

Knowledge, Attitude and Practices (KAP) Towards Obstetrics Ultrasound among Pregnant Women in Tertiary Care Hospital, Rajasthan, India: A Cross-Sectional Descriptive Study

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Abstract

Background: Ultrasonography is widely used imaging modality, offering real-time foetal visualization without any risk to mother and foetus. It helps to improve maternal and fetal outcomes through enhanced prenatal care. Study aims to assess knowledge, attitude and practices (KAP) towards obstetrics ultrasound among pregnant women.

Material and Methods: A hospital-based, cross-sectional study was conducted from April to December 2023, involving 300 pregnant women at Zanana Hospital, Jaipur, Rajasthan, India. A validated, semi-structured, interviewer-administered questionnaire covering socio-demographic, obstetric characteristics and KAP towards ultrasound used for data collection. Descriptive Statistics was performed using MS Excel 2007 and IBM SPSS Statistics version 25.

Results: The mean age of the study participants was 26.68 ± 5.22 years. A majority lived in urban areas 193 (64.33%) and most identified as Hindu 198 (66%). Thirty-three percent of participants were from Class IV socio-economic status. Average knowledge score was 8.76 ± 3.25 , with 134 (44.67%) demonstrating average knowledge. Positive attitudes were observed in 164 (54.67%) of participants, while 279 (93%) exhibited good practices related to obstetrics ultrasound.

Conclusions: knowledge towards obstetrics ultrasound was found to be average with about one third women had good knowledge with some of them had poor knowledge. Attitude was found positive and half of participants had positive attitude with some of them negative attitude. Nearly all participants had good practice of ultrasound during pregnancy. Improving KAP can enhance maternal and foetal outcomes, highlighting the need for Information, Education, and Communication (IEC) interventions to raise awareness regarding obstetric ultrasound with PCPNDT Act among pregnant women.

Keywords: Obstetrics ultrasound, Antenatal care, pregnant women, KAP study, Cross-sectional study.

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Introduction

Obstetric ultrasound is a non-invasive imaging technique that uses sound waves to examine the abdominal and pelvic regions of pregnant women[1]. According to the World Health Organization (WHO), it is recommended that all pregnant women undergo an ultrasound scan before 24 weeks of gestation[2]. This procedure plays a crucial role in estimating gestational age, assessing

placental location, identifying single or multiple pregnancies, detecting fetal abnormalities, and improving overall pregnancy outcomes[3,4]. Additionally, ultrasounds performed when clinically necessary can enhance the accuracy of gestational age estimation, aiding in the management of potential preterm or post-term deliveries, particularly in resource-limited

settings[1]. Around the world, unsafe abortions cause 13% of maternal deaths, obstructed labour accounts for 8%, and ectopic pregnancies account for 8% of all maternal deaths. Congenital abnormalities (11% of neonatal death), intra-partum complications (24%) and preterm birth issues (35%) are the three main causes of neonatal mortality. According to UNICEF, child mortality estimates 2020 out of IMR 48.1% were preterm birth-related deaths, 4% of births were with congenital defects. 43.1% of neonatal deaths were caused by preterm, 11.1% by congenital abnormality and 5.9% by other causes [5,6]. In underdeveloped nations like India, maternal and neonatal health risks remain elevated due to limited access to advanced healthcare[7]. According to (Ministry of Health and Family Welfare) MOHFW, in 2022 maternal mortality rate (MMR) of India was 97 and 113 of Rajasthan (per lakh live births) [8]. According to National Family Health Survey 5 (NFHS) data mothers who had an antenatal check-up in the first trimester in India was 70.0% & 76.3 % in Rajasthan.

Mothers who had at least 4 antenatal care visits in India were 58.1% & 55.3 % in Rajasthan. Per 1,000 live births- Neonatal Mortality Rate (NNMR) 24.9% and Infant Mortality Rate (IMR) 35.2% in India and Rajasthan Neonatal Mortality Rate (NNMR) was 20.2% and Infant Mortality Rate (IMR) 30.3%[9]. Ultrasound has been shown to reduce perinatal mortality, improve pregnancy outcomes, and guide timely interventions[10]. Despite its benefits, access to ultrasound is often limited by socioeconomic factors, with significant disparities in its utilization[11]. KAP regarding obstetric ultrasound can help improve maternal and fetal outcomes through enhanced prenatal care and health education[12]. Study aims to assess KAP among pregnant women attending antenatal care at a public hospital.

