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Impact of Samrakshan Program in Pregnant Women

Sikandar Khan^{1*}, Akshara Gupta¹ & L K Sharma¹

¹Department of Radiodiagnosis, Gajra Raja Medical College & Jaya Arogya Hospital, Gwalior, India

HIGHLIGHTS

- Doppler improved risk stratification
- Aspirin reduced pre-eclampsia incidence
- Surveillance prevented fetal growth
- CPR accurately predicted FGR
- Reduced perinatal mortality significantly

Key Words:

Samrakshan Programme
Perinatal Mortality
Pre-eclampsia
Fetal Growth Restriction
Doppler Ultrasonography

ABSTRACT

Introduction: Perinatal mortality remains a major challenge in India. The IRIA-initiated Samrakshan Programme integrates trimester-specific fetal Doppler with antenatal ultrasonography for early detection of pre-eclampsia, FGR, and other high-risk conditions. **Aim & objective:** This study evaluated the impact of the Samrakshan Programme on maternal and perinatal outcomes among high-risk pregnancies attending Gajra Raja Medical College (GRMC), Gwalior. **Material & Methods:** 36 first-trimester high-risk pregnant women meeting predefined inclusion and exclusion criteria. Participants underwent trimester-specific Doppler evaluation, including uterine artery, umbilical artery, middle cerebral artery, cerebroplacental ratio (CPR) assessments. Women identified as high risk for preterm pre-eclampsia received low-dose aspirin prophylaxis. Maternal and fetal outcomes were analyzed using SPSS version 25, with $p < 0.05$ considered statistically significant. **Results:** Normal uterine artery pulsatility index increased significantly from 44.4% in the first trimester to 80.6% in the third trimester ($p = 0.003$), accompanied by a significant reduction in mean arterial pressure ($p < 0.005$). Early aspirin prophylaxis markedly reduced the incidence of pre-eclampsia and prevented FGR among treated high-risk women. Pre-eclampsia was significantly associated with oligohydramnios ($p = 0.0021$), while abnormal third-trimester CPR demonstrated 100% sensitivity, specificity, and diagnostic accuracy for predicting FGR ($p < 0.001$). No maternal deaths and only one stillbirth were recorded, with significantly lower maternal mortality, perinatal mortality, and FGR rates compared with baseline data from Madhya Pradesh ($p < 0.001$). **Conclusion:** Samrakshan Programme improved maternal and fetal outcomes through early Doppler risk stratification, aspirin prophylaxis, and serial surveillance. It reduced pre-eclampsia and perinatal mortality, improved uteroplacental perfusion, and enhanced fetal compromise prediction, supporting broader antenatal implementation. Larger multicentric studies are needed to validate findings.



* Corresponding Author: Sikandar Khan, e-mail: khansikandar27@gmail.com

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INTRODUCTION

India continues to experience a substantial burden of perinatal mortality, with the National Family Health Survey-5 reporting approximately 27 perinatal deaths per 1,000 pregnancies, highlighting persistent deficiencies in maternal & fetal health-care services. Perinatal mortality, which includes stillbirths & early neonatal deaths, reflects the quality of antenatal surveillance, intrapartum care, & neonatal management. To address these challenges, the Indian Radiological & Imaging Association (IRIA) launched the Samrakshan Programme in June 2019 as a nationwide initiative focused on reducing preventable maternal and perinatal morbidity and mortality. The programme integrates trimester specific fetal Doppler evaluation with routine antenatal ultrasonography to facilitate early identification of pregnancies at risk for pre-eclampsia, fetal growth restriction (FGR), preterm birth, and adverse neonatal outcomes. Through standardized risk assessment and timely intervention, Samrakshan aims to improve pregnancy outcomes while strengthening antenatal care practices across India [1].

