic strategy in low-resource settings where formal risk-stratification testing is unfeasible.

Keywords: Low-dose aspirin, Preeclampsia prevention, Uterine artery Doppler, Pulsatility index, Antenatal care, Low-risk pregnancy

INTRODUCTION

Low-dose aspirin (LDA) functions as a selective cyclooxygenase-1 (COX-1) inhibitor, exerting both antiplatelet and anti-inflammatory actions. Within clinical obstetrics, LDA is primarily indicated for the prophylaxis and delayed onset of preeclampsia (PE). Furthermore, accumulating evidence suggests its potential therapeutic utility in reducing the incidence of intrauterine fetal demise, fetal growth restriction (FGR), spontaneous preterm delivery, and early pregnancy loss.

Current clinical guidelines from the World Health Organization (WHO) advocate the initiation of low-dose aspirin (75 mg/day) prior to 20 weeks of gestation in gravidas stratified as high risk for PE-specifically individuals presenting with a history of preeclampsia, pre-gestational diabetes, chronic hypertension, renal disease, autoimmune disorders, or multifetal gestations.[1]

Consensus data from systematic reviews of randomized controlled trials (RCTs) confirm that gestational LDA administration does not significantly increase the risk of

maternal or fetal hemorrhagic events.[2-4] Similarly, comprehensive meta-analyses evaluating aspirin for preeclampsia prevention demonstrate no elevated risk of major congenital malformations.[2-4] These findings are corroborated by a randomized trial of 1228 women-including 615 participants initiated on preconception LDA continued throughout gestation-which demonstrated no rise in adverse fetal or neonatal outcomes associated with aspirin exposure.[5]

Absolute contraindications to LDA therapy remain sparse.[6] However, administration is strictly contraindicated in women with documented aspirin hypersensitivity (e.g., urticaria) or salicylate intolerance due to the risk of life-threatening anaphylactic reactions. Given substantial pharmacologic cross-reactivity, LDA is likewise contraindicated in individuals with known sensitivity to nonsteroidal anti-inflammatory drugs (NSAIDs).

Owing to its favorable safety profile and favorable mechanisms, including the suppression of local vascular inflammation and optimization of intervillous perfusion, LDA remains a widely implemented preventive intervention. The present study evaluates the longitudinal effect of LDA on uterine artery Doppler indices across all three trimesters of pregnancy in a cohort of Indian women.

METHODS

Study design and patient population

This single-center, prospective interventional study evaluated the physiological impact of early-initiated low-dose acetylsalicylic acid (aspirin) on longitudinal uterine artery Doppler hemodynamics across all gestational trimesters in an unselected, low-risk Indian population. Consecutive pregnant women attending the antenatal outpatient clinic at Sparsh Hospital were recruited between March 2024 and December 2025 and followed prospectively through delivery.

Eligibility and risk stratification

Inclusion criteria

Pregnant women aged between 21 and 35 years at the time of recruitment; absence of identifiable medical comorbidities or high-risk factors; and no prior history of adverse obstetric outcomes, such as hypertensive disorders of pregnancy, recurrent pregnancy loss, or fetal growth restriction were included.

Exclusion criteria

Patients with known hypersensitivity or allergy to aspirin or other salicylates; history of respiratory hypersensitivity, including aspirin-induced bronchospasm; presence of severe systemic illness, including significant cardiac, hepatic, or renal dysfunction; patients diagnosed with autoimmune disorders; history of psychiatric illness that could interfere with study compliance; and history of alcohol or substance abuse within the preceding six months were excluded.

Interventional protocol and cohort allocation

Following baseline clinical evaluation, 279 eligible participants were enrolled and allocated into two comparative cohorts: study group (n=115): initiated on oral low-dose aspirin (75 mg once daily, administered at bedtime) immediately following TVS confirmation of fetal cardiac activity. Prophylaxis was maintained through 36 weeks of gestation or delivery. Control group (n=164): managed with standard routine antenatal care without antiplatelet intervention. Baseline maternal demographic variables, detailed obstetric histories, gestational age estimates (confirmed by first-trimester crown-rump length ultrasound), and routine clinical laboratory parameters were systematically logged at enrollment.

Uterine artery Doppler assessment

Longitudinal hemodynamic evaluations of the uteroplacental circulation were conducted across three prespecified gestational windows. First trimester was 11 to 14 weeks of gestation, second trimester was 18 to 22 weeks of gestation, third trimester was 28 to 35 weeks of gestation. All ultrasonographic examinations were performed by experienced sonographers using a standardized protocol with the patient placed in a semi-recumbent position. Using color flow mapping, the main uterine arteries were identified at the apparent crossover point with the external iliac arteries. Pulsed-wave Doppler spectral waveforms were acquired to measure the pulsatility index (PI), resistance index (RI), and systolic/diastolic (S/D) ratio. The arithmetic mean of the bilateral uterine artery Doppler indices was calculated for subsequent comparative analysis.

