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**Awareness of Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act and Gender preference among antenatal women attending a tertiary care hospital: A Cross-sectional Study**

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**Abstract**

**Background:** Prenatal sex determination and female feticide continue to be significant ethical and social challenges in India despite the enforcement of the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994. Awareness of the Act among antenatal women is essential for its effective implementation and for promoting gender equity.

**Objectives:** To assess awareness of the PCPNDT Act and gender preference among antenatal women and to identify determinants and factors influencing awareness.

**Methods:** A cross-sectional study was conducted in 2024 over 12 months among 172 pregnant women attending the antenatal outpatient department at a tertiary care hospital in Puducherry. After obtaining ethics committee approval and informed consent, data were collected using a pre-validated questionnaire. Associations were assessed using the chi-square test and multivariable logistic regression to identify independent predictors of awareness.

**Results:** Overall, 65.1% of participants were aware of the PCPNDT Act. Awareness increased significantly with education ( $p = 0.004$ ), parity ( $p = 0.044$ ) and knowledge of sex ratio ( $p < 0.001$ ) but not with occupation, gender preference, or family pressure for a male child. Multivariable logistic regression demonstrated that secondary education (adjusted OR 3.19; 95% CI 1.09–9.30) and multigravidity (adjusted OR 2.41; 95% CI 1.16–5.00) were independently associated with greater awareness.

**Conclusion:** Although a majority of antenatal women were aware of the PCPNDT Act, important knowledge gaps persist. Higher educational status and previous pregnancy experience were independently associated with greater awareness. Strengthening antenatal counselling, community-based sensitisation, and legal literacy programs is vital to increase awareness and reduce gender bias.

**Keywords:** PCPNDT Act, antenatal women, awareness, gender preference, education

## **Introduction**

Prenatal sex determination is a major ethical and social concern in India, where a persistent preference for male children has led to female feticide and a declining sex ratio of 914 females per 1000 males (IIPS and ICF, NFHS-5 2021)<sup>1</sup>. To address this, the Government of India enacted the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994, which prohibits the misuse of diagnostic methods for sex determination and aims to prevent gender-biased abortions. However, awareness of the Act among antenatal women remains limited, allowing unethical practices to continue.

With the easy availability of ultrasonography, even in rural areas, families often determine fetal sex and opt for abortion if the fetus is female (IIPS and ICF, NFHS-5 2021). <sup>1</sup>Such practices reflect deep-rooted gender bias and violate women's reproductive rights. Raising awareness about the PCPNDT Act is essential to curb these practices, promote gender equality, and protect the girl child.

Although several studies from different regions of India have evaluated awareness of the PCPNDT Act, most have primarily reported overall awareness levels without simultaneously examining the relationship between awareness, gender preference, parity, educational status, and knowledge of the declining sex ratio using multivariable analysis. Furthermore, evidence from Puducherry remains limited despite its unique socio-demographic profile and relatively high institutional antenatal care coverage. Identifying independent determinants of awareness among antenatal women may help design targeted educational interventions and strengthen implementation of the PCPNDT Act at the community level.

## Methodology

This cross-sectional observational study was conducted over a period of 12 months in 2024 among pregnant women attending the outpatient department (OPD) of Mahatma Gandhi Medical College and Research Institute. The study aimed to assess awareness of the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, identify gaps in knowledge, evaluate attitudes toward prenatal sex determination, and explore gender preference among pregnant women.

The sample size was calculated using the single population proportion formula:

$$n = \frac{Z^2 pq}{d^2}$$

where  $n$  is the required sample size,  $Z$  is the standard normal deviate corresponding to a 95% confidence level (1.96),  $p$  is the anticipated proportion of awareness of the PCPNDT Act,  $q = (1 - p)$ , and  $d$  is the allowable error. Assuming a prevalence of awareness of 50% (to obtain the maximum sample size in the absence of reliable local estimates), a 95% confidence level, and an absolute precision of 7.5%, the calculated sample size was approximately 171 participants. To ensure adequate representation and account for possible incomplete responses, a total of 172 pregnant women were included in the study. A convenience sampling method was adopted, whereby all eligible pregnant women attending the antenatal OPD during the study period and willing to participate were consecutively recruited until the required sample size was achieved.

