



Shock Index in Predicting Maternal Outcomes in Postpartum Haemorrhage - A Cohort Study

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Introduction

- **PPH is a leading cause of maternal mortality**, especially in low-resource settings like India, where 19.9% of maternal deaths are attributed to it. (1)
- **Traditional indicators (e.g., HR, BP) and visual estimation of blood loss (VEBL)** are often unreliable, leading to delays in diagnosis and intervention. (2)
- **Physiological changes during pregnancy mask hypovolemia**, making early detection of hemorrhagic shock challenging. (3)
- **Shock Index (SI)** offers a non-invasive, cost-effective, and sensitive alternative for early detection of hemodynamic instability. (4)
- Despite its promise, **limited prospective data exists in the Indian context**, especially in resource-constrained, high-burden public healthcare settings. (5)

Aims and Objectives:

- To evaluate the **efficacy of SI** in predicting adverse maternal outcomes in PPH cases.
- To establish **SI thresholds** for predicting specific adverse outcomes (e.g., transfusion, ICU admission) in low-resource settings.
- To determine the **sensitivity, specificity, and predictive values** of SI compared to conventional vital parameters (HR, MAP).

Methodology

- **Design:** Prospective cohort study at a tertiary care center in Central India.
- **Population:** 100 women (aged 15–49) with PPH based on standard thresholds.
- **Measurements:** SI & MSI at 3 intervals; vital signs, lab data, VEBL.
- **Outcome Tracking:** ICU admission, transfusion, complications (DIC, MODS), mortality
- **Analysis:** ROC curves, Mann-Whitney U test, logistic regression via SPSS

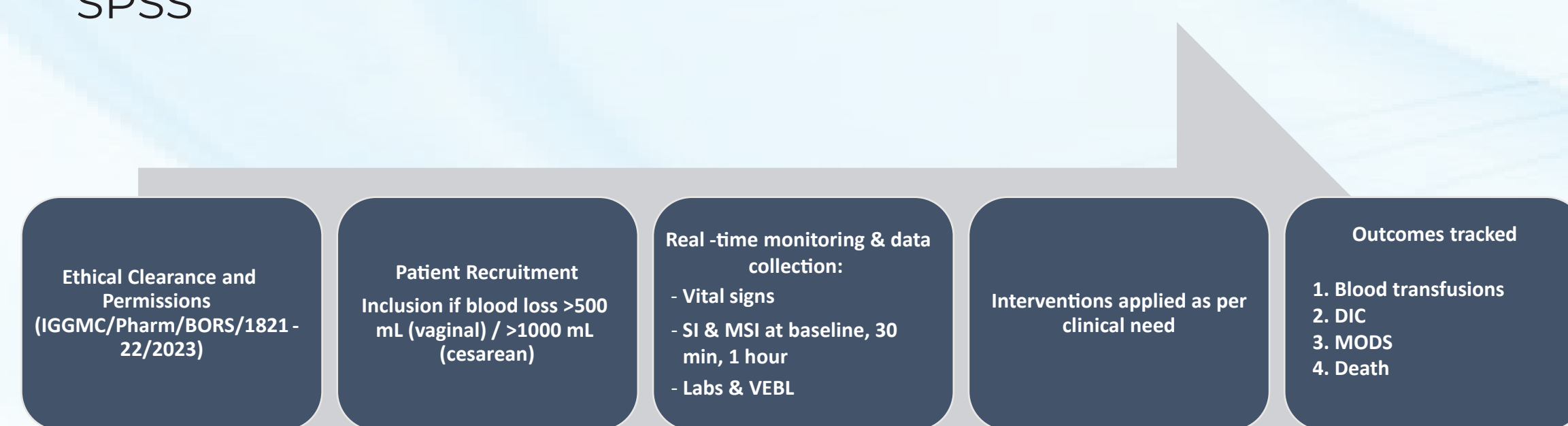


Figure 1: Summary of Methodology

Results

- **SI and MSI are strong predictors of adverse maternal outcomes** in PPH.
- **SI ≥ 1.0** at baseline is a significant predictor of **blood transfusion need**
AUC = 0.93, Sensitivity = 76.5%, Specificity = 100%
- **SI ≥ 1.04** is associated with **ICU admission**
Statistically significant ($p \leq 0.05$), AUC = 0.79
- **MSI shows better performance than SI**
MSI AUC = 0.97 for predicting blood transfusion
- **SI ≥ 1.6** is strongly associated with **maternal death**
Significant **reduction in SI from baseline to 1 hour** post-intervention ($p = 0.0171$)