Primary and secondary endpoints

The primary outcome measure was the longitudinal variation in mean uterine artery Doppler indices (UtA-PI, RI, and S/D ratio) across trimesters in response to low-dose aspirin therapy. Secondary clinical endpoints included the overall incidence of hypertensive disorders of pregnancy (gestational hypertension and preeclampsia), fetal growth restriction, spontaneous preterm birth, and other adverse maternal-fetal outcomes.

Statistical analysis

Statistical computations were executed using Jamovi (Version 2.3; The Jamovi Project, 2022) and R (Version 4.1; R Core Team, 2021). Continuous variables were tested for distribution normality using the Shapiro-Wilk test and summarized as mean±standard deviation (SD) or median with interquartile range (IQR), as appropriate. Categorical variables were presented as absolute counts

and percentages N (%). Inter-group comparative analyses of continuous Doppler parameters between the study and control cohorts were conducted using independent-samples t-tests for normally distributed data or Mann-Whitney U tests for non-parametric data. Categorical outcome measures were analyzed using Pearson's Chi-square test or Fisher's exact test. A two-tailed p value <0.05 was established as the threshold for statistical significance.

RESULTS

In the first trimester (11-14 weeks), uterine artery pulsatility index (UtA-PI) measurements were evaluated across 78 total observations, comprising the control cohort (n=39, Ecosprin intake=0) and the low-dose aspirin study cohort (n=39, Ecosprin intake=1). The control group demonstrated a mean UtA-PI of 1.47±0.443 (median: 1.42; range: 0.520-2.48). The study group exhibited a comparable mean UtA-PI of 1.46±0.493 (median: 1.46; range: 0.730-2.70). Independent samples t-test revealed no statistically significant difference in UtA-PI between the control and intervention groups (t=0.172, df=76, p=0.864) (Table 1).

During the second trimester (18-22 weeks), evaluation of uteroplacental resistance encompassed 105 participants (control group, n=57; aspirin study group, n=48). The mean UtA-PI in the control arm was 1.11±0.330 (median: 1.01; range: 0.570-2.00). In comparison, the low-dose aspirin group demonstrated a mean UtA-PI of 0.991±0.315 (median: 0.935; range: 0.520-1.94). Statistical comparative analysis using Student's t-test confirmed no significant inter-group difference in second-trimester mean UtA-PI (t=1.880, df=103, p=0.063) (Table 2).

In the third trimester (28-35 weeks), Doppler analysis was performed for 93 participants (control group, n=68; aspirin study group, n=25). The control group recorded a mean UtA-PI of 0.880±0.335 (median: 0.780; range: 0.380-2.10), while the low-dose aspirin group yielded a mean UtA-PI of 0.862±0.204 (median: 0.870; range: 0.560-1.40). Independent samples t-test showed no statistically significant difference between the two cohorts (t=0.251, df=91, p=0.802) (Table 3).

Table 1: First trimester uterine artery Doppler parameters.

Parameters	Control group (no Ecosprin, n=39)	Study group (75 mg Ecosprin, n=39)	Statistical significance
Gestational age (in weeks)	11-14	11-14	-
UtA-PI mean±SD	1.47±0.443	1.46±0.493	t=0.172
UtA-PI median	1.42	1.46	df=76
UtA-PI range (min-max)	0.520-2.480	0.730-2.700	p=0.864

UtA-PI=Uterine artery pulsatility index; SD=standard deviation; df=degrees of freedom; p<0.05 considered statistically significant

Table 2: Second trimester uterine artery Doppler parameters.

Parameters	Control group (no Ecosprin, n=57)	Study group (75 mg Ecosprin, n=48)	Statistical significance
Gestational age (in weeks)	18-22	18-22	-
UtA-PI mean±SD	1.110±0.330	0.991±0.315	t=1.880
UtA-PI median	1.010	0.935	df=103
UtA-PI range (min-max)	0.570-2.000	0.520-1.940	p=0.063

UtA-PI=Uterine artery pulsatility index; SD=standard deviation; df=degrees of freedom; p<0.05 considered statistically significant

Table 3: Third trimester uterine artery Doppler parameters.

