

Original Research Article

EFFICACY OF LOW-DOSE ASPIRIN (ECOSPRIN) IN PREVENTING PREECLAMPSIA, ECLAMPSIA, AND HELLP SYNDROME IN WOMEN WITH ABNORMAL FIRST-TRIMESTER UTERINE ARTERY DOPPLER: AN OBSERVATIONAL STUDY FROM A RURAL TERTIARY CARE CENTRE IN SOUTH INDIA

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ABSTRACT

Background: Preeclampsia, eclampsia, and HELLP syndrome remain leading causes of maternal and perinatal morbidity worldwide, arising from defective trophoblastic invasion and uteroplacental insufficiency. First-trimester uterine artery Doppler (UAD) identifies women at high risk of these placental disorders, and low-dose aspirin initiated before 16 weeks is the only intervention with trial-level evidence for risk reduction.

Objective: To evaluate the efficacy of low-dose aspirin (Ecosprin 150 mg once daily) in preventing preeclampsia, eclampsia, and HELLP syndrome among primigravid women who screened positive on first-trimester uterine artery Doppler.

Methods: This observational analysis was nested within a prospective comparative study of 100 primigravid women (11⁶ / 7 – 13⁶ / 7 weeks) screened by transabdominal UAD at PES Institute of Medical Sciences and Research, Kuppam, over 18 months (April 2024–October 2025). All 19 women with abnormal Doppler were offered Tab. Aspirin 150 mg once daily; 17 (89.5%) were compliant (initiated at a mean of 12.56 ± 0.27 weeks) and 2 discontinued within 4 weeks due to gastritis and were classified non-compliant. Maternal and fetal outcomes were compared between compliant and non-compliant women within this high-risk subgroup.

Results: No case of eclampsia, ICU admission, or HELLP syndrome occurred among the 17 aspirin-compliant women. Both non-compliant women developed preeclampsia; one progressed to severe preeclampsia, eclampsia, and ICU admission, with emergency LSCS at 35 weeks and a low-birth-weight neonate requiring prolonged NICU stay. No case of HELLP syndrome was observed in either subgroup. Given the very small non-compliant subgroup (n=2), between-group significance testing was not meaningful for these outcomes; the findings are presented as a descriptive, hypothesis-generating comparison.

Conclusion: Within the limits of a small, non-randomised high-risk subgroup, compliance with Doppler-triggered low-dose aspirin prophylaxis was associated with the complete absence of eclampsia and ICU admission, while both instances of eclampsia-range severity in the cohort occurred in non-compliant women. These real-world observations are directionally consistent with trial-level evidence for early aspirin prophylaxis and support reinforcing compliance counselling in Doppler-identified high-risk women, though they cannot establish causality.

Keywords: Preeclampsia; Eclampsia; HELLP syndrome; Low-dose aspirin; Ecosprin; Uterine artery Doppler; Primigravida; Preeclampsia prophylaxis

INTRODUCTION

Preeclampsia complicates approximately 2–8% of pregnancies worldwide and remains a leading cause of maternal death, preterm birth, and long-term maternal and offspring cardiovascular risk.¹² Its most severe expressions — eclampsia and HELLP (haemolysis, elevated liver enzymes, low platelets) syndrome — carry disproportionately high rates of maternal mortality, ICU admission, and adverse perinatal outcome, and both are, in principle, preventable if the underlying placental pathology is identified and modified early enough in pregnancy.

The pathophysiological basis for prevention lies in the two-stage model of preeclampsia: defective trophoblastic invasion and failure of spiral artery remodelling in the first trimester (Stage 1) precede the systemic maternal endothelial syndrome that follows in the second half of pregnancy (Stage 2). Because Stage 1 predates clinical disease by many weeks, first-trimester uterine artery Doppler (UAD) — which directly interrogates uteroplacental vascular resistance — offers a window for risk stratification before the maternal syndrome becomes irreversible.³

Low-dose aspirin, through irreversible inhibition of platelet thromboxane A₂ synthesis and favourable modulation of the prostacyclin–thromboxane balance at the trophoblast–decidual interface, is the only pharmacological intervention with randomised trial evidence for reducing preterm preeclampsia when started before 16 weeks of gestation. The ASPRE trial demonstrated a 62% reduction in preterm preeclampsia with aspirin 150 mg/day initiated before 16 weeks in women identified as high-risk by a combined first-trimester screening algorithm.⁴ Aspirin's efficacy is critically time-dependent: benefit is consistently shown when initiated before, but not reliably after, 16 weeks, reflecting the window during which trophoblastic invasion and spiral artery remodelling are still amenable to modification.⁵

Despite this evidence, real-world data on Doppler-triggered aspirin prophylaxis — particularly its association with the most severe endpoints of preeclampsia (eclampsia and HELLP syndrome) rather than preeclampsia alone — remain limited, especially from resource-constrained, primarily rural obstetric settings in India where routine combined first-trimester screening algorithms are not

universally available. Uterine artery Doppler alone, without paired biochemical or biophysical markers, is nonetheless a pragmatic and accessible criterion for selecting aspirin-eligible women in such settings. This article examines an institutional cohort of Doppler-screened primigravid women in whom aspirin (Ecosprin) prophylaxis was initiated on the basis of an abnormal first-trimester uterine artery Doppler, with the specific aim of describing its association with the prevention of preeclampsia, eclampsia, and HELLP syndrome.