Pre-eclampsia is one of the leading causes of maternal and perinatal mortality worldwide, affecting nearly 2–8% of pregnancies. It is characterized by new-onset hypertension with multisystem involvement after 20 weeks of gestation and is associated with abnormal placental implantation, endothelial dysfunction, and impaired uteroplacental perfusion. Women with advanced maternal age, obesity, nulliparity, multiple gestation, chronic hypertension, diabetes, or previous pre-eclampsia are at increased risk. Doppler ultrasonography has become an essential non-invasive tool for evaluating uteroplacental circulation and identifying pregnancies at risk before the onset of clinical disease. Early recognition allows preventive strategies, particularly low -dose aspirin prophylaxis, to reduce

to reduce the incidence and severity of pre-eclampsia and its associated complications [2].

The Samrakshan protocol incorporates first trimester assessment of uterine artery pulsatility index (PI) for prediction of pre-eclampsia and placental dysfunction. Elevated uterine artery PI reflects increased vascular resistance and impaired placental perfusion, serving as an important predictor of hypertensive disorders and poor fetal outcomes. During the second and third trimesters, Doppler assessment of the umbilical artery, middle cerebral artery (MCA), and cerebroplacental ratio (CPR) provides valuable information regarding fetal circulation, placental function, and fetal adaptation to hypoxia. Increased umbilical artery PI, reduced MCA PI, and abnormal CPR indicate placental insufficiency and fetal compromise, thereby guiding closer surveillance, timely referral, and appropriate obstetric intervention [3]. Fetal growth restriction remains another major contributor to perinatal morbidity and mortality and is commonly associated with placental insufficiency. Fetuses affected by FGR have increased risks of stillbirth, preterm delivery, neonatal intensive care admission, & long-term neurodevelopmental & cardiovascular complications. Doppler ultrasonography enables differentiation between early- and late-onset FGR by evaluating fetal hemodynamics and placental resistance. Serial Doppler monitoring facilitates timely recognition of progressive fetal compromise and assists clinicians in balancing the risks of prolonged intrauterine exposure against those of preterm delivery. Consequently, Doppler-based surveillance has become an indispensable component of modern obstetric practice for improving fetal outcomes [4]. Beyond improving immediate pregnancy outcomes, early detection and management of pre-eclampsia & FGR also reduce long-term health consequences for both