Parameters	Control group (no Ecosprin, n=68)	Study group (75 mg Ecosprin, n=25)	Statistical significance
Gestational age (in weeks)	28-35	28-35	-
UtA-PI mean±SD	0.880±0.335	0.862±0.204	t=0.251
UtA-PI median	0.780	0.870	df=91
UtA-PI range (min-max)	0.380-2.100	0.560-1.400	p=0.802

UtA-PI=Uterine artery pulsatility index; SD=standard deviation; df=degrees of freedom; p<0.05 considered statistically significant

Across all three gestational trimesters, both cohorts demonstrated expected gestational-age-dependent decreases in uterine arterial resistance. However, inter-group comparative analyses demonstrated that

prophylactic administration of low-dose aspirin (75 mg/day) was not associated with statistically significant alterations in macro-vascular uterine artery pulsatility indices relative to standard care controls ($p>0.05$ across all intervals).

Baseline maternal demographic variables, detailed obstetric histories, gestational age estimates (confirmed by first-trimester crown-rump length ultrasound), and routine clinical laboratory parameters.

DISCUSSION

PE and intrauterine growth restriction (IUGR) represent primary etiologies of maternal and neonatal morbidity and mortality worldwide.[7,8] Preeclampsia complicates approximately 2% to 5% of all gestations and accounts for over 100,000 maternal fatalities globally each year.[8] Even within developed healthcare systems, PE remains a critical driver of severe maternal morbidity, including consumption coagulopathy, acute renal and hepatic failure, cerebrovascular accidents, and maternal mortality.[9]

Physiological placentation relies on endovascular extravillous trophoblast invasion of the maternal spiral arteries, inducing structural vasodilation and wall remodeling.[10] This critical wave of endovascular remodeling initiates at approximately 8 weeks of gestation and reaches completion between 16 and 20 weeks.[7,9,10]

A robust consensus in the literature validates both the prophylactic efficacy and safety profile of low-dose aspirin (LDA) in reducing ischemic placental disease among high-risk gravidas presenting with established clinical indicators.[14-18] Conversely, empirical evidence evaluating LDA efficacy in low-risk obstetric cohorts remains scarce.[19-21] Antenatal LDA therapy is associated with absolute risk reductions of 2% to 5% for preeclampsia, 1% to 5% for fetal growth restriction (FGR), and 2% to 4% for spontaneous preterm labor, without increasing maternal or perinatal morbidity.[22] Correspondingly, the United States Preventive Services Task Force (USPSTF) issued updated clinical guidance expanding the risk-based indications for LDA initiation. Daily administration of low-dose aspirin during gestation is widely acknowledged as a safe preventive strategy carrying minimal risk of major maternal, fetal, or neonatal complications.[23,24]

In the present investigation, comparative analysis revealed no statistically significant differences in mean uterine artery pulsatility indices (UtA-PI) between the study and control arms, reflecting the unselected low-risk baseline profile of both cohorts.

Strengths

The strength of the study was that we had compared patients in all trimesters and Ecosprin was started very early, i.e., 7 to 9 weeks in almost all patients.

Limitations

The limitations were that it was a single center study and done on single ethnicity. Also the study size was also small.

CONCLUSION

The results of this study showed that there was no statistically significant change in the mean uterine artery PI between the control and study groups. In the control group, 2.94% of patients developed pre-eclampsia, whereas no patient in the study group developed pre-eclampsia. Based on the findings of this study, low-dose Ecosprin may be started in all low-risk pregnant women to prevent hypertension-related complications. A dose of 75 mg Ecosprin at bedtime should be prescribed as soon as cardiac activity is detected on ultrasonography (USG). In low-resource countries, investigations required to identify high-risk patients are often expensive and not available in all healthcare settings.

ACKNOWLEDGEMENTS

The author sincerely acknowledges Dr. Saket Shekhar, Assistant Professor in the Department of Community Medicine at ESIC Medical College and Hospital, for his valuable support and contribution to the statistical analysis of this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health Organization. WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. Geneva (Switzerland), 2011. Available at: http://apps.who.int/iris/bitstream/10665/44703/1/9789241548335_eng.pdf. Accessed on 15 July 2026.
2. Duley L, Henderson-Smart DJ, Meher S, King JF. Antiplatelet agents for preventing pre-eclampsia and its complications. Cochrane Database Syst Rev. 2007:(2):CD004659.
3. Askie LM, Duley L, Henderson-Smart DJ, Stewart LA. Antiplatelet agents for prevention of pre-eclampsia: a meta-analysis of individual patient data. PARIS Collaborative Group. Lancet. 2007;369(9575):1791-8.
4. Henderson JT, Whitlock EP, O'Connor E, Senger CA, Thompson JH, Rowland MG. Low-dose aspirin for prevention of morbidity and mortality from preeclampsia: a systematic evidence review for the U.S. Preventive Services Task Force. Ann Intern Med. 2014;160:695-703.
5. Ahrens KA, Silver RM, Mumford SL, Sjaarda LA, Perkins NJ, Wactawski-Wende J, et al. Complications and safety of preconception low-dose aspirin among