Figure 2: Shock Index (SI) Variation Over Time. shows the decrease in SI from baseline to 1 hour, supporting the effectiveness of clinical intervention in PPH management.

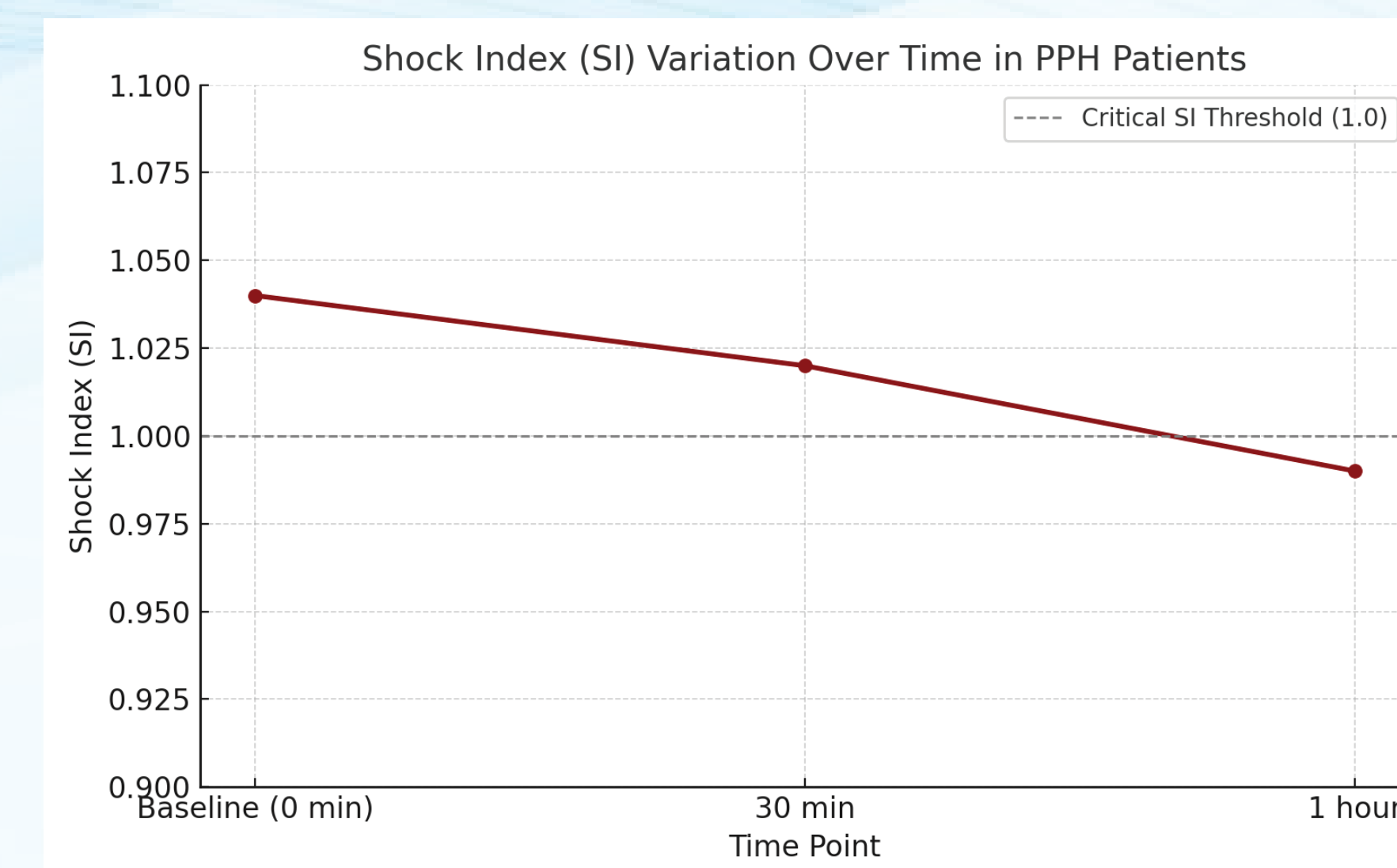


Figure 4: SI and MSI Thresholds for Predicting Major Maternal Outcomes. It clearly shows at what values each index most effectively predicts critical outcomes such as transfusion, ICU admission, and mortality.