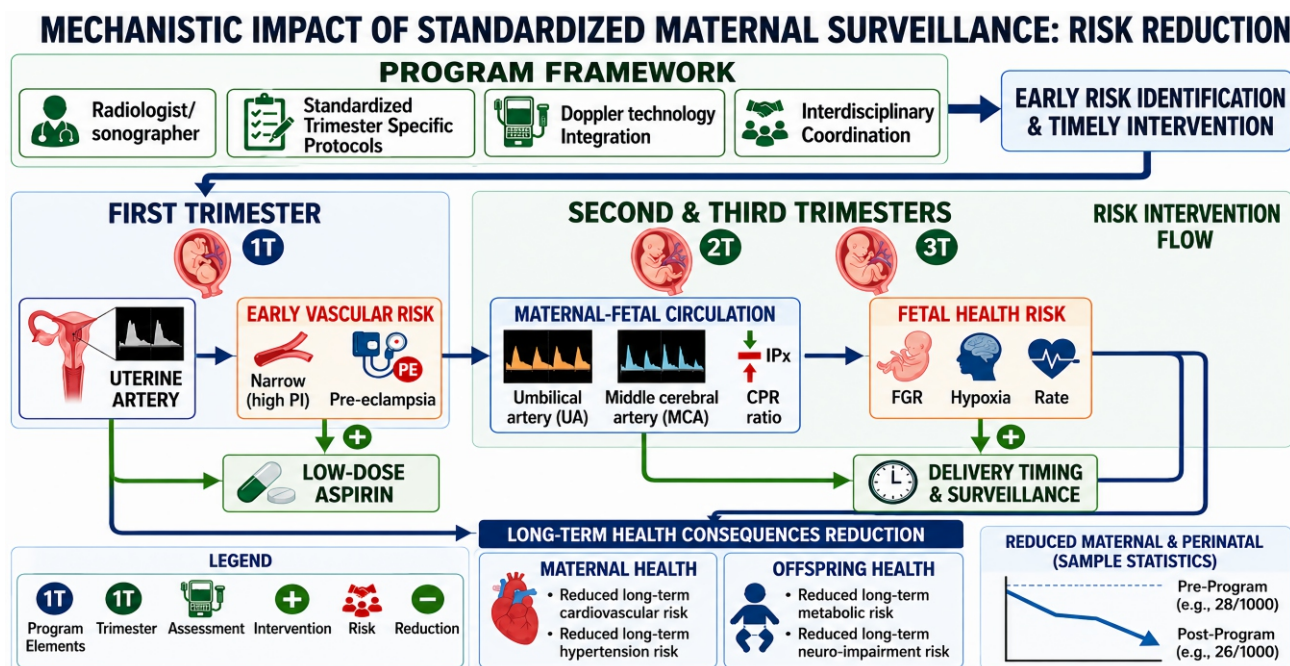


Figure 1: Mechanistic framework of standardized maternal surveillance for early risk identification, timely intervention, and reduced maternal and perinatal complications.

mother and child. Women with previous pre-eclampsia are at increased risk of chronic hypertension, cardiovascular disease, & renal dysfunction later in life, while infants affected by FGR are predisposed to metabolic disorders, hypertension, impaired neurodevelopment, and cardiovascular disease during adulthood. Early identification of high-risk pregnancies through Doppler screening enables targeted preventive interventions, individualized antenatal care, optimized timing of delivery, & improved neonatal survival [5].

Evidence from pilot studies conducted under the Samrakshan Programme has demonstrated encouraging improvements in maternal and neonatal outcomes. Reports from different regions of India have shown reductions in perinatal mortality, low birth weight, preterm birth, and pregnancy complications following implementation of standardized trimester-specific Doppler protocols [6].

First-trimester uterine artery PI and third-trimester cerebroplacental ratio have emerged as reliable predictors of adverse pregnancy outcomes. Nevertheless, successful nation-wide implementation remains challenged by inadequate Doppler facilities, limited availability of trained radiologists, socioeconomic disparities, and reduced awareness among healthcare providers and pregnant women [7]. The programme therefore emphasizes radiologist training, multidisciplinary collaboration, public awareness, systematic monitoring, policy advocacy, and integration with maternal health initiatives through its Seven Star framework. By combining technical education, standardized reporting, collaborative obstetric care, and evidence-based screening, the Samrakshan Programme aims to reduce pre-eclampsia, fetal growth restriction, low birth weight, perinatal hypoxia, stillbirths, and overall perinatal mortality by 2030. The present study was undertaken to evaluate the effectiveness of this programme among high-risk pregnancies attending the Department of Radiodiagnosis at Gajra Raja Medical College, Gwalior, & to determine its role in improving maternal and fetal outcomes through trimester-specific Doppler surveillance [8,9].

Figure 1. Mechanistic framework illustrating the impact of standardized maternal surveillance on early risk identification, timely intervention, and reduction of maternal and perinatal complications.

The primary objectives of the study were to assess the impact of the Samrakshan Program on perinatal mortality among pregnant women attending the Department of Radiodiagnosis at GRMC and to evaluate the role of integrating fetal Doppler studies with routine trimester-specific antenatal ultrasonography for the early prediction of pre-eclampsia and fetal growth restriction.

MATERIAL & METHODS

This prospective observational study was conducted at the Department of Radiodiagnosis, Gajra Raja Medical College (GRMC), Gwalior from April 2023 to October 2024. Ethical approval has been obtained from the Ethical Approval

Committee of Gajra Raja Medical College (GRMC), Gwalior, a tertiary care hospital catering to a large and diverse population in Madhya Pradesh, India.