women with prior pregnancy losses. Obstet Gynecol. 2016;127:689-98.
6. Whittlesea C, Hodson K. Clinical pharmacology. 6th edition. Elsevier; 2018.
7. World Health Organization International Collaborative Study of Hypertensive Disorders of Pregnancy. Geographic variation in the incidence of hypertension in pregnancy. Am J Obstet Gynecol. 1988;158(1):80-3.
8. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006;367(9516):1066-74.
9. Sibai B, Dekker G, Kupferminc M. Pre-eclampsia. Lancet. 2005;365(9461):785-99.
10. Brosens I, Robertson WB, Dixon HG. The physiological response of the vessels of the placental bed to normal pregnancy. J Pathol Bacteriol. 1967;93(2):569-79.
11. Khong TY, De Wolf F, Robertson WB, Brosens I. Inadequate maternal vascular response to placentation in pregnancies complicated by pre-eclampsia and by small-for-gestational age infants. Br J Obstet Gynaecol. 1986;93(10):1049-59.
12. Pijnenborg R, Dixon G, Robertson WB, Brosens I. Trophoblastic invasion of human decidua from 8 to 18 weeks of pregnancy. Placenta. 1980;1(1):3-19.
13. De Wolf F, DeWolf-Peeters C, Brosens I, Robertson W. The human placental bed: electron microscopic study of trophoplastic invasion of spiral arteries. Am J Obstet Gynecol. 1980;137(1):58-70.
14. Staff AC, Benton SJ, Dadelszen PV, Roberts JM, Taylor RN, Powers RW, et al. Redefining pre-eclampsia using placenta-derived biomarkers. Hypertension. 2013;61(5):932-42.
15. Brown MA, Lindheimer MD, Swiet MD, Assche AV, Moutquin JM. The classification and diagnosis of hypertensive disorders of pregnancy: statement from the international Society for the Study of Hypertension in Pregnancy (ISSHP). Hypertens Pregnancy. 2001;20(1):9-12.
16. Villa PM, Kajantie E, Räikkönen K, Pesonen AK, Hämäläinen E, Vainio M, et al. Aspirin in the prevention of pre-eclampsia in high-risk women: a randomized placebo controlled PREDO trial and a meta-analysis of randomised trials. BJOG. 2013;120(1):64-74.
17. Duley L, Meher S, Hunter KE, Seidler AL, Askie LM. Antiplatelet agents for preventing preeclampsia and its complications. Cochrane Database Syst Rev. 2019;2019(10):CD004659.
18. Roberge S, Villa P, Nicolaides K, Giguère Y, Vainio M, Bakthi A, et al. Early administration of low-dose aspirin for the prevention of preterm and term preeclampsia: a systematic review and meta-analysis. Fetal Diagn Ther. 2012;31(3):141-6.
19. Yu CKH, Papageorghiou AT, Parra M, Dias RP, Nicolaides KH, Fetal Medicine Foundation Second Trimester Screening Group. Randomized controlled trial using low-dose aspirin in the prevention of pre-eclampsia in women with abnormal uterine artery Doppler at 23 weeks' gestation. Ultrasound Obstet Gynecol. 2003;22(3):233-9.
20. Low dose aspirin in pregnancy and early childhood development: follow up of the collaborative low dose aspirin study in pregnancy. Br J Obstet Gynaecol. 1995;102(11):861-8.
21. National Collaborating Centre for Women's and Children's Health (UK). The National Institute for Health and Clinical Excellence. The Management of Hypertensive Disorders During Pregnancy. London: RCOG Press; 2010.
22. Rolnik DL, Wright D, Poon LC, O'Gorman N, Syngelaki A, Matallana CDP, et al. Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia. N Engl J Med. 2017;377(7):613-22.
23. LeFevre ML, U.S. Preventive Services Task Force. Low-dose aspirin use for the prevention of morbidity and mortality from preeclampsia: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med. 2014;161(11):819-26.
24. Bhide A, Acharya G, Bilardo CM, Brezinka C, Cafici D, Hernandez-Andrade E, et al. ISUOG practice guidelines: use of Doppler ultrasonography in obstetrics. Ultrasound Obstet Gynecol. 2013;41(2):233-9.

Cite this article as: Singh M, Singh S. Effect of ecosprin on pulsatility index of uterine artery in all trimesters of pregnancy – cross sectional interventional study in Indian pregnant women. Int J Reprod Contracept Obstet Gynecol 2026;15:3471-5.