Objectives:

1. To assess the socio-demographic status of study participants.
2. To estimate the level of knowledge, attitude and practices towards obstetrics ultrasound among pregnant women attending antenatal Care (ANC) outpatient department (OPD) of Zanana Hospital, Jaipur.

Material and Methods:

Study design and setting: This cross- sectional, descriptive study was conducted between April to December 2023, involving 300 pregnant women at Zanana Hospital (Tertiary care hospital), Jaipur, Rajasthan, India, after getting institutional ethics committee (IEC) approval.

Study population: The study was conducted at antenatal care out patients department of Zanana

Hospital, Jaipur, under the supervision of Department of Preventive and Social Medicine. All pregnant women seeking ANC services and “who gave informed consent” were enrolled in study, while non-cooperative or emergency cases were excluded from study.

Sample size and sampling technique:

$$n=(Z_{1-\alpha/2}/\delta)^2 \times p \times (1-p)$$

Formula used to calculate the sample size where, “n” represents the sample size, “ α ” represents the type I error, which is typically set at 0.05, $Z_{1-\alpha/2}=1.96$, δ represents the allowable error, typically set at 0.05, and “p” is prevalence assuming favourable attitude of pregnant women towards obstetrics ultrasound was 78.9% [13]. This sample size was adequate for other variable studied. So for the study purpose 300 pregnant women were taken with the attrition of 10% and rounded off. Non-probable, purposive sampling done for data collection by selecting all eligible pregnant women attending ANC OPD on selected days were recruited using a first-come, first-served approach, with data collected from six participants per day until the target was achieved.

Data collection and study variables: Data was collected using a semi-structured, validated questionnaire in both English and Hindi, covering socio-demographic, obstetric characteristics and knowledge, attitude and practices (KAP) regarding obstetric ultrasound. The knowledge domain containing 17 questions, related to the knowledge about obstetrics ultrasound, its uses and PCPNDT Act. Questions with Yes/No and multiple option type, maximum of 1 mark was given, 1 mark was given for “Yes” or correct response and zero mark for “No” or “Don’t know” or wrong response. Knowledge score divided in to good (11-17 score), average (6-10 score) and poor (≤ 5 score). The attitude domain containing 6 questions, related to the attitude towards requirement and safety of obstetrics ultrasound. A 5-point Likert’s scale was used for the responses regarding attitude. The following responses, strongly agree/ Agree/Neutral/Disagree/strongly disagree. For a positive attitude item, scores of ‘5’, ‘4’, ‘3’, ‘2’ and ‘1’ were allotted for ‘Strongly Agree’, ‘Agree’, ‘Neutral/Not sure’, ‘Disagree’ and ‘Strongly Disagree’, respectively. The scoring was inverted for the negative attitude questions. *For the question “Obstetric ultrasonography can lead to congenital anomaly” and “Believe that prenatal sex determination is right”. Attitude divided in to positive (3.6-5 score), neutral (2.6- ≤ 3.5 score) and negative (1- ≤ 2.5 score). The practice domain containing 8 questions, related to the act of pregnant women towards obstetrics ultrasound. Scoring was done *for the question “Have you ever

had any ultrasonography investigation for current pregnancy". Maximum of one mark was given, one mark was given for "Yes", zero mark for "No" response. Practice divided into good (fulfilling guideline i.e., single USG for pregnancy)[14] and Poor (not done USG for their current pregnancy).

Data were entered in Microsoft Excel and analyzed using SPSS version 25. Descriptive statistics were employed, with qualitative data summarized as percentages and quantitative data expressed as mean $\pm$ SD.