Data were collected using a structured questionnaire developed after an extensive review of relevant literature, previous studies assessing awareness of the PCPNDT Act, and official

guidelines pertaining to the Act. The initial questionnaire was prepared in English and reviewed by a panel of experts comprising faculty members from the Departments of Community Medicine and Obstetrics and Gynecology for content validity. The experts evaluated the questionnaire for relevance, clarity, comprehensiveness, and appropriateness of the items. Necessary modifications were incorporated based on their recommendations.

The questionnaire was subsequently pilot-tested among 20 pregnant women who met the study eligibility criteria but were excluded from the final analysis. Feedback obtained during the pilot study was used to improve the wording, sequencing, and comprehensibility of the questions. Reliability testing of the knowledge and attitude domains was performed using Cronbach's alpha coefficient, which demonstrated good internal consistency (Cronbach's alpha = 0.82). Awareness of the PCPNDT Act was assessed using multiple structured questions addressing the legal prohibition of prenatal sex determination, disclosure of fetal sex, penalties for violation of the Act, and its primary objective. Responses were recorded as correct or incorrect according to the provisions of the Act. Gender preference and family pressure regarding the sex of the child were assessed separately using predefined categorical responses. The questionnaire required approximately 10–15 minutes to complete and was administered in the participant's preferred language by trained investigators to minimise interviewer bias.

Ethical approval was obtained from the Institutional Ethics Committee of Mahatma Gandhi Medical College and Research Institute prior to commencement of the study. Written informed consent was obtained from all participants after explaining the purpose and procedures of the study. Confidentiality and anonymity of participant information were maintained throughout the research process.

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics, including frequencies and percentages, were used to summarize participant characteristics and awareness levels. Associations between categorical variables were assessed using the chi-square test. A p-value of <0.05 was considered statistically significant.

## **Results**

A total of 172 antenatal women participated in the study. Nearly half of the participants (49.4%) were aged 18–24 years, followed by 34.9% aged 25–29 years. More than half were Hindus (52.9%), while 36.6% were Muslims and 8.1% were Christians. Slightly over half of the

participants resided in urban areas (51.7%), followed by rural (31.4%) and semi-urban areas (16.9%). The study population comprised almost equal proportions of primigravida (51.2%) and multigravida (48.8%). Most participants were in the second trimester of pregnancy (42.4%), followed by the third trimester (39.5%) and first trimester (18.0%) as shown in Table 1.

**Table 1. Sociodemographic characteristics of participants (n=172)**

Variables	n (%)
<b>Age(years)-</b>	
18-24	85 (49.4%)
25-29	60(34.9%)
30-34	25(14.5%)
≥35	2(1.2%)
<b>Religion</b>	
Hindu	91(52.9%)
Christian	14(8.1%)
Muslim	63(36.6%)
Others	4(2.3%)
<b>Residence</b>	
Urban	89(51.7%)
Rural	54(31.4%)
Semi-urban	29(16.9%)
<b>Gravidity</b>	
Primigravida	88(51.2%)
Multigravida	84(48.8%)
<b>Trimester</b>	
I	31(18%)
II	73(42.4%)
III	68(39.5%)

Overall, 112 of the 172 participants (65.1%) were aware of the PCPNDT Act, whereas 60 (34.9%) were unaware. Awareness increased with educational attainment, ranging from 54.5%

among women with primary education to 80.4% among graduates. Educational status was significantly associated with awareness of the Act ( $p = 0.004$ ), as shown in Table 2.