Aims and Objectives:

To evaluate the efficacy of low-dose aspirin (Ecosprin 150 mg once daily) in preventing preeclampsia, eclampsia, and HELLP syndrome among primigravid women who screened positive on first-trimester uterine artery Doppler.

MATERIALS AND METHODS

Study design and setting: Observational analysis nested within a prospective comparative study conducted in the Department of Obstetrics and Gynaecology, PES Institute of Medical Sciences and Research (PESIMSR), Kuppam, Andhra Pradesh, over 18 months (April 2024–October 2025).

Study population: All primigravid women between 11⁶/₇ and 13⁶/₇ weeks of gestation attending antenatal care were screened by transabdominal uterine artery Doppler and serum β -hCG. Women with multiple gestation, known fetal malformation, or pre-existing comorbidities (gestational or overt diabetes, chronic hypertension, hypothyroidism) were excluded. Of 100 screened women, 19 (19%) had an abnormal uterine artery Doppler and form the high-risk subgroup analysed here.

Aspirin protocol: All 19 women with abnormal Doppler were prescribed Tab. Aspirin (Ecosprin) 150 mg once daily. Compliance was defined as continued use through pregnancy; women who discontinued were classified as non-compliant, with the reason for discontinuation documented. Seventeen women (89.5%) were compliant, initiated at a mean gestational age of 12.56 ± 0.27 weeks (range 12.1–13.3 weeks) — within the evidence-based window of initiation before 16 weeks. Two women discontinued within 4 weeks of starting aspirin because of severe gastritis and were classified as non-compliant.

Follow-up and outcome definitions: Women were followed to delivery with serial blood pressure measurement, urine protein assessment, and clinical evaluation for severe features (headache, visual disturbance, epigastric pain, breathlessness). Preeclampsia was defined as blood pressure $\geq 140/90$ mmHg after 20 weeks on two occasions ≥ 4 hours apart with proteinuria $\geq 1+$ on dipstick (or ≥ 30 mg/dL) or 24-hour urinary protein ≥ 300 mg, or new-onset end-organ dysfunction with or without proteinuria. Severe preeclampsia, eclampsia, and HELLP syndrome were defined per standard obstetric criteria. Maternal outcomes recorded included severe preeclampsia, eclampsia, HELLP syndrome, ICU admission, preterm delivery (<37 weeks), and mode of delivery; fetal outcomes included birth weight, Apgar scores, and NICU admission.

Statistical analysis: Descriptive statistics (mean $\pm$ SD, frequencies, percentages) were used to

summarise the compliant ($n=17$) and non-compliant ($n=2$) subgroups within the abnormal-Doppler cohort. Given the very small size of the non-compliant subgroup, inferential testing was not applied to this within-subgroup comparison; findings are presented descriptively as case-level and proportional data. Ethical clearance was obtained from the Institutional Human Ethics Committee, and written informed consent was taken from all participants.

RESULTS

Of 100 primigravid women screened, 19 (19.0%) had an abnormal first-trimester uterine artery Doppler and were started on Ecosprin 150 mg/day. Seventeen (89.5%) remained compliant through pregnancy; 2 (10.5%) discontinued within 4 weeks due to gastritis.

Table 1. Aspirin Initiation and Compliance in the Abnormal-Doppler Subgroup (n=19)

Parameter	Value
Total abnormal Doppler (aspirin-eligible)	19
Aspirin compliant	17 (89.5%)
Non-compliant (discontinued – gastritis)	2 (10.5%)
Mean GA at initiation, compliant group (weeks $\pm$ SD)	12.56 $\pm$ 0.27
Range of GA at initiation (weeks)	12.1–13.3

Table 2. Maternal and Fetal Outcomes by Aspirin Compliance Status, Abnormal-Doppler Subgroup (n=19)

Outcome	Compliant (n=17)	Non-compliant (n=2)
Preeclampsia (any)	5 (29.4%)	2 (100%)
Severe preeclampsia	1 (5.9%)	1 (50%)
Eclampsia	0 (0.0%)	1 (50%)
HELLP syndrome	0 (0.0%)	0 (0.0%)
ICU admission	0 (0.0%)	1 (50%)
Preterm delivery (<37 weeks)	4 (23.5%)	1 (50%)
Emergency LSCS for eclampsia/severe PE	1 (5.9%)	1 (50%)
Low birth weight (<2500 g)	5 (29.4%)	1 (50%)
NICU admission	6 (35.3%)	1 (50%)

The two non-compliant women had markedly divergent but instructive courses. The first developed preeclampsia and delivered vaginally at term with acceptable Apgar scores. The second — who had both an abnormal Doppler and abnormal β -hCG — progressed to severe preeclampsia and eclampsia, required ICU admission, underwent emergency LSCS at 35 weeks, and delivered a 1855 g neonate with Apgar scores of 3 and 5 at 1 and 5 minutes respectively, necessitating prolonged NICU admission. This case represented the most severe maternal and neonatal outcome in the entire screened cohort of 100 women.