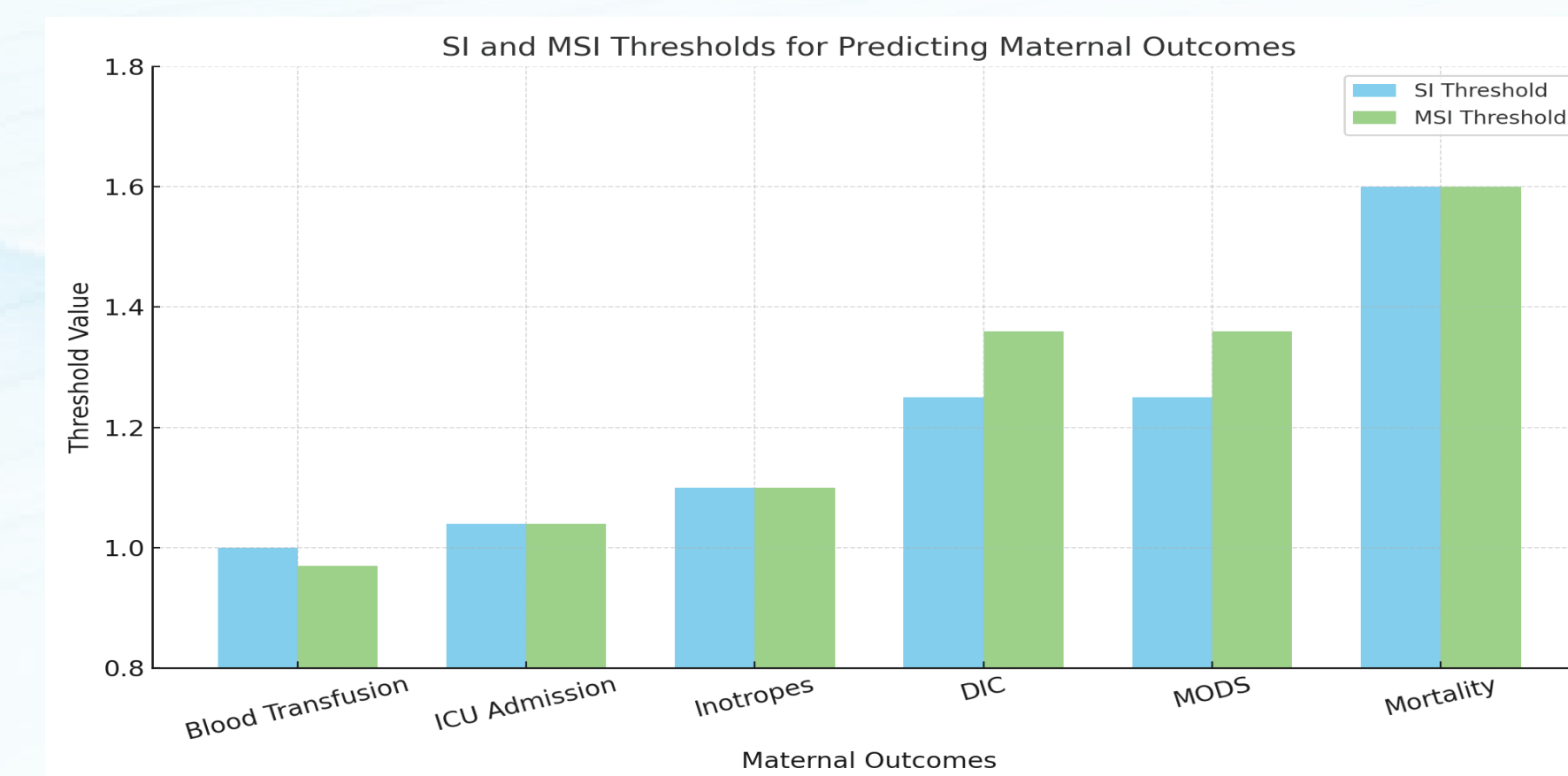
