International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622
Impact Factor (RJIF): 6.71

www.gynaecologyjournal.com
2025;9(4): 46-52
Received: 07-06-2025
Accepted: 12-07-2025

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Knowledge, attitude, and practices regarding antenatal ultrasounds in a semi-urban Indian population: A comprehensive cross-sectional study

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DOI: https://www.doi.org/10.33545/gynae.2025.v9.i4a.1661

Abstract
Background: Antenatal ultrasonography plays a pivotal role in detecting fetal anomalies. This study assessed knowledge, attitude, and practices regarding anomaly scans among pregnant women in a semi-urban setting.
Methods: Cross-sectional study at Amandeep Kamal Hospital, Tarantaran involving 500 pregnant women attending their first antenatal visit. A structured questionnaire explored demographics, knowledge of routine ultrasounds, anomaly scans, and genetic testing.
Results: 65% of participants were aware of routine ultrasounds, but only 27% knew of the anomaly scan; 18% had undergone anomaly scans previously. Financial constraints, lack of counseling, and misconceptions were key barriers. Awareness of genetic testing was poor (10% aware; none underwent NIPT). Educational level showed significant correlation with awareness ($p<0.05$).
Conclusion: Early counseling and community-based interventions are essential to enhance anomaly scan uptake and improve perinatal outcomes.
Demographic Characteristics of Participants
Note: The detailed Antenatal Ultrasound Awareness Questionnaire is provided immediately following this section as Annexure.

Keywords: Antenatal ultrasound; anomaly scan; prenatal screening; KAP study; semi-urban India

Introduction

Congenital malformations are a major cause of neonatal morbidity and mortality worldwide.1 While many preventable causes of neonatal death have declined, birth defects continue to pose significant challenges to maternal and child health programs. In developed countries, second trimester ultrasound scans performed between 18 and 22 weeks of gestation detect nearly 70 to 90 percent of structural anomalies. ^2,3^ In contrast, Indian studies consistently report detection rates below 50 percen.

Several factors contribute to these low rates, including delayed antenatal registration, limited awareness among pregnant women, financial constraints, and sociocultural beliefs.^6,7^ Kashyap *et al.* demonstrated in their tertiary care study that first trimester scans could detect up to 50 percent of major malformations compared to just 1.6 percent detection with current practices, underscoring the potential of earlier screening to improve perinatal outcomes.8 Similarly, Akinmoladun *et al.* in Nigeria rep.

Rural-urban disparities are a critical determinant. National surveys indicate that while 61 percent of Indian women receive at least one ultrasound during pregnancy, many do not undergo targeted anomaly scans, especially in rural settings where facilities and counseling are limited. ^10,11^ Tribal population studies show anomaly scan awareness rates below 30 percent,12 whereas urban tertiary hospitals report awareness closer to 50 percent.13 Global data from WHO and NICE guidelines recommend universal.

This study was conducted in a semi-urban region of Punjab, aiming to evaluate knowledge, attitude, and practices (KAP) regarding antenatal ultrasonography, especially anomaly scans and prenatal genetic testing. By contextualizing findings against national and global data, the study identifies key barriers and suggests strategies to improve anomaly detection in similar populations.

Despite improvements in maternal healthcare indicators, anomaly detection during pregnancy is inconsistent in India.^16-18 Studies from rural and semi-urban regions reveal low awareness of recommended anomaly scans, often compounded by myths regarding ultrasound safety and limited antenatal counseling. ^19-21 Global guidelines recommend a targeted scan at 18-22 weeks to detect structural anomalies, ^22 yet compliance remains low in low-resource settings. ^23-25 This study aims to assess KAP related to anomaly scans among pregnant women in Tarantaran, emphasizing potential strategies for improving fetal anomaly detection rates.