Study Population

The study population comprised pregnant women in the first trimester who were identified as high-risk due to severe anemia (hemoglobin <7 g/dL), pregnancy-induced hypertension or pre-eclampsia, gestational diabetes mellitus, maternal age <20 or >35 years, systemic lupus erythematosus or antiphospholipid antibody syndrome, or a history of adverse obstetric outcomes. Women providing written informed consent were included, while those with chronic hypertension, pre-existing liver disease, substance abuse, smoking, alcohol use during pregnancy, or inability to comply were excluded.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Continuous variables, including pulsatility index and cerebroplacental ratio, were summarized as mean, median, and standard deviation, while categorical variables were expressed as frequencies and percentages. Associations between Doppler findings and categorical outcomes were assessed using the chi-square test, and logistic regression identified predictors of adverse maternal and neonatal outcomes. A p-value of <0.05 was considered statistically significant.

RESULTS

Data were analyzed using SPSS version 20 for Windows. A total of 36 pregnant women in the first trimester who fulfilled the inclusion and exclusion criteria were prospectively enrolled between April 2023 and October 2024. The mean maternal age was 29.17 ± 6.76 years, with a median age of 31 years (range: 18–40 years). Most participants belonged to the 31–35 years (30.6%) and 36–40 years (30.6%) age groups, together accounting for 61.2% of the study population, while 22.2% were aged 26–30 years and 16.7% were 18–25 years. Regarding parity, 30.6% of women were in their second pregnancy, 25.0% each were in their first and fourth pregnancies, and 19.4% were in their third pregnancy, indicating a relatively balanced distribution across parity groups. Assessment of body mass index (BMI) showed that 52.8% of participants had a normal BMI (18.5–24.9 kg/m²), 41.7% were overweight (25.0–29.9 kg/m²), and 5.6% were obese (≥ 30 kg/m²), while no participant was underweight. The mean BMI was 24.3 ± 3.16 kg/m², with a median and mode of 24.46 kg/m², suggesting that the average participant was at the upper limit of the normal BMI range. Analysis of birth outcomes demonstrated that 88.9% of neonates had a birth weight of at least 2.5 kg, whereas only 11.1% had low birth weight (<2.5 kg). Mean arterial pressure (MAP) also demonstrated a favorable trend during pregnancy. In the first

trimester, the largest proportion of women (44.4%) had MAP values between 85 and 90 mmHg, followed by 25.0% with MAP between 90 and 95 mmHg, while only one participant (2.8%) had MAP ≥ 100 mmHg. During the second trimester, MAP values shifted toward lower ranges, with 41.7% of women recording MAP between 80 and 85 mmHg and 27.8% between 85 and 90 mmHg, indicating an overall improvement in blood pressure control as pregnancy progressed. Most participants had a third-trimester mean arterial pressure (MAP) of 80–85 mmHg (61.11%), followed by 85–90 mmHg and 95–100 mmHg (13.89% each), while only 5.56% had MAP values of 70–80 mmHg or 90–95 mmHg, and none had MAP above 100 mmHg (**Table 1 & Figure 2**). Comparison across the three trimesters showed a gradual shift in mean arterial pressure (MAP) toward the 80–85 mmHg range, increasing from 6 cases in the first trimester to 15 in the second and 22 in the third trimester, while higher MAP categories (85–100 mmHg) became less frequent overall, and no participant had a MAP above 100 mmHg after the first trimester. Comparison of mean arterial pressure (MAP) across pregnancy demonstrated a statistically significant reduction over successive trimesters ($\chi^2=25.27$, $df=8$, $p=0.00485$). Women identified as high risk for pre-eclampsia during the first trimester received prophylactic low-dose aspirin, following which MAP progressively shifted toward lower ranges. The proportion of women with MAP between 80–85 mmHg increased from 16.7% in the first trimester to 41.7% in the second and 61.1% in the third trimester, while the frequency of higher MAP categories steadily declined, with no participant recording MAP ≥ 100 mmHg beyond the first trimester. Regarding maternal risk factors, 22.2% had a history of diabetes mellitus, 27.8% had previous pre-eclampsia, 25.0% reported a maternal history of pre-eclampsia, 8.3% had systemic lupus erythematosus or antiphospholipid antibody syndrome, and 2.8% had chronic hypertension, whereas none had a history of smoking. Serial assessment of uterine artery pulsatility index (PI) also demonstrated significant improvement across pregnancy ($p=0.003$). Normal PI values increased from 44.4% in the first trimester to 50.0% in the second trimester and 80.6% in the third trimester, while abnormal PI values (>95 th percentile) declined from 55.6% to 50.0% and finally to 19.4%. Correspondingly, the mean uterine artery PI progressively decreased from 1.70 ± 0.53 in the first trimester to 1.65 ± 0.36 in the second trimester and 0.98 ± 0.31 in the third trimester, with similar reductions in median values and variability, suggesting improved utero-placental perfusion following early Doppler-based risk stratification and prophylactic low-dose aspirin therapy. In the first trimester, 55.5% (20/36) of women were classified as high risk and 44.5% (16/36) as low risk for pre-eclampsia. During the second trimester, 27.7% (10/36) were at high risk for pre-eclampsia before 32 weeks, while 45.5% (16/36) were at high risk for pre-eclampsia before 36 weeks. By the third trimester, the proportion of high-risk women decreased