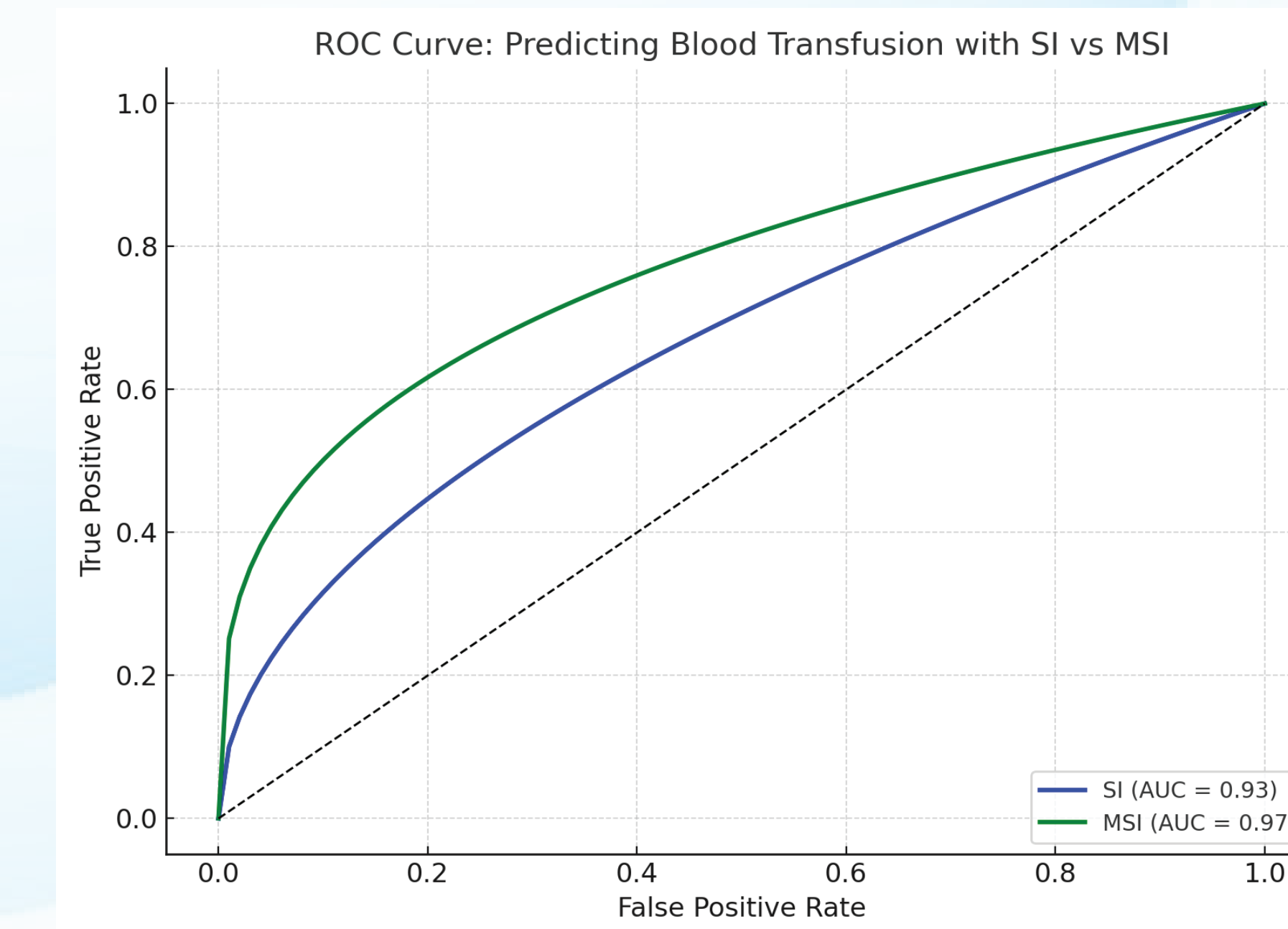