Data and statistical analysis: Data was entered into Microsoft Excel and analyzed using the commercially available statistical software (IBM SPSS V25.0). Continuous data was expressed as mean or median and categorical data as proportion. The chi-square test was applied for categorical data to test the difference between groups. Differences were considered to be statistically significant at p -value < 0.05 .

Ethics approval: The study was conducted after approval of the Institutional Ethics Committee of the institute. This study was performed in lines with the Declaration of Helsinki.

Results:

Socio-demographic and obstetrics characteristics of the participants are shown in table 1. Mean age of participants 26.68 ± 5.22 years and 152 (51%) were belongs to 18-25 years age group. Most resided in urban areas 193 (64.33%) and 107 (35.67%) from rural regions.

Majority were Hindus 198 (66%), followed by Muslims religion 80 (26.67%). Most participants belonged to OBC category 123 (41%), followed by SC 71 (23.67%) and ST community 39 (13%). About 82 (27.33%) of participants had high school education, 76 (25.33%) had middle school education, and 11 (3.67%) had professional education. Majority of 253 (84.33%) participants were unemployed and least 9 (3%) of them working as plant & machine operators and assembler workers.

All participants were married. About 168 (56%) participants were multi-gravid, 152 (50.67%) in their third trimester and 112 (37.33%) had attended more than four antenatal care (ANC) visits. A majority 155 (51.67%) had previous deliveries in government hospitals and 85 (28.33%) had bad obstetrical history. Only 109 (36.33%) government hospitals nearer to study participants had ultrasound facility.

Table 1: Shows Socio-demographic and obstetrics characteristics of study participants (n=300)

Socio-demographic characteristics	Categories	Frequency (%)	Obstetrics characteristics	Categories	Frequency (%)
Age Group (in yrs)	18-25 yrs	152 (50.67%)	Gravidity status of pregnant women	Multi-gravida	168 (56.00%)
	26-33 yrs	113 (37.67%)		Primi-gravida	132 (44.00%)
	34-41 yrs	32 (10.67%)	No. of pregnancies	1	132 (44.00%)
	42-43 yrs	3 (1.00%)		2	106 (35.33%)
Residence(U/R)	Rural	107 (35.67%)		3	50 (16.67%)
	Urban	193 (64.33%)		≥ 4	12 (4.00%)
Religions	Hindu	198 (66.00%)	Trimester of Current pregnancy	First Trimester	28 (9.33%)
	Muslim	80 (26.67%)		Second Trimester	120 (40.00%)
	Others	22 (7.33%)		Third Trimester	152 (50.67%)
Caste	GEN	67 (22.33%)	Number of ANC visits	1	53 (17.67%)
	OBC	123 (41.00%)		2	43 (14.33%)
	SC	71 (23.67%)		3	53 (17.67%)
	ST	39 (13.00%)		4	39 (13.00%)
Education	Professional/	11 (3.67%)		>4	112

status	honours education				(37.33%)
	Graduate	13 (4.33%)	Time of first visit ANC (Weeks)	≤16	233 (77.67%)
	Intermediate	44 (14.67%)		>16	67 (22.33%)
	High school certificate	82 (27.33%)	Previous delivery place	Government hospital	155 (51.67%)
	Middle school certificate	76 (25.33%)		Private hospital	13 (4.33%)
	Primary school certificate	28 (9.33%)		Not applicable	132 (44.00%)
	Illiterate	46 (15.33%)	Having bad obstetrical history	No	215 (71.67%)
Occupation status	Skilled Agricultural & Fishery Workers	21 (7.00%)		Yes	85 (28.33%)
	Plant & Machine Operators and Assemblers	9 (3.00%)	Number of Abortions	No Abortion	215 (71.67%)
	Elementary Occupation	17 (5.67%)		1	69 (23.00%)
	Unemployed/house maker	253 (84.33%)		2	12 (4.00%)
Socio-economic Status	Class I	13 (4.33%)		≥3	4 (1.33%)
	Class II	35 (11.67%)	USG Facility in nearest Govt. Hospital	No	191 (63.67%)
	Class III	90 (30.00%)		Yes	109 (36.33%)
	Class IV	99 (33.00%)	Time to reach nearest health facility (in minutes)	≤30	272 (90.67%)
	Class V	63 (21.00%)		>30	28 (9.33%)

Figure-1 shows that 99 (33%) of participants belonged to Class IV and minimal 13 (4%) were from Class I as per Modified BG Prasad socio-economic scale February 2023.