to 19.5% (7/36), with 80.5% (29/36) classified as low risk, indicating a progressive reduction in pre-eclampsia risk following prophylactic low-dose aspirin therapy (**Table 2**). Assessment using the Fetal Medicine Foundation (FMF) software identified 15 (41.7%) women as high risk and 21 (58.3%) as low risk for developing fetal growth restriction (FGR). Among the 20 women eligible for low-dose aspirin prophylaxis, 16 received treatment and only 2 (12.5%) subsequently developed pre-eclampsia, whereas all 4 women who did not receive prophylaxis developed the condition, demonstrating a significant protective effect of early aspirin therapy (Chi-square $p=0.038$; Fisher's exact $p=0.041$). The diagnostic performance of prophylactic risk stratification showed a sensitivity of 83.3%, specificity of 50.0%, positive predictive value of 25.0%, negative predictive value of 93.7%, and an overall accuracy of 55.6%, indicating excellent ability to identify women unlikely to develop pre-eclampsia. Oligohydramnios was observed in 13.9% of pregnancies and showed a strong association with pre-eclampsia, occurring in 57.1% of affected women compared with only 3.4% of normotensive pregnancies. This association was statistically significant ($\chi^2=9.47$, $p=0.0021$; Fisher's exact $p=0.0027$), with an odds ratio of 37.33 and relative risk of 4.26, indicating a markedly increased likelihood of oligohydramnios among women with pre-eclampsia. Third-trimester cerebroplacental ratio (CPR) assessment demonstrated that 88.9% of pregnancies had normal values, while only 11.1% exhibited abnormal CPR, suggesting that most fetuses maintained normal placental and cerebral circulatory adaptation during late gestation. An abnormal third-trimester cerebroplacental ratio (CPR; <5 th percentile) was observed in 4 (11.1%) fetuses, all of whom developed fetal growth restriction, whereas all 32 (88.9%) fetuses with a normal CPR had normal fetal outcomes, demonstrating a strong association between abnormal CPR and fetal growth restriction (**Table 3**). Third-trimester cerebro-placental ratio (CPR) demonstrated excellent diagnostic performance for identifying fetal growth restriction (FGR), with 100% sensitivity, 100% specificity, and 100% overall diagnostic accuracy. A highly significant association was observed between abnormal CPR (<5 th percentile) and FGR ($p<0.001$), with all fetuses exhibiting abnormal CPR developing fetal growth restriction and/or preterm birth, confirming CPR as a reliable marker of fetal compromise. Evaluation of low-dose aspirin prophylaxis among the high-risk group further showed a marked preventive effect on FGR. None of the 16 women who received early aspirin prophylaxis developed FGR, whereas all four women who did not receive prophylaxis subsequently developed FGR, indicating a strong association between early prophylactic intervention and improved fetal growth outcomes. Following early prophylactic therapy and regular follow-up, combined fetomaternal complications (pre-eclampsia, fetal growth restriction, and stillbirth) occurred in 7 (19.4%) women, with a higher frequency

