Cost-Effectiveness of Low-Dose Aspirin in Preventing Preeclampsia-Related Maternal Deaths in India

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Background:

- Preeclampsia (PE) complicates 5-17% of pregnancies in India far higher than the global average of 2-8%.
- PE causes 9-21% of all maternal deaths in India, plus stillbirths and neonatal complications.
- Nearly 50% of healthcare costs are paid out-of-pocket, making affordable prevention a public health priority.
- Current antenatal care lacks a structured preventive strategy for preeclampsia.

Objectives:

- To evaluate the cost-effectiveness of Low-Dose Aspirin (LDA) vs. Standard of Care (SoC) in preventing preeclampsia-related maternal deaths among high-risk pregnant women in India.

Methods:

- A decision tree model compared Low-Dose Aspirin (LDA, 75–150 mg/day) versus Standard of Care in high-risk women identified through FMF first-trimester screening, tracking outcomes from first trimester to six weeks postpartum.
- Costs were estimated in 2024 INR using bottom-up micro-costing, with clinical inputs sourced from the ASPRE trial, a network meta-analysis of 23 RCTs, and an Indian systematic review.
- The primary outcome was ICER per QALY against India's WTP threshold of ₹2,31,784/QALY, with uncertainty assessed through one-way sensitivity analysis and 1,000 Monte Carlo simulations.

PICO Framework:

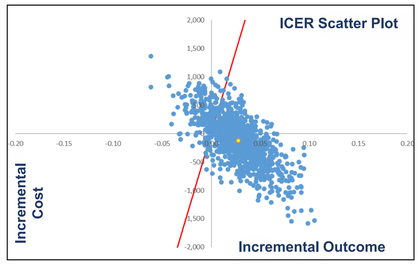
POPULATION	High-risk pregnant women (FMF first-trimester screening model)
INTERVENTION	LDA 75-150 mg/day initiated before 20 weeks of gestation
COMPARATOR	Standard of Care (SoC): routine ANC & BP management
OUTCOMES	ICER/QALY, Net Monetary Benefit, Maternal Deaths Averted
PERSPECTIVE	Societal, Time Horizon: First trimester to 6 weeks postpartum

Results:

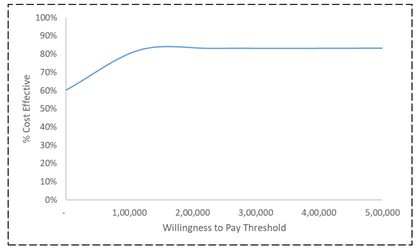
- **Base Case Results**

Metric	LDA	SoC
Total cost/patient	₹30,735	₹30,858
QALYs gained	46.0661	46.0385
Net Monetary Benefit	₹1,06,46,658	₹1,06,40,133
Incremental cost	₹-123	
Incremental QALY	0.028	
ICER per QALY	₹-4,477	
Incremental NMB	+₹6,525	

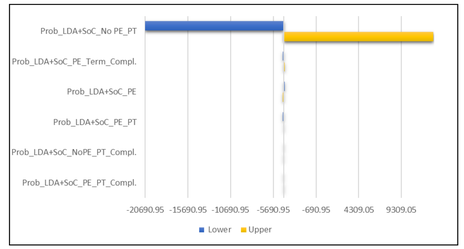
- **Probability Sensitivity Analysis (PSA):**



- **Cost Effectiveness Acceptability Curve:**



- **Tornado Plot**



50.7
Deaths Averted

Per 100,000 women treated

NNT to avert 1 maternal death: ~1,972 women
ICER/maternal death averted: ₹–2,43,930

Discussion:

- LDA dominates: saves ₹123/patient while gaining 0.028 QALYs, with a negative ICER (₹−4,477/QALY) confirming it's not a trade-off but a net win.
- PSA (92% of 1,000 simulations) and OWSA both confirm robustness findings hold even under unfavourable parameter extremes.
- Positive incremental NMB (₹6,525) reinforces adoption from a health system perspective.
- Consistent with evidence from Canada, Belgium, and the USA; Indian cohort data (Saxena et al.) confirm local applicability.
- At ₹375 for a full course, already on India's NLEM, LDA requires no new infrastructure integration into NHM/Ayushman Bharat antenatal packages offers substantial returns at minimal additional cost.

Conclusion:

- Low-dose aspirin is a cost-effective, cost-saving, and clinically superior strategy for preventing preeclampsia-related maternal deaths in India. With strong evidence across probabilistic and deterministic analyses, LDA provides better health outcomes at lower cost, making it highly suitable for integration into NHM and Ayushman Bharat.

Limitations:

- Uniform adherence assumed real-world compliance and access may vary across health settings.
- Long-term neonatal outcomes (beyond 6 weeks) were not modelled due to limited data.
- Aspirin adverse event rates and some neonatal inputs drawn from global data where Indian evidence was sparse.
- Mortality estimates are from trials not powered specifically to detect mortality differences.

Policy Implications:

- Integrate LDA prophylaxis into NHM and Ayushman Bharat antenatal care packages the drug is already on the NLEM at ₹2.5/tablet.
- Adopt FMF-based first-trimester risk stratification to ensure LDA reaches the women who benefit most, reducing unnecessary use.
- Embed LDA recommendations into Standard Treatment Workflows and FOGSI/MoHFW clinical guidelines for consistency across states.
- HTAIn should formalize recommendations and support state health departments in phased, evidence-based rollout.
- Routine monitoring of adherence and PE outcomes under programme conditions will validate real-world impact and guide scale-up.

Future Direction:

1. Evaluate full FMF-based universal screening cost-effectiveness in the Indian context.
2. Real-world adherence and programme coverage studies under NHM conditions.
3. Long-term child health outcomes to capture full benefit of PE prevention.
4. State- and district-level budget impact analysis to guide phased rollout.

References:

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3. Poon LC et al. FIGO Initiative on Pre-eclampsia. Int J Gynaecol Obstet. 2019;145(S1):1–33.
4. Ortved D et al. Cost-effectiveness of FMF + LDA. Ultrasound Obstet Gynecol. 2019;53:239–44.
5. Werner EF et al. Cost-Benefit of LDA Prophylaxis in the USA. Obstet Gynecol. 2015;126:1242–50.