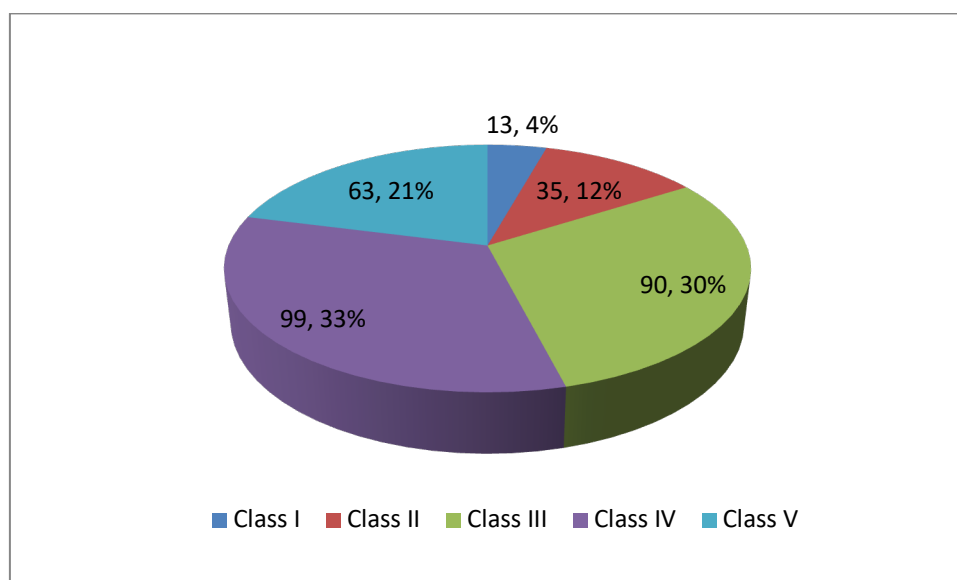


Figure 1: Distribution of study participants as per their Socio-economic status

Figure-2 showing that 134 (44.67%) had average knowledge score about obstetric ultrasonography, 164 (54.66%) of participants had positive attitude score and 279 (93%) participants had good practices score.

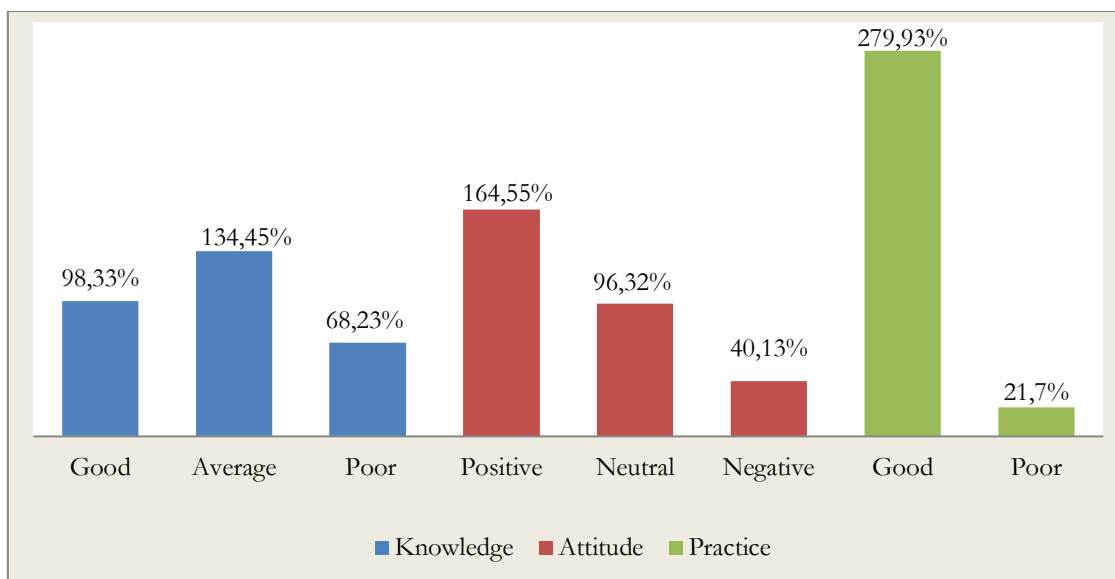


Figure 2: Distribution of study participants according to their knowledge, attitude and practice scores