Materials and Methods

- **Design:** Cross-sectional observational study conducted over 12 months.
- **Setting:** Amandeep Kamal Hospital, Tarantaran, catering to semi-urban and nearby rural populations.
- **Participants:** 500 pregnant women attending first antenatal visit; exclusions included those already counseled or under routine obstetric follow-up.
- **Tool:** Structured questionnaire assessing demographics, obstetric history, and knowledge of anomaly scans and genetic testing.
- **Analysis:** Data analyzed using descriptive statistics; chi-square test applied for associations ($p<0.05$ significant).

Results

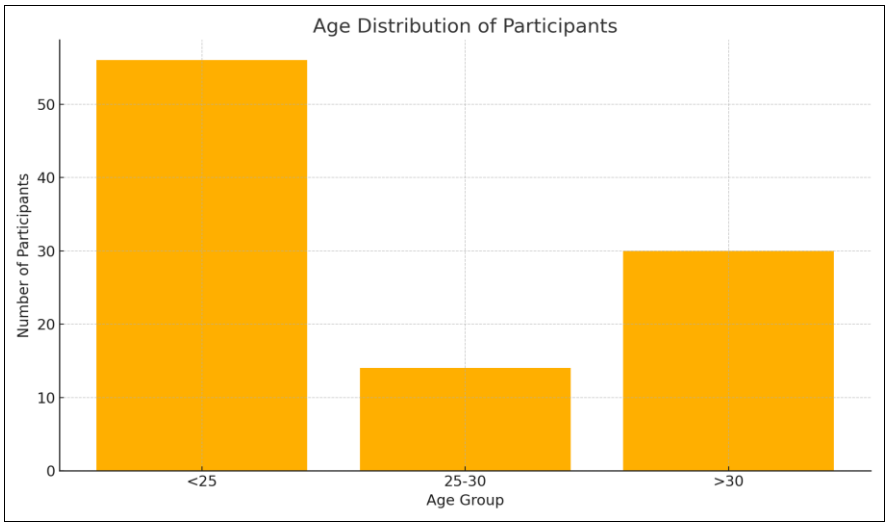
Of the 500 pregnant women studied, 65 percent were aware of routine antenatal ultrasounds, but only 27 percent knew the purpose of a dedicated anomaly scan. A mere 18 percent had undergone an anomaly scan in previous pregnancies. Awareness of prenatal genetic testing, such as dual marker screening or non-invasive prenatal testing (NIPT), was low at 10 percent, and none of the women had undergone such tests.

The demographic profile showed that 70 percent of participants were younger than 30 years and 56 percent were below 25 years. Educational status varied: 45 percent had completed high school, 20 percent were graduates, and 3 percent postgraduates. Most participants (80 percent) were homemakers, and 59 percent lived in rural areas.

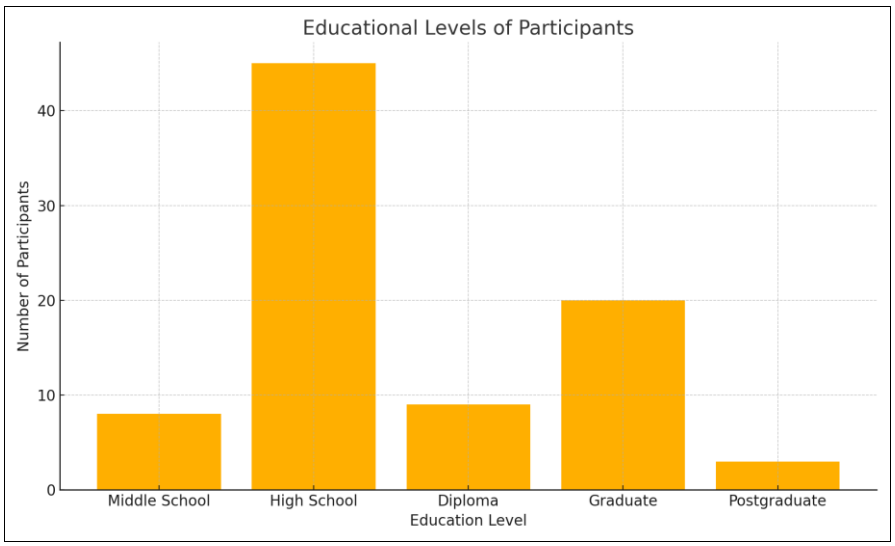
Comparisons with other Indian studies indicate that our semi-urban cohort lies between rural and urban extremes. Tribal studies from Maharashtra and central India report awareness below 30 percent,[12] while urban tertiary hospitals in Gujarat and Andhra Pradesh report rates between 35 and 50 percent.^13,16^ The barriers identified-lack of counseling, financial issues, and misconceptions about ultrasound safety-echo findings from previous studies in both rural and semi-urban settings.^6,17^ Higher education.

