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Research Article

"From Biomarkers to Risk Scores: Maternal First Trimester Dual Marker Screening, Risk Stratification for Trisomy 21/18/13".

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Background

Prenatal screening plays a vital role in identifying pregnancies at increased risk for chromosomal conditions such as Down's syndrome (Trisomy 21), Edwards syndrome (Trisomy 18), and Patau syndrome (Trisomy 13). First trimester screening combines maternal serum biomarkers—free β-Human Chorionic Gonadotropin (β-HCG) and Pregnancy Associated Plasma Protein A (PAPP-A)—with ultrasound parameters like Nuchal Translucency (NT) and Crown Rump Length (CRL). These inputs, when analyzed using validated software such as SSDW, allow for early, non-invasive risk stratification. By integrating biochemical and sonographic data, this approach supports timely clinical decisions and minimizes the need for invasive diagnostic procedures.

Study Place: QLabs Clinical Laboratory, Dubai

Study Period: March–September 2025

Methods

- This retrospective study was conducted at QLabs over a 6-month period (March–September 2025), involving **189 pregnant women** screened exclusively in the **first trimester** using SSDW software.

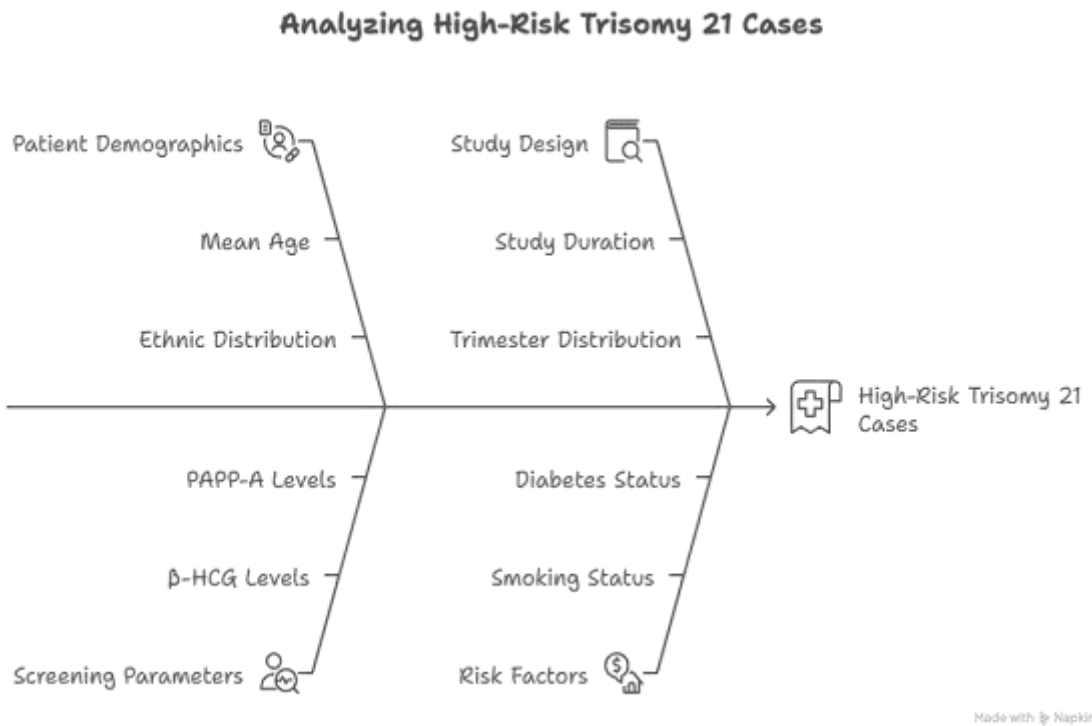

Figure 1

Cohort Overview

- **Total Patients Screened:** 189
- **Study Duration:** 6-month retrospective analysis
- **Mean Age:** 30.99 years (Reproductive age group)
- **Mean Weight:** 61.9 kg (Used for MoM normalization)
- **Gestational Age at Screening:** Median 88 days
- **Trimester Distribution:** 100% First Trimester
- Non-Caucasian patients: **1.6%** (ethnic adjustment applied)
- No history of chromosomal anomalies, smoking, or diabetes
- Biochemical markers were expressed in **Multiples of Median (MoM)** and interpreted using SSDW algorithms. NT measurements were included in risk calculation. The SSDW cut-off for high risk was set at **1:250** for Trisomy 21, 18, and 13.