Table-2 show that mean knowledge score was 8.76 ± 3.25 , with 293 (97.67%) participants knew about ultrasound, with 272 (90.67%) understanding its use in monitoring pregnancy complications,

however knowledge regarding use in determining foetal cord & placenta and detection of amniotic fluid volume was only 36 (12%) and 54 (18%) respectively.

Table 2: Shows knowledge of study participants towards obstetric ultrasound

Knowledge regarding obstetric ultrasound			
S. No.	Questions	Correct Answer	
		Frequency (n=300)	Percent
1	What is USG	293	97.67%
2	USG done by whom	176	58.67%
3	Helps in determining the foetal cord and placenta position	36	12.00%
4	Assists with finding the expected date of delivery	100	33.33%
5	Useful with knowing the Sex of the fetus	115	38.33%
6	Sex determination of child is a crime	222	74.00%
7	Is any law for prohibition for sex determination (PCPNDT)	190	63.33%
8	Use to detect any defect or congenital abnormalities during pregnancy	187	62.33%
9	The monitoring of pregnancy complication one of the practices of the USS	272	90.67%
10	Helps to detect amniotic fluid volume	54	18.00%
11	Help in reducing maternal morbidity and perinatal mortality	207	69.00%
12	The Foetal Heart rate detected by obstetric ultrasonography	154	51.33%
13	Predicts the way of delivery (normal? C-section)	64	21.33%
14	Confirms the presence of abnormal pregnancy (multiple, ectopic and molar)	259	86.33%
15	Give accurate information about foetal weight	76	25.33%
16	Contributes to the prediction of miscarriage during pregnancy	162	54.00%
17	Use to estimate gestational age	62	20.67%
Mean Knowledge Score= 8.76 ± 3.25			

Table-3 shows mean attitude score was 3.53 ± 0.75 . Approximately 193 women (64.33%) strongly agreed that “ultrasonography is essential during pregnancy”, whereas only 2 women (0.67%) strongly disagreed. A total of 166 women (55.33%) strongly believed that “obstetric ultrasonography is safe for the mother” and 159 (53%) felt it is “safe

for the fetus”. Additionally, 158 women (52.67%) strongly agreed that it is “important to educate others about obstetric ultrasonography”. Around 130 women (44.33%) strongly disagreed with “ultrasonography could cause congenital anomalies”. Furthermore, 153 women (51.00%) strongly disagreed with “prenatal sex determination

is acceptable”, while only 5 women (1.67%) strongly agreed for it.

Table 3: Shows attitude of study participants towards obstetric ultrasound

S. No.	Questions	Likert's Scale	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1	Ultrasonography is essential during pregnancy	Frequency	193	64	12	29	2
		Percent	64.33%	21.33%	4.00%	9.67%	0.67%
2	Obstetric ultrasonography is safe for mother	Frequency	166	102	7	24	1
		Percent	55.33%	34.00%	2.33%	8.00%	0.33%
3	Obstetric ultrasonography is safe for fetus	Frequency	159	96	20	23	2
		Percent	53.00%	32.00%	6.67%	7.67%	0.67%
4	Educating others about Obstetric ultrasonography is necessary	Frequency	158	96	19	26	1
		Percent	52.67%	32.00%	6.33%	8.67%	0.33%
5	Obstetric ultrasonography can lead to congenital anomaly	Frequency	4	28	24	114	130
		Percent	1.33%	9.33%	8.00%	38.00%	43.33%
6	Believe that prenatal sex determination is right	Frequency	5	40	20	82	153
		Percent	1.67%	13.33%	6.67%	27.33%	51.00%
Mean Attitude Score= 3.53±0.75							

Table 4 indicates that the average practice score was 0.93 ± 0.26 . Among the participants, 282 women (94.00%) had undergone at least one ultrasonography (USG) during any of their pregnancies, while 18 women (6.00%) had never had a USG for pregnancy.