in the high-risk group (6/20) compared with the low-risk group (1/16), while 29 (80.6%) had no complications (**Table 4**). Based on FMF risk assessment, 55.6% (20/36) of women were classified as high risk and 44.4% (16/36) as low risk. Fetomaternal complications occurred in 30.0% (6/20) of the high-risk group compared with 6.3% (1/16) of the low-risk group despite early prophylaxis and follow-up, demonstrating a statistically significant association between FMF risk category

and adverse outcomes ($\chi^2 = 4.26$, $df = 1$, $p = 0.039$) (**Table 5**). Compared with the Madhya Pradesh NHFS-5 (2022) baseline, the study population at GRMC Gwalior demonstrated no maternal mortality, one perinatal death, and a significantly lower rate of fetal growth restriction (11% vs. 33%; $p < 0.001$), while the prevalence of pre-eclampsia (16.6% vs. 10.4%) did not differ significantly, indicating improved maternal and fetal outcomes except for pre-eclampsia incidence (**Table 6**).

Table 1: Distribution of Mean arterial pressure (MAP) in study population in 3rd trimester

3 RD TRIMESTER MEAN ARTERIAL PRESSURE			
MAP Range	Frequency	Percentage (%)	Cumulative Percentage (%)
70-80	2	5.56%	5.56%
80-85	22	61.11%	66.67%
85-90	5	13.89%	80.56%
90-95	2	5.56%	86.11%
95-100	5	13.89%	100.00%
100+	0	0.00%	100.00%

Comparison of Mean Arterial Pressure (MAP) Across the Trimesters

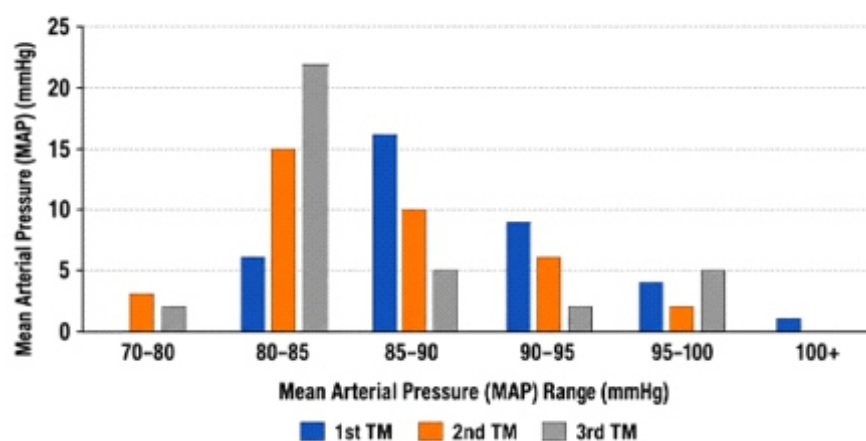


Figure 2: Comparison of Mean arterial pressure in study population in across the trimesters

Table 2: Calculated risk of pre-eclampsia across the trimesters based on FMF (Fetal Medicine Foundation) software

PRE ECLAMPSIA	1 st TM	2 nd TM		3 rd TM
		<32wk	<36wk	
High risk	20 (55.5%)	10 (27.7%)	16 (45.5%)	7 (19.5%)
Low risk	16 (45.5%)	26 (72.3%)	20 (55.5%)	29 (80.5%)
Total	36	36	36	36