Patient Data Analysis

Characteristic	Value	Interpretation
Total Patients	189	Full cohort screened using SSDW
Study Duration	March–September 2025	6-month retrospective analysis
Mean Age	30.99 years	Reproductive age group
Mean Weight	61.9 kg	Used for MoM normalization
Previous Anomalies	None	No prior chromosomal abnormalities
Smokers / Diabetics	None	No confounding risk factors
Non-Caucasian Patients	16%	Ethnic adjustment applied in SSDW
Trimester Distribution	100%	First TrimesterNo second trimester cases
Positive Risk (Overall)	3.72%	SSDW-flagged high-risk cases
Positive Risk Trisomy	3.92%	All flagged cases aligned with Trisomy 21
Median β-HCG (1st)	1.0218	Slight elevation in high-risk profiles
Median β-HCG (2nd)	0	Not applicable
Median PAPP-A	1.015	Mild reduction in high-risk profiles
Median NT	0.9486	Borderline elevation in flagged cases
Median Gestational Age	88 days	Within optimal screening window

Figure 2

Clinical Background

- **Previous Anomalies:** None (No prior chromosomal abnormalities)
- **Smokers / Diabetics:** None (No confounding risk factors)
- **Non-Caucasian Patients:** 1.6% (Ethnic adjustment applied in SSDW)