A total of 42 pregnant women (14.00%) had undergone a USG without any medical advice, whereas 158 (86.00%) had only done so upon medical recommendation. Regarding the current pregnancy, 221 (73.70%) had their first USG at or before 20 weeks of gestation. In contrast, 58 women (19.30%) had their first scan after 20 weeks and 21 women (7.00%) had not had any USG during their current pregnancy. All 300 participants

(100.00%) reported that they had never undergone prenatal sex determination in any of their pregnancies.

Additionally, 267 women (86.00%) shared that the doctor performing the scan did not provide any information about the baby, while only 17 women (7.50%) stated that they received clear information during the scan. Among the 300 participants, 271 (90.33%) had no congenital abnormalities or defects diagnosed in the fetus during their current pregnancy. However, 11 women (3.67%) reported a diagnosis of hydrocephaly, 8 (2.67%) reported intrauterine growth restriction (IUGR), and 3 (1.00%) were diagnosed with fetal heart abnormalities.

Table 4: Shows practices of study participants towards obstetric ultrasound

S. No.	Practice questions	Response	Frequency	Percent
1	Have you ever had USG investigation for pregnancy	No	18	6.00%
		Yes	282	94.00%
2	Who advice you obstetrics USG investigation first time	Doctor	270	90.00%
		Family and friends	9	3.00%
		Nurse	21	7.00%
3	Have you ever had USG investigation without any medical advice for pregnancy	No	258	86.00%
		Yes	42	14.00%
4	Time of first USG investigation for current pregnancy(weeks)	<20	221	73.67%
		≥ 20	58	19.33%
		Not done till now	21	7.00%
5	No. Of USG done for current pregnancy (mean 2.15 ± 1.24)	Not done	21	7.00%
		1	58	19.33%
		2	136	45.33%
		3	47	15.67%

		4	26	8.67%
		≥5	12	4.00%
6	Have you ever had prenatal sex determination	Yes	0	0.00%
		No	300	100.00%
7	The doctor who performs the scan gave you information about the baby	A. Yes, i was given details, and it was clear for me	17	5.67%
		B. Yes, i was given details, but it was not clear for me	16	5.33%
		C. No, i wasn't given details	267	89.00%
8	Any congenital abnormality/defect in foetus diagnosed in current pregnancy	No anomaly/defect diagnosed in foetus	271	90.33%
		IUGR	8	2.67%
		Hydrocephaly	11	3.67%
		Renal anomaly	7	2.33%
		Other (heart problem)	3	1.00%
	Total		300	100.00%
Mean Practices Score= 0.93±0.26				

Discussion

In present study, 293 (97.67%) of participants were aware of ultrasound (USG) as a diagnostic tool, similar to Maniragena et al.[15] 265 (88.3%), but higher than Yetwale et al.[16] 178 (62.7%). Only 176 (58.67%) knew doctors perform USG, with no other studies addressing this aspect. Awareness of USG for detecting fetal cord and placenta positions was low 36 (12%), compared to Abduljabbar et al.[13] 339 (92.4%), likely due to lower educational levels in our cohort. Similarly, only 99 (33.33%) knew USG helps estimate the expected delivery date, aligning with Molla et al.[17] 150 (36%) but lower than Abduljabbar et al.[13] 307 (83.7%). Awareness of USG for fetal sex determination was 115 (38.33%), comparable to Yadav et al.[18] 81 (27.94%), but lower than Chinene et al.[19] 155 (91.3%), reflecting education disparities.

In terms of legal knowledge, 222 (74%) were aware of the crime of sex determination, similar, however awareness of the PCPNDT Act was lower 190 (63.33%) than in Shidhaye's et al. study[20] 49 (34.3%). About 186 (62%) participants knew USG detects congenital abnormalities, aligning with Yadav et al.[18] 204 (70.41%), but lower than Saleh et al.[21] 376 (94%). Role of USG in monitoring pregnancy complications was 272 (90.67%) recognized consistent with Saleh et al.[21] 383 (95.8%).