Table 3: Association of abnormal Cerebroplacental ratio (CPR) with Fetal growth restriction

3 rd Trimester CPR Ratio	Fetal growth restriction	Normal Fetal Outcome	Total
Abnormal (<5 th percentile)	4	0	4
Normal	0	32	32
Total	4	32	36

Table 4: Combined fetomaternal complications (pre-eclampsia, fetal growth restriction and Stillbirth) in study population after early prophylaxis and follow-ups

Fetomaternal Complications After Early Prophylaxis and Follow -ups	High Risk	Low Risk	Total
Present	6	1	7
Absent	14	15	29
Total	20	16	36

Table 5: Statistics of fetomaternal complications in study population after early prophylaxis and follow-ups

Statistic	Value
Chi-Square (χ^2)	4.26
Degrees of Freedom (df)	1
p-value	0.039
Significance Level (α)	0.05
Statistical Significance	Yes

Table 6: Perinatal Indices in the Study population At GRMC Gwalior to Baseline Data from 2022-23

Indicator	Madhya Pradesh (2022)	In Study population at GRMC Gwalior (2023-24)	P value
Maternal Mortality Rate	173 per 1 lakh (NHFS 5)	0	<0.001
Perinatal Mortality Rate	27 per 1000 (NHFS 5)	1	<0.001
Fetal growth restriction	33%	11%	<0.001
Pre-eclampsia	10.4% (NHFS 5)	16.6%	Not significant

DISCUSSION

The present prospective study was conducted to evaluate the impact of the trimester-based Samrakshan Programme on maternal and perinatal outcomes among high-risk pregnancies attending the Department of Radiodiagnosis, Gajra Raja Medical College (GRMC), Gwalior. India continues to report a high perinatal mortality rate of approximately 27 deaths per 1,000 pregnancies according to the National Family Health Survey-5 (NFHS-5), reflecting persistent challenges in antenatal care and maternal health services. To address this burden, the Indian Radiological and Imaging Association (IRIA) launched the Samrakshan Programme in 2019, integrating trimester-specific fetal Doppler assessment into routine antenatal ultrasonography for the early identification of pregnancies at risk of pre-eclampsia, fetal growth restriction (FGR), preterm birth, and perinatal mortality. The programme combines standardized Doppler evaluation with timely interventions, structured training, multidisciplinary collaboration, and continuous monitoring to improve maternal and neonatal outcomes, while aiming to substantially reduce pre-eclampsia, FGR, low birth weight, stillbirths, and infant mortality by 2030 [1-3].

A total of 36 pregnant women fulfilling the inclusion criteria were prospectively enrolled between April 2023 and October 2024. Most participants belonged to the 31–40-year age group (61.2%), with a mean maternal age of 29.17 ± 6.76 years, and parity was relatively evenly distributed across first to fourth pregnancies. The mean body mass index was 24.3 kg/m^2 , with overweight women accounting for 41.7% of the study population. Established maternal risk factors were common, including previous pre-eclampsia (27.8%), diabetes mellitus (22.2%), and chronic hypertension (2.8%), while none of the participants reported smoking. These findings indicated that the study population represented a genuinely high-risk obstetric group in whom Doppler-based surveillance and early preventive interventions could provide maximum clinical benefit [4,5].

Serial Doppler evaluation demonstrated progressive improvement in uteroplacental circulation throughout pregnancy. The proportion of women with normal uterine artery pulsatility index increased significantly from 44.4% during the first trimester to 80.6% in the third trimester ($p=0.003$), suggesting improved placental perfusion following early risk stratification and intervention. Similarly, the proportion of women categorized as high risk for pre-eclampsia using the Fetal Medicine Foundation (FMF) risk assessment model decreased from 55.6% in the first trimester to 19.5% in the third trimester. Mean arterial pressure also showed a statistically significant decline across gestation ($p<0.005$), with most women achieving values between 80 and 85 mmHg by the third trimester. These improvements likely reflect the effectiveness of early management strategies, particularly the administration of low-dose aspirin among women identified as high risk, supporting previous findings that early screening and prophylactic therapy reduce hypertensive complications and improve pregnancy outcomes [6,7].