**Table 2. Awareness of the PCPNDT Act according to educational status**

Educational status	Total (n)	Aware n (%)	Not aware n (%)	p-value
Primary	33	18 (54.5)	15 (45.5)	
Secondary	69	41 (59.4)	28 (40.6)	
Graduate	46	37 (80.4)	9 (19.6)	
Postgraduate	24	16 (66.7)	8 (33.3)	
Total	172	112 (65.1)	60 (34.9)	0.004

Awareness was significantly higher among multigravida (72.6%) than primigravida (58.0%) ( $p = 0.044$ ). Participants with adequate knowledge of the sex ratio demonstrated substantially higher awareness of the PCPNDT Act than those with poor knowledge (89.6% vs. 25.8%;  $p < 0.001$ ), indicating a strong association between awareness and knowledge regarding gender demographics (Tables 3 and 4).

**Table 3. Association between parity and awareness of the PCPNDT Act**

Parity	Aware n (%)	Not aware n (%)	p-value
Primigravida	51(58.0)	37(42.0)	
Multigravida	61(72.6)	23(27.4)	0.044*

**Table 4. Association between knowledge of sex ratio and awareness**

Knowledge of the sex ratio	Aware %	Not aware %	p-value
Adequate	89.6	10.4	
Poor	25.8	74.2	<0.001

Bivariate analysis demonstrated that educational status, parity, and knowledge of the sex ratio were significantly associated with awareness of the PCPNDT Act. In contrast, occupation, gender preference, family pressure for a male child, and beliefs regarding gender equality were not significantly associated with awareness, as shown in Table 5.

**Table 5. Factors associated with awareness (Bivariate analysis)**

Variable	Chi-square	p-value	Interpretation
Education	16.065	0.004	Significant
Occupation	2.182	0.535	NS
Parity	4.069	0.044*	Significant
Gender preference	0.105	0.746	NS
Family pressure	1.012	0.314	NS
Knowledge of sex ratio	73.036	<0.001	Significant
Gender equality belief	0.129	0.720	NS

Variables demonstrating potential associations in the bivariate analysis were included in a multivariable logistic regression model. Secondary education was independently associated with greater awareness of the PCPNDT Act (adjusted OR 3.19; 95% CI 1.09–9.30;  $p = 0.034$ ). Multigravidity also remained an independent predictor of awareness (adjusted OR 2.41; 95% CI 1.16–5.00;  $p = 0.018$ ). Occupation and gender preference were not independently associated with awareness after adjustment for potential confounders as shown in Table 6.

**Table 6. Multivariable logistic regression**

Variable	Adjusted OR	95% CI	p-value
Primary vs No formal education	1.27	0.52–3.11	0.596
Secondary vs No formal education	3.19	1.09–9.30	0.034
Graduate vs No formal education	1.30	0.28–5.99	0.736
Skilled vs Homemaker	1.63	0.67–3.96	0.278
Professional vs Homemaker	1.05	0.39–2.83	0.923

Unskilled Homemaker	vs	1.58	0.39–6.35	0.521
Multigravida Primigravida	vs	2.41	1.16–5.00	0.018
Gender preference Yes vs No		1.45	0.67–3.15	0.340