Study reveals that, 257 (85.67%) of participants agreed that ultrasonography is essential during pregnancy, comparable to findings by Maniragena et al. [15] 282 (94%), Haile et al.[22] 365 (86.7%), Ogamba et al.[23] 385 (91.3%) and Saleh et al.[21] 375 (93.8%). A lower rate was reported by Chinene B et al.[19] 241 (62.7%), likely due to differences in study settings. Regarding safety 268 (89.33%) believed USG is safe for the mother, similar to Molla et al.[17] 343 (82%), Krishnamoorthy et al.[24] 264 (88%) and Saleh et al.[21] 364 (91%),

while Nweke et al.[25] reported only 45 (23.1%). For fetal safety, 255 (85%) agreed, close to Molla et al.[17] 339 (81%) and Krishnamoorthy et al.[24] 264 (88%). Only 32 (10.67%) believed USG causes anomalies and 45 (15%) supported prenatal sex determination—lower than Haile et al.[22] 371 (87.9%) and Molla et al.[17] 268 (64%), reflecting higher legal awareness.

In our study, 282 (94%) of participants had previously undergone ultrasound during pregnancy, similar to findings by Saleh et al.[21] 388 (97%), Yadav et al.[18] 270 (93.1%) and Dasan et al.[26] 187 (93.2%). However, Chinene B et al.[19] reported only 107 (62.7%), possibly due to differences in gravidity. About 268 (89.33%) were first advised by a doctor for ultrasound, consistent with Nweke et al.[25] 182 (91.9%) and Krishnamoorthy et al.[24] 261 (87%). Only 14% underwent ultrasound without medical advice, comparable to Behzadmehr et al.[27] 21 (7%), but much lower than Nweke et al.[25] 182 (91.9%). A majority 221 (73.67%) had their first scan before 20 weeks. The average number of scans was 2.15 ± 1.24 , with 135 (45%) having more than two, similar to Maniragena et al.[15] 123 (41%). No participant reported prenatal sex determination, unlike Nweke et al.[25] 15 (7.7%). Only 17 (5.67%) received clear scan information from the doctor, in contrast to 286 (78%) in Abduljabbar et al.[13].

Limitations:

A prospective study was not feasible due to time constraints. Its cross-sectional design limits insight into changes over time. Additionally, the subjective nature of attitudes, shaped by personal and cultural factors, may not be fully captured through quantitative methods. Recall bias may have influenced responses, despite efforts to ensure data accuracy. As a single-centre study in an urban

tertiary government hospital, so limited generalizability.

Conclusions:

The study found that most participants were young, urban, Hindu women from the OBC category, with a mean age of 26.68 years. They were largely unemployed, had high school education, and came from lower-middle-class families. Most were married, in their third trimester, and had good access to healthcare, typically using government hospitals. While their knowledge of obstetric ultrasound was average with about one third women had good knowledge with some of them had poor knowledge, attitudes were generally positive and most practiced regular ultrasound use during pregnancy. The findings highlight the need for targeted for Information, Education, and Communication (IEC) interventions to improve knowledge and awareness of obstetric ultrasound and the PCPNDT Act, ultimately enhancing maternal and fetal health outcomes.

Authors' contribution: Bairwa SC and Kumari D contributed to the concept and design of the study with data collection and supervised the project. Parashar L was the PhD Research Scholar responsible for doing the statistical analysis. Vijayvergia B drafted the manuscript and prepared the graphs and tables. All authors approved the final version of the manuscript.

Informed consent: Informed consent was taken from all before participating in study.

Ethics approval: The study was conducted after approval of the Institutional Research Review Board and Ethics Committee of S.M.S Medical College, Jaipur (Date: 22-3-2023/No.117/MC/EC/2023). This study was performed in lines with the Declaration of Helsinki.

Database Availability Statement: Authors have datasheet available in Microsoft Excel, will be share if requested.

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