No case of HELLP syndrome occurred in either subgroup; the cohort was underpowered to assess this outcome specifically, given its low baseline incidence. Eclampsia and ICU admission occurred exclusively in the non-compliant subgroup: both events were confined to a single woman, who accounted for 100% of eclampsia and ICU admissions recorded in the overall 100-woman cohort.

DISCUSSION

The central observation of this analysis is that, among women independently identified as high-risk by first-trimester uterine artery Doppler, those who remained compliant with low-dose aspirin experienced no eclampsia and no ICU admission, while both non-compliant women developed preeclampsia and one progressed to eclampsia. This pattern is directionally consistent with the ASPRE trial, in which aspirin 150 mg/day initiated before 16 weeks in high-risk women produced a 62% reduction in preterm preeclampsia,⁴ and with subsequent reviews emphasising that initiation before 16 weeks is critical to aspirin's protective effect.⁵ The mean gestational age at initiation in the compliant group in this cohort (12.56 $\pm$ 0.27 weeks) fell well within this window. It is also consistent with ACOG guidance recommending low-dose aspirin from 12–28 weeks (optimally before 16 weeks) in women with risk factors for preeclampsia,² and suggests that an abnormal first-

trimester Doppler alone — without a paired biochemical or combined-screening algorithm — can serve as a pragmatic, accessible trigger for aspirin initiation in a resource-limited setting.

These findings should, however, be read with considerable caution. The non-compliant subgroup comprised only two women, which precludes any formal statistical comparison and any claim of causal protection; the results are better characterised as a clinically striking observation than as evidence of efficacy in the epidemiological sense. Compliance itself was not randomly assigned — both non-compliant women stopped aspirin because of gastritis, and it is possible, though unproven, that factors associated with drug intolerance or that eclampsia developed for reasons unrelated to aspirin discontinuation. The compliant group, being the entire Doppler-abnormal population, was also compared only internally; there was no true untreated high-risk comparator, since withholding aspirin from Doppler-positive women would not be ethically justifiable given existing trial evidence. As such, this analysis functions as real-world descriptive reinforcement of trial-level evidence rather than an independent efficacy study, and its main clinical value lies in illustrating the consequence of non-compliance in a screened high-risk population rather than in establishing a new efficacy estimate.

The complete absence of HELLP syndrome in this cohort, in both subgroups, reflects its low baseline incidence rather than any inference about aspirin's specific effect on this endpoint; substantially larger, ideally multicentric, cohorts or trials would be required to meaningfully assess aspirin's association with HELLP syndrome specifically, as distinct from preeclampsia and eclampsia.

Strengths:

Prospective, single-institution design with a standardised Doppler assessment window (11⁶/₇ – 13⁶/₇ weeks) and documented gestational age at aspirin initiation; comprehensive maternal and perinatal outcome capture; one of few reports from a rural South Indian tertiary centre linking Doppler-triggered aspirin initiation to compliance-stratified outcomes.

Limitations:

Very small non-compliant comparator (n=2), precluding statistical inference; non-randomised, observational design, so the association between

compliance and outcome cannot be interpreted causally; single-centre data limiting generalisability; Doppler classified as abnormal per institutional criteria rather than a validated combined-screening algorithm; and no formal power calculation for aspirin-specific outcomes, which were a secondary analysis of a study primarily designed to evaluate Doppler and β -hCG as predictive screening tools.

CONCLUSION

In this Doppler-screened primigravid cohort, compliance with low-dose aspirin (Ecosprin 150 mg/day), initiated within the first trimester in women with abnormal uterine artery Doppler, was associated with the complete absence of eclampsia and ICU admission, whereas both eclampsia-range severe outcomes in the cohort occurred in the two non-compliant women. While the small numbers preclude definitive causal conclusions, these real-world observations are consistent with, and lend institutional support to, existing trial-level evidence for early aspirin prophylaxis in Doppler-identified high-risk pregnancies, and underscore the clinical importance of reinforcing compliance counselling — including proactive management of aspirin-related gastritis — once prophylaxis is initiated. Larger, adequately powered, multicentric studies are needed to define aspirin's specific association with eclampsia and HELLP syndrome as distinct endpoints.

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