27. Charts and Visual Data

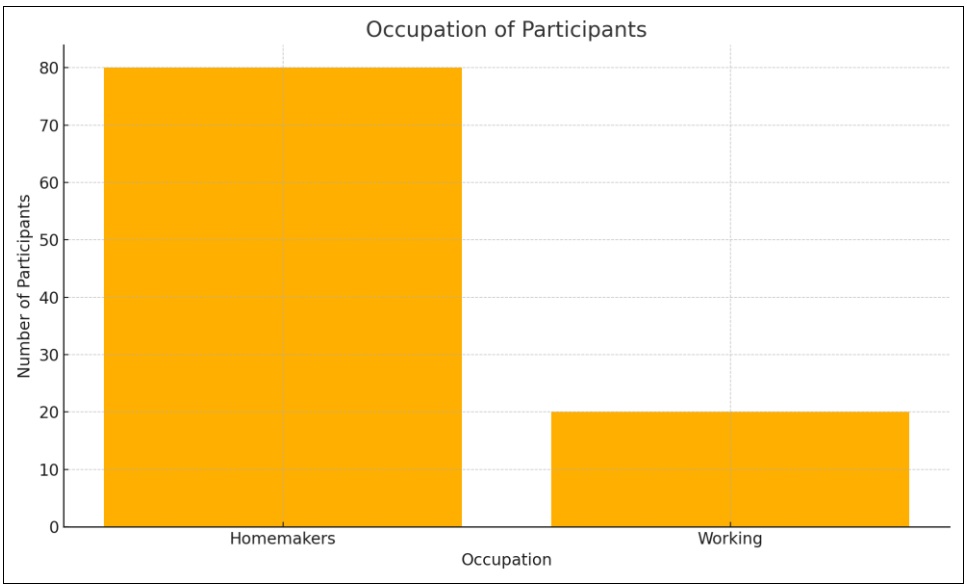
28. Age Distribution



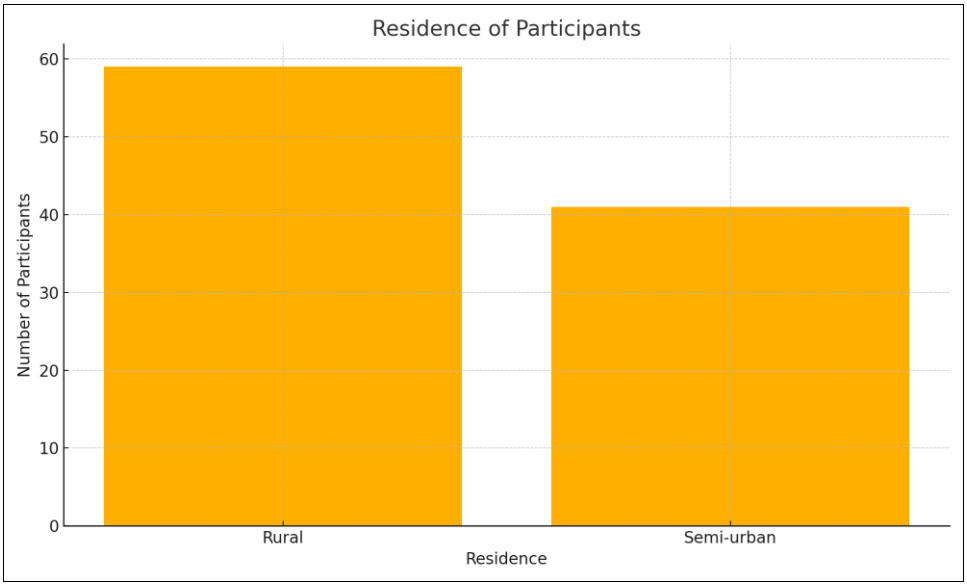
29. Education Levels



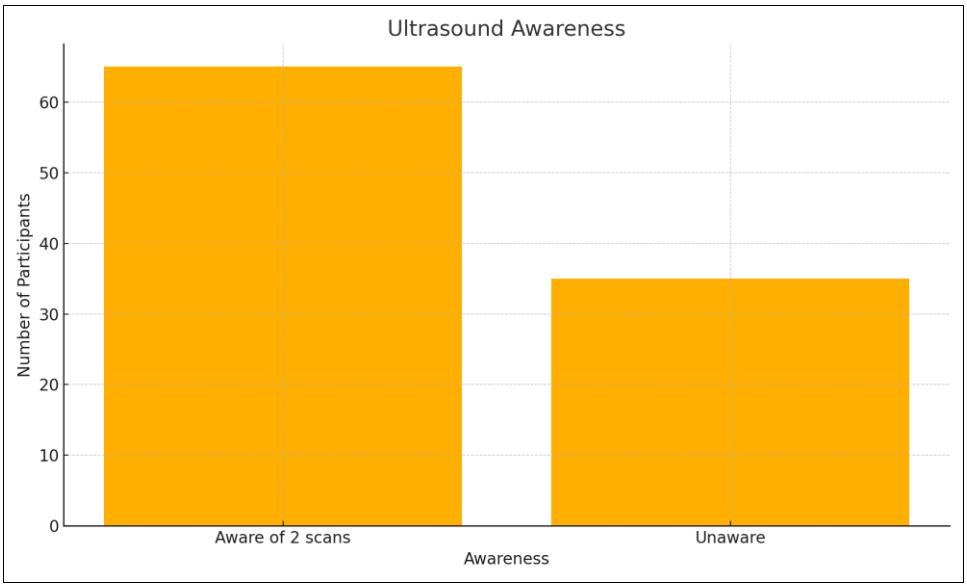
30. Occupation



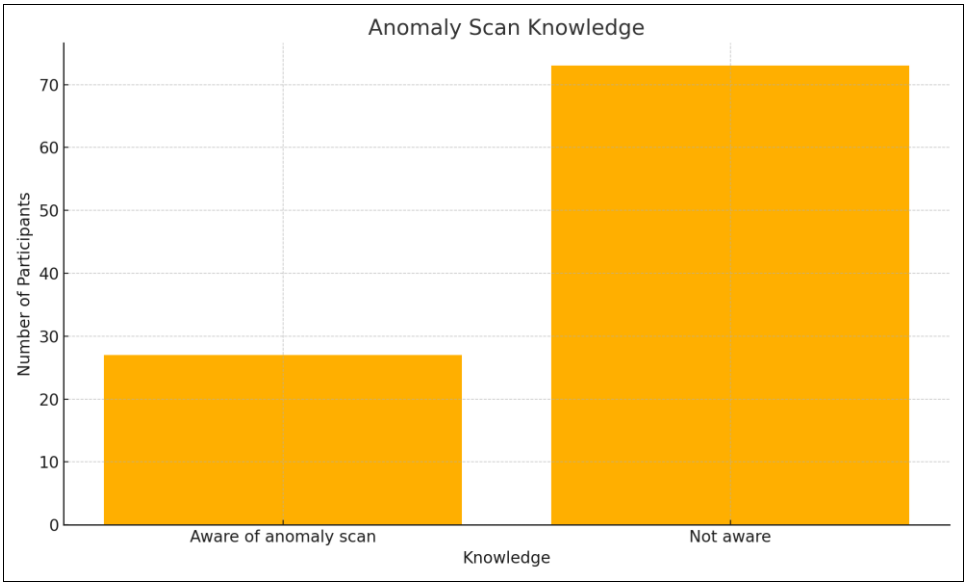
31. Residence



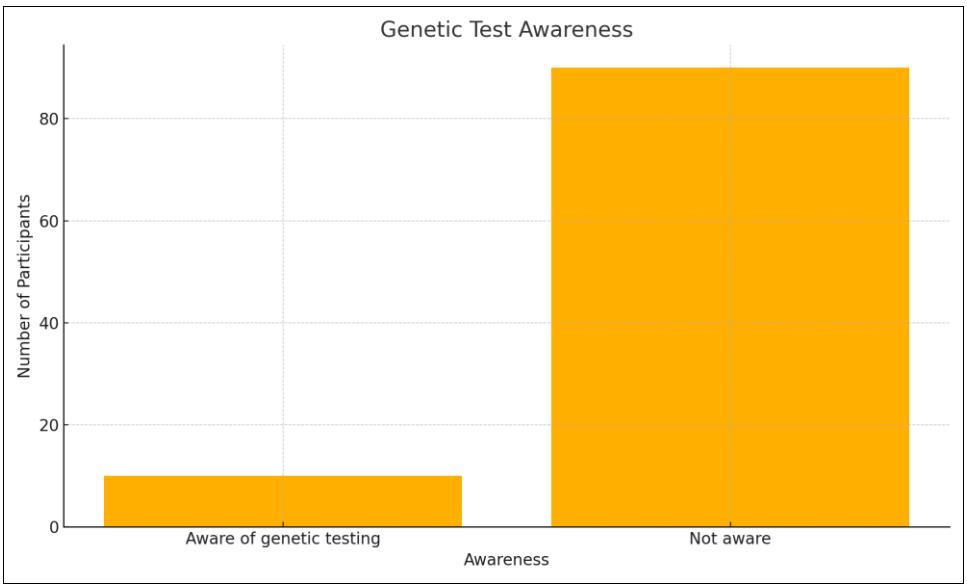
32. Ultrasound Awareness



33. Anomaly Scan Knowledge



34. Genetic Test Awareness



Category	Count (n=500)
Age < 25	280
Age 25-30	70
Age > 30	150
Middle School	40
High School	225
Diploma	45
Graduate	100
Postgraduate	15
Homemakers	400
Working	100
Rural	295
Semi-urban	205

Table 1: Comparison of anomaly scan uptake in rural and urban India and developed countries

Context	Anomaly Scan Uptake / Detection Rate	Key Factors
Rural India	<50% detection; low awareness; only 25% had any ultrasound in tribal studies	Limited awareness, financial constraints, fewer facilities
Urban India	35-50% awareness; detection rates higher but still suboptimal	Better access and education; still gaps in counseling
Developed Countries	70-90% detection; near-universal uptake	Structured screening programs, universal access, high public awareness

Table 2: Relation of education level with awareness of ultrasound

Education Level	Awareness of Ultrasound (%)
Middle School	20
High School	45
Diploma	50
Graduate	70
Postgraduate	85