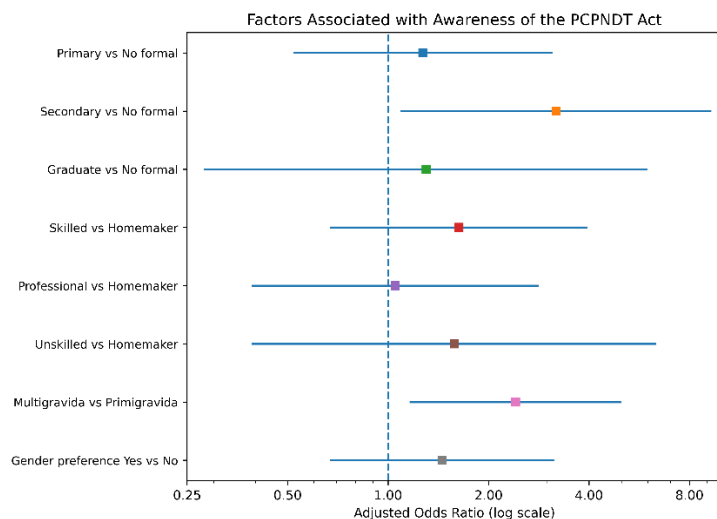


Figure 1. Forest plot showing adjusted odds ratios (AORs) and 95% confidence intervals from the multivariable logistic regression analysis of factors associated with awareness of the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act among antenatal women. The vertical dashed line represents an odds ratio of 1.0 (no association). Estimates to the right of the line indicate increased odds of awareness relative to the reference category.

Nearly two-thirds of participants (63.4%) reported no preference for the sex of their child, while 27.3% preferred a male child and 9.3% preferred a female child. Among women reporting family pressure for a male child, mothers-in-law were the most common source of pressure (56.8%), followed by husbands (32.4%). Regarding specific knowledge of the PCPNDT Act, 65.1% knew that prenatal sex determination is illegal, 61.0% knew that disclosure of fetal sex is prohibited, and 59.0% were aware that violations are punishable. However, only 34.9% correctly identified the primary objective of the PCPNDT Act, indicating an important knowledge gap despite moderate overall awareness, as shown in Tables 7 and 8.

**Table 7. Gender preference and related characteristics**

Variable	n	%
Preferred male child	47	27.3
Preferred female child	16	9.3
No preference	109	63.4
Family pressure for male child	37	21.5
Husband exerted pressure	12	32.4
Mother-in-law exerted pressure	21	56.8
Others	4	10.8

**Table 8. Knowledge regarding specific provisions of the PCPNDT Act**

Question	Correct response n (%)
Knows sex determination is illegal	112(65.1%)
Knows disclosure of fetal sex is prohibited	105(61%)
Knows punishment under the Act	101(59%)
Knows objective of PCPNDT Act	60(34.9%)

## DISCUSSION

The present cross-sectional study assessed awareness of the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act and gender preference among antenatal women attending a tertiary care hospital in Pondicherry. While nearly two-thirds (65.1%) of participants were aware of the Act, the findings indicate that awareness remains incomplete despite more than two decades of implementation of the legislative efforts to reduce sex-selective practices. Educational status, parity, and knowledge of the sex ratio were significantly associated with awareness, whereas occupation, gender preference, family pressure for a male child, and beliefs regarding gender equality were not significantly associated. These findings suggest that awareness of the PCPNDT Act is influenced predominantly by educational level and previous experience with antenatal care services rather than by individual sociocultural attitudes alone.

An important contribution of the present study is the identification of independent predictors of awareness rather than merely reporting prevalence. By employing multivariable logistic regression, the study demonstrates that educational attainment and previous pregnancy experience independently influence awareness of the PCPNDT Act after adjustment for potential confounders. These findings provide practical evidence for policymakers to prioritise educational interventions among first-time mothers and women with lower educational attainment, thereby facilitating more targeted implementation of maternal health education programmes.

The overall awareness level observed in the present study is comparable to that reported in other parts of India<sup>2-7</sup>. However, awareness alone does not necessarily translate into a comprehensive understanding of the objectives, legal provisions, and social implications of the PCPNDT Act. Many women may have heard about restrictions on prenatal sex determination through healthcare providers, media campaigns, or community discussions but may lack deeper knowledge regarding the legal framework and its role in addressing gender discrimination. This suggests that awareness campaigns should move beyond simple dissemination of information and focus on improving legal literacy and critical understanding of gender-related issues.

Educational level emerged as one of the strongest predictors of awareness<sup>2,3,4</sup>. Women with graduate and postgraduate education demonstrated substantially higher awareness levels compared with those having primary or secondary education. This association can be explained through several mechanisms. Education enhances health literacy, improves access to diverse information sources, and strengthens the ability to understand legal and public health messages. Educated women are also more likely to engage with print media, digital platforms, and healthcare professionals, thereby increasing opportunities to acquire information about the PCPNDT Act. Furthermore, education promotes critical thinking and autonomy in decision-making, enabling women to challenge traditional norms and unethical practices related to sex selection. The findings support the broader understanding that female education serves not only as a social determinant of health but also as an important tool for promoting gender equity and legal awareness.