Figure 3

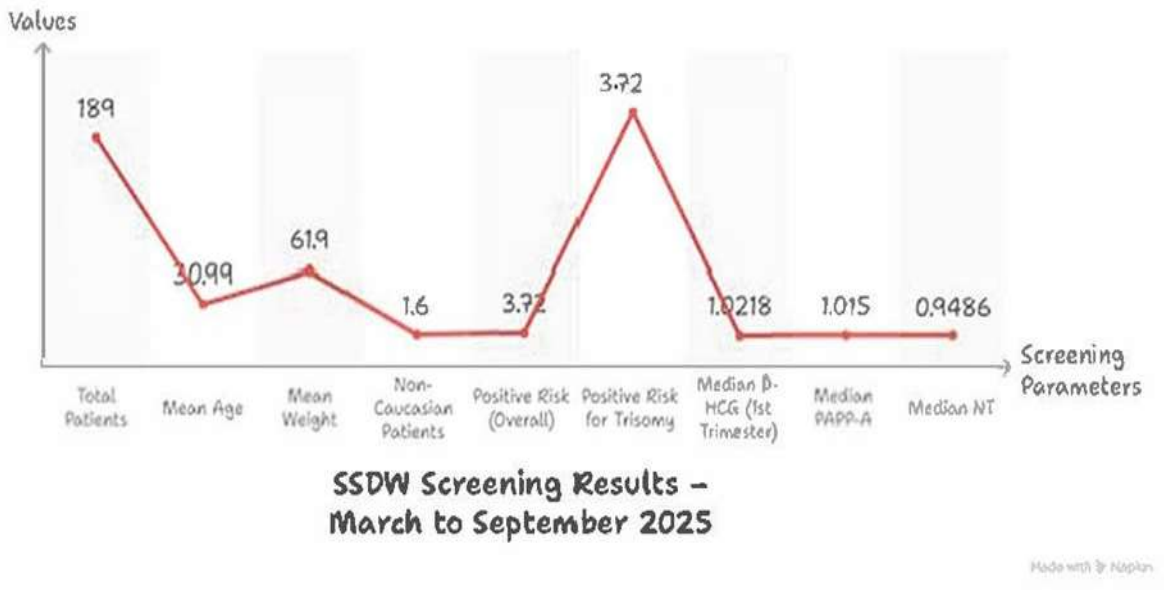

Figure 4

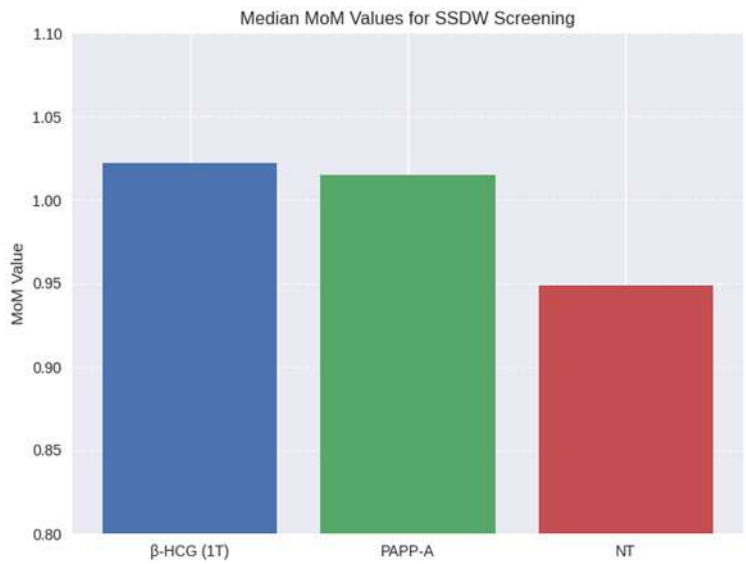

Figure 5

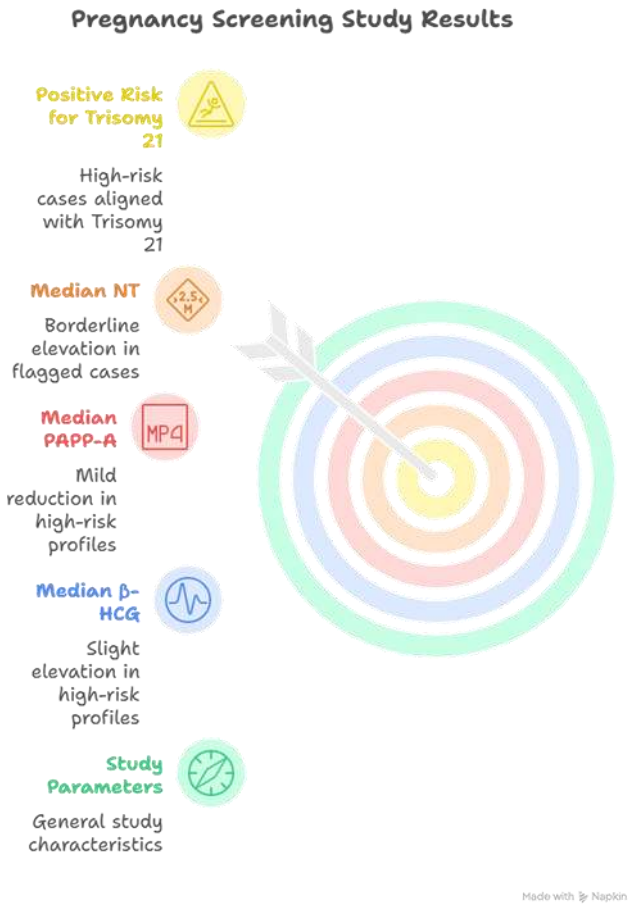

Figure 6

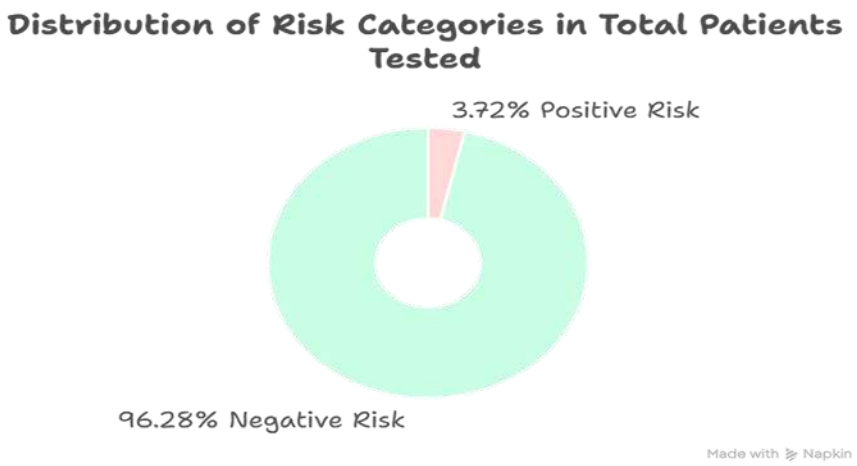

Figure 7

Conclusion

Out of 189 patients screened, 3.72% were flagged as high-risk for Trisomy 21 based on SSDW analysis. Elevated β-HCG and reduced PAPP-A levels were consistent with known biochemical trends in affected pregnancies. NT measurements showed borderline elevation in flagged cases.

This study reinforces the value of first trimester double marker screening combined with ultrasound and SSDW analytics in identifying high-risk pregnancies early—supporting timely clinical decisions and reducing reliance on invasive testing.

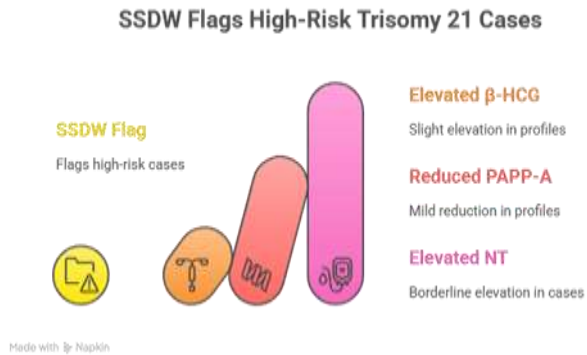

Figure 8

Acknowledgments

Gratitude to our technical and entire QLABS CLINICAL LABORATORY team for their dedication and precision. This work reflects our shared commitment to excellence, innovation, and patient-centered care, and continuous improvement. Special appreciation to ROCHE DIGNOSTICS and data handling team of SSDW software.

"Empowering early detection through data-driven screening".

Disclaimers

- This poster presents retrospective screening data analyzed using SSDW software and is intended for educational and audit purposes.
- Risk estimates are probabilistic and should be interpreted in conjunction with clinical findings, ultrasound parameters, and patient history.
- Biochemical values are expressed in Multiples of Median (MoM), normalized for maternal weight, gestational age, and ethnicity.
- Screening outcomes do not confirm diagnosis and should be followed by appropriate clinical evaluation and, where indicated, confirmatory testing.

Ethics Statement

This retrospective analysis was conducted using anonymized patient data in accordance with institutional protocols. No patient-identifiable information was used, and all procedures adhered to local regulation standards for ethical data reporting and laboratory practice.

References

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3. SSDW Software User Manual, Versions 5 & 6 – Risk Calculation Algorithms and MoM Normalization Protocols.

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