Figure 3: ROC Curve – Predictive Accuracy of SI vs MSI for Blood Transfusion. It visually demonstrates that MSI outperforms SI in predictive value.



Discussion

Utility of SI in Early Prediction

The Shock Index (SI), a non-invasive and cost-effective hemodynamic marker, has gained attention for early detection of maternal deterioration in PPH. This study confirmed SI's efficacy, aligning with findings by Nathan et al. (2015), who demonstrated SI ≥ 0.9 was associated with significantly higher risk of ICU admission, transfusion, and mortality

Comparative Effectiveness vs. Conventional Parameters

Compared to traditional vital signs like HR and MAP, SI and MSI offered superior predictive value. The results mirror Lee et al. (2019), where SI had the highest AUROC (0.815) for predicting massive transfusion and was more sensitive than HR or BP in early hemorrhage detection

Time-Based SI Trends and Intervention Outcomes

This study noted statistically significant reductions in SI at one hour post-diagnosis ($p=0.0171$), indicating improved stability following early intervention. This is supported by Drew et al. (2021), who found SI peaked within 60 minutes post-delivery and strongly correlated with blood loss

Thresholds and Specific Predictions

Defined SI cutoffs (e.g., ≥ 1.0 for ICU admission, ≥ 1.42 for mortality) reinforce the index's value in stratifying risk, consistent with Butt et al. (2022) who validated similar cutoffs with 80–90% sensitivity for predicting adverse events

MSI as a Complementary Tool

Modified Shock Index (MSI) demonstrated even higher AUROC values (up to 0.97) for predicting transfusion and ICU admissions. This finding supports El Ayadi et al. (2016) who advocated for using MSI alongside SI for triaging in low-resource settings

Limitations and Global Context

However, studies like Mizutani et al. (2024) caution against universal applicability, particularly noting poor predictive power of SI during cesarean deliveries (AUROC 0.54). This underlines the importance of contextual adaptation and further research in diverse obstetric populations.

Conclusion

SI and MSI are robust, early predictors of adverse maternal outcomes in PPH. They can enhance timely interventions, particularly in resource-limited settings. Standardized use of these indices could improve maternal outcomes, with future research focusing on refining thresholds and expanding their applicability across diverse and broader obstetric populations

References

1. Nathan HL, et al. Shock index: an effective predictor of outcome in postpartum haemorrhage. BJOG. 2015;122(2):268–75.
2. El Ayadi AM, et al. Shock index and vital signs predict severe maternal outcomes in women with hypovolemic shock: A secondary analysis of the WHO trial. BMC Pregnancy Childbirth. 2016;16(1):1–12.
3. Nwafor JI, et al. Shock index versus conventional vital signs in predicting maternal outcomes. Int J Gynecol Obstet. 2019;146(1):63–8.
4. Lee SY, et al. Clinical usefulness of shock index in obstetric hemorrhage. Obstet Gynecol Sci. 2019;62(1):25–31.
5. Agarwal V, et al. Role of Shock Index in predicting adverse outcomes in postpartum hemorrhage. J Obstet Gynaecol India. 2021;71(2):163–9.

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