The study further demonstrated significant associations between Doppler parameters and adverse fetal outcomes. Pre-eclampsia was strongly associated with the development of oligohydramnios, emphasizing the close relationship between maternal vascular dysfunction and impaired placental function. Furthermore, an abnormal third-trimester cerebroplacental ratio was consistently associated with fetal growth restriction, whereas no cases of FGR were observed among fetuses with normal CPR values. These findings reinforced the clinical importance of third-trimester fetal Doppler assessment, particularly cerebroplacental ratio, as a reliable indicator of fetal compromise and placental insufficiency, facilitating timely obstetric intervention before irreversible fetal deterioration occurs [6]. Regarding pregnancy outcomes, no maternal deaths were recorded, and only one stillbirth occurred during the study period. Maternal mortality, neonatal mortality, and fetal growth restriction rates were significantly lower than baseline statistics reported for Madhya Pradesh ($p<0.001$). These encouraging findings

suggested that implementation of the Samrakshan Programme contributed to improved maternal and neonatal outcomes through systematic trimester-specific Doppler surveillance, accurate risk stratification, and timely clinical intervention. The observed reduction in perinatal mortality is consistent with previous Indian studies demonstrating the effectiveness of Doppler-guided antenatal care and stage-based fetal growth restriction management in reducing adverse pregnancy outcomes. Although the relatively small sample size and single-center design limit the generalizability of these findings, the results provide further evidence supported wider implementation of the Samrakshan Programme across tertiary and secondary healthcare facilities in India to strengthen maternal-fetal surveillance and reduce preventable maternal and perinatal mortality [10,11].

CONCLUSION

The study suggests that the Samrakshan program may improve important maternal and fetal health outcomes by reducing mean arterial pressure, uterine artery pulsatility index, the risk of pre-eclampsia, oligohydramnios, and perinatal mortality. Among high-risk women receiving low-dose aspirin, a reduction in pre-eclampsia risk and progressive improvement in uterine artery Doppler indices were observed across pregnancy, indicating the value of early risk assessment and timely intervention. However, the findings are limited by the small sample size & single-center design, highlighting the need for larger multi-center randomized studies to validate these results and enhance their generalizability.

LIMITATIONS & FUTURE PERSPECTIVES

The study was limited by its single-centre design, relatively small sample size, and short duration, which may restrict generalizability. Future research could focus on multicenter studies with larger cohorts to validate findings, evaluate long-term outcomes, and explore innovative diagnostic and management strategies for appendicular perforation, improving patient prognosis and reducing complications

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical healthcare applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient care, diagnosis, and treatment outcomes. By highlighting real world relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

FGR: Fetal Growth Restriction

CPR: Cerebroplacental Ratio

PI: Pulsatility Index

PE: Pre-eclampsia

UA: Umbilical Artery

MCA: Middle Cerebral Artery

AUTHOR INFORMATION

Dr. Sikandar Khan: MD, Junior Resident, <http://orcid.org/0009-0003-8995-8337>

Dr. Akshara Gupta: Professor & HOD

Dr. L K Sharma: Sanrakshan Program Head

AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research directions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

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Dr. Vinay Kumar Yadav^{1,2,3}

¹CSIR-Indian Institute of Toxicology Research (IITR), Lucknow, India

²Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, U.P., India

³Biological E Ltd, Hyderabad, Telangana, India

HANDLING EDITOR

Dr. Karan Singh Saini^{1,2,3}

¹Ph.D. in Cancer Research from CDRI-JNU New Delhi, India

& ²Post-Doctoral Fellow from University of Illinois at Chicago, USA

³Department of Zoology, P.M. College of Excellence, Government Postgraduate College in Sheopur, Madhya Pradesh, India

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