Table 3: Relation of age group with awareness of ultrasound

Age Group	Awareness of Ultrasound (%)
<25 years	55
25-30 years	65
>30 years	72

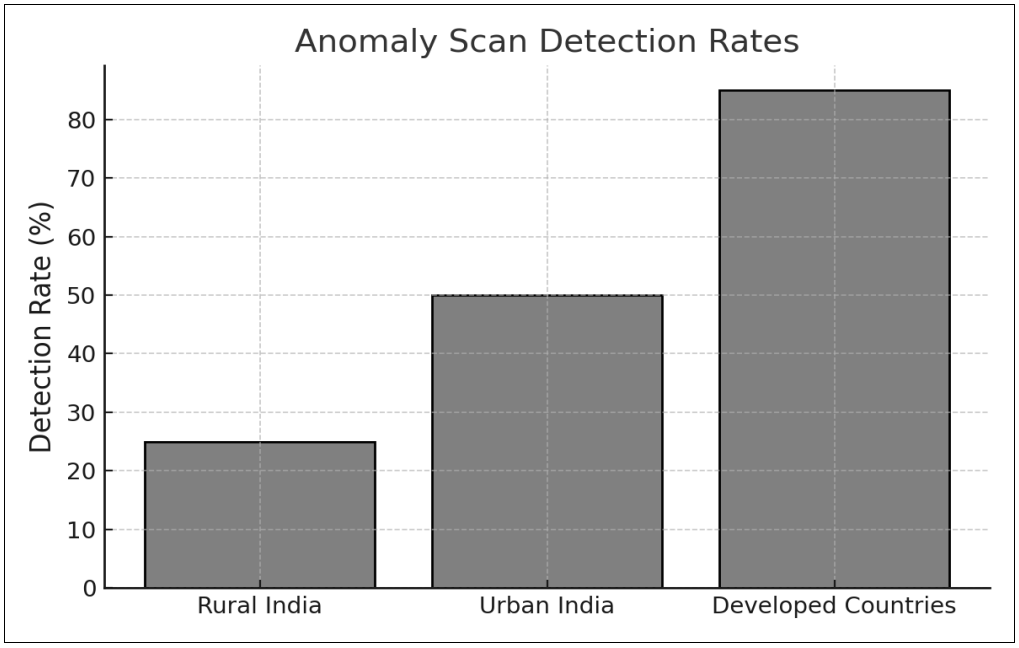


Fig 1: Anomaly Scan Detection Rates - Rural vs Urban vs Developed Countries

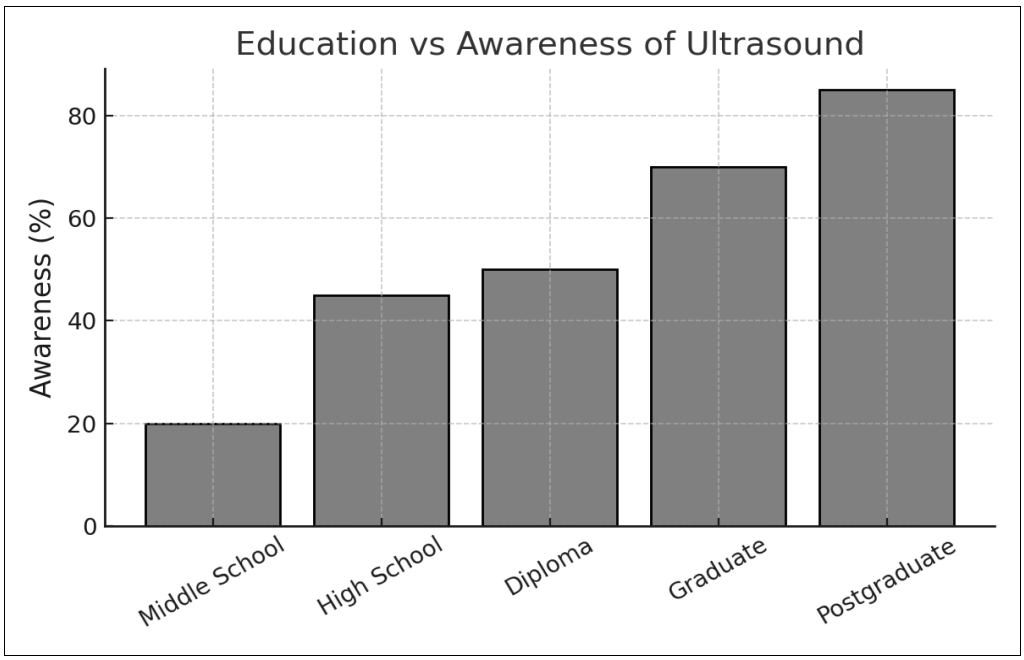


Fig 2: Education vs Awareness of Ultrasound

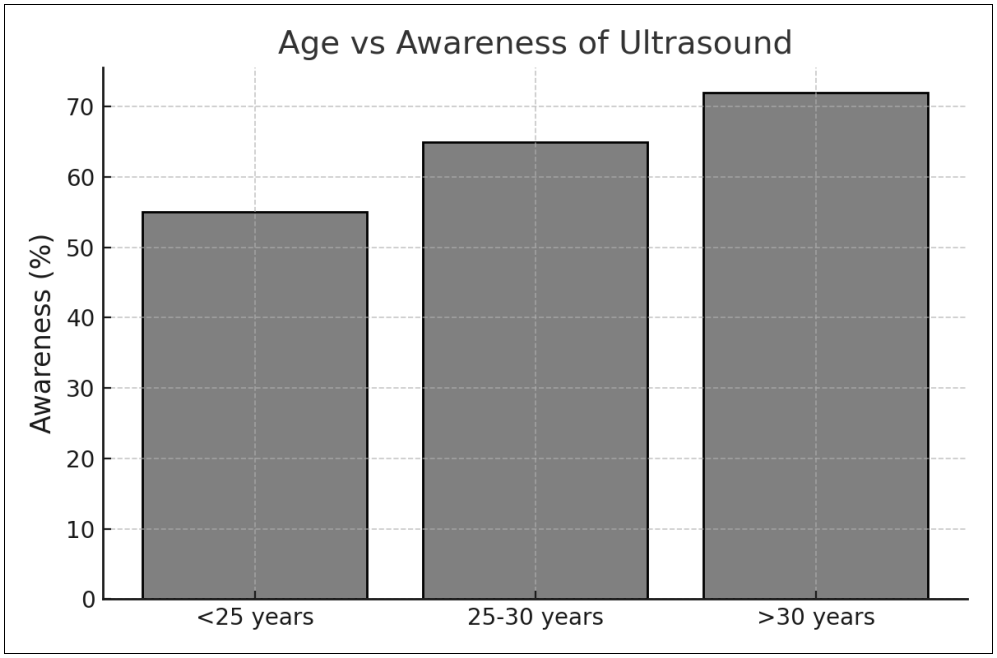


Fig 3: Age vs Awareness of Ultrasound

Discussion

This study highlights persistent gaps in anomaly scan awareness and utilization among semi-urban women in northern India. Although two-thirds of women knew about routine ultrasounds, fewer than one-third understood the purpose or timing of anomaly scans—a finding consistent with prior studies from Punjab, Gujarat, and Uttar Pradesh.^4,13,19^

The rural-urban divide remains significant. Awareness in our cohort (27 percent) exceeds figures reported in tribal populations (<25 percent) but falls short of urban tertiary settings (35-50 percent).^12,13^ This gradient reflects differences in literacy, access to trained sonographers, and structured antenatal counseling. Rural women often initiate antenatal care later and receive fewer scans—a pattern documented in community-based studies from both India and other low-resource settings.^6,9^

Global comparisons further emphasize this gap. Countries with structured screening programs, such as the UK's NHS or Australia's public health system, achieve near-universal uptake and 70-90 percent prenatal anomaly detection.^14,15^ By contrast, Indian detection rates remain below 50 percent, even in urban hospitals.^4,5^ Kashyap *et al.*'s study demonstrates that earlier first trimester scanning could dramatically improve detection and allow timely management of congenital malformations. [8] These insigh.

Barriers identified in our cohort mirror those reported nationally: financial constraints, absence of counseling, and misconceptions about ultrasound safety. Targeted interventions are needed. Community-based education through ASHA workers, early antenatal counseling at the first visit, and mobile-based reminders can significantly improve awareness and uptake.^17,18^ Subsidizing essential prenatal tests and equipping primary health centers with skilled personnel and quality ultrasound machines are equall.

By addressing these gaps, India can substantially improve prenatal anomaly detection rates and reduce preventable neonatal morbidity and mortality. Semi-urban communities, situated between rural and urban contexts, present an ideal focus for scalable interventions.

Conclusion and Future Directions

This study reinforces the critical need for enhancing awareness and uptake of anomaly scans and prenatal genetic testing in semi-urban India. Policy-level interventions should prioritize structured counseling at the first antenatal visit, community-based awareness programs, and financial support mechanisms to make anomaly scans universally accessible. Such steps can substantially reduce preventable neonatal morbidity and mortality linked to undetected congenital anomalies.^8,13,22

Future research should evaluate the effectiveness of digital health tools, community health worker-led interventions, and public-private partnerships in scaling prenatal screening programs. Implementation studies could further guide resource allocation and policy-making for wider impact.

- **Key Message / Thought for the Masses:**
- *Every pregnancy deserves a chance at a healthy outcome - awareness of anomaly scans is the first step toward saving lives. Bridging this knowledge gap is not just a medical priority but a moral imperative for society.*

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Annexure: Antenatal Ultrasound Awareness Questionnaire (KAP)

Section 1: Demographics

• 1. Name: _____

• 2. Age: _____

• 3. Educational Qualification:

☐ No formal education ☐ Primary school ☐ Secondary school ☐ Graduate ☐ Postgraduate

• 4. Occupation: _____

• 5. Residential Area: ☐ Urban ☐ Semi-urban ☐ Rural

Section 2: Obstetric History

• 6. Gravida (No. of pregnancies): _____

• 7. Para (Live births): _____

• 8. Abortions (If any): _____

• 9. Stillbirths (If any): _____

• 10. Current Gestational Age (in weeks): _____

• 11. Any complications in previous pregnancies? ☐ Yes ☐ No

If yes, please specify: _____

Section 3: Knowledge of Basic Antenatal Ultrasounds

• 12. Do you know what an antenatal ultrasound is? ☐ Yes ☐ No

• 13. How many times do you think ultrasounds should be done during pregnancy?

☐ Once ☐ Two to three times ☐ More than three times ☐ Don't know

• 14. What do you think antenatal ultrasounds are used for? (You can choose more than one)

☐ To check baby's heartbeat ☐ To find out baby's gender ☐ To see baby's growth

☐ To identify problems in baby ☐ Don't know

Section 4: Knowledge of Anomaly Scan

• 15. Have you heard of the anomaly scan or TIFFA scan? ☐ Yes ☐ No

• 16. When should an anomaly scan be done?

☐ Before 12 weeks ☐ Between 18-22 weeks ☐ After 30 weeks ☐ Don't know

• 17. What do you think is the purpose of an anomaly scan?

☐ To find out the baby's sex ☐ To check for physical abnormalities in the baby

☐ To determine the baby's position ☐ Don't know

• 18. Have you undergone an anomaly scan in this pregnancy? ☐ Yes ☐ No

If No, what was the reason?

☐ Not aware ☐ Doctor did not advise ☐ Could not afford ☐ Facility not available

☐ Other (specify): _____

Section 5: Knowledge of Tests for Fetal Anomalies & Genetic Disorders

• 19. Are you aware of any tests that can detect genetic or chromosomal problems in a baby? ☐ Yes ☐ No

• 20. Which of the following tests have you heard about or undergone? (Tick all that apply)

☐ Dual marker test ☐ Triple marker test ☐ NIPT (Non-invasive prenatal test)

☐ Amniocentesis ☐ Chorionic Villus Sampling (CVS) ☐ None of the above

• 21. If not taken any of these tests, what was the reason?

☐ Not aware ☐ Doctor did not suggest ☐ High cost ☐ Fear of side effects

☐ No facility nearby ☐ Other (specify): _____

Final Section: Suggestions or Concerns

• 22. Do you have any concerns or questions about antenatal scans or tests?

How to Cite This Article
Salhan H, Kaur A, Kaur K. Knowledge, attitude, and practices regarding antenatal ultrasounds in a semi-urban Indian population: A comprehensive cross-sectional study. International Journal of Clinical Obstetrics and Gynaecology 2025;9(4):46-52.