Parity was another significant factor associated with awareness. Multiparous women were more likely to be aware of the PCPNDT Act than primigravidae<sup>2,3</sup>. This finding may reflect cumulative exposure to healthcare services across successive pregnancies. Women who have experienced multiple antenatal care visits, institutional deliveries, immunization programs, and

interactions with healthcare workers are more likely to encounter information regarding maternal health policies and reproductive legislation<sup>5,6</sup>. Repeated contact with the healthcare system provides opportunities for counselling and reinforcement of health messages, leading to greater awareness over time. This finding underscores the importance of utilizing antenatal care encounters as platforms for educating women about legal and ethical aspects of prenatal care, particularly during the first pregnancy when awareness may be relatively limited.

A particularly notable finding was the strong association between awareness of the PCPNDT Act and knowledge regarding the sex ratio. Women who understood the issue of declining sex ratios were significantly more likely to be aware of the Act. This relationship suggests that awareness of the PCPNDT Act is not merely a legal issue but is closely linked to broader social understanding of gender discrimination and its demographic consequences<sup>7</sup>. Knowledge of the adverse effects of skewed sex ratios may enhance appreciation of the rationale behind the legislation and foster greater acceptance of its objectives<sup>8,9</sup>. Conversely, women who lack awareness of demographic and gender-related concerns may perceive the Act as merely a legal restriction rather than a social justice measure.

Interestingly, occupation, gender preference, family pressure for a male child, and beliefs regarding gender equality were not significantly associated with awareness. This finding indicates that awareness of the PCPNDT Act may be influenced more strongly by educational exposure and access to information than by personal attitudes alone. However, the absence of statistical significance should not be interpreted as evidence that socio-cultural factors are unimportant. Gender preference and son preference remain deeply embedded within many communities due to cultural traditions, inheritance practices, economic considerations, and social expectations regarding family lineage and care of elderly parents<sup>7,8</sup>. As a result, women may possess awareness of the PCPNDT Act while simultaneously experiencing social pressure to conform to prevailing gender norms.

The coexistence of awareness and persistent gender bias represents an important public health challenge. Awareness of legal provisions alone may be insufficient to change behaviour when societal values continue to favour male children. In many settings, son preference is reinforced by family structures, economic dependence, dowry-related concerns, and perceptions of sons as providers of financial security and social status. Consequently, increasing awareness must be accompanied by broader efforts to transform gender norms, empower women, and promote the social value of girls<sup>8</sup>. Community-based interventions, school-based gender education,

engagement of men and family decision-makers, and media campaigns addressing gender stereotypes may be necessary to achieve meaningful behavioural change.

The findings of this study support the need for integrating PCPNDT-related education into routine antenatal care services. Antenatal visits provide a valuable opportunity to deliver targeted information regarding the legal prohibition of sex determination, the consequences of gender-biased sex selection, and the importance of gender equality. Strengthening Information, Education, and Communication (IEC) activities through frontline health workers, including ASHAs and Anganwadi workers, may further improve community-level awareness and contribute to changing social attitudes toward gender preference<sup>10</sup>.

### **Strengths and Limitations**

A major strength of this study is its focus on antenatal women, a population directly affected by the objectives of the PCPNDT Act. The use of a validated questionnaire and inclusion of women from diverse educational backgrounds enabled comprehensive assessment of socio-demographic factors associated with awareness. The findings also facilitate comparison with national and regional studies.

However, certain limitations should be acknowledged. The study was conducted in a single tertiary care centre, which may limit the generalizability of the findings to other regions of India. The use of convenience sampling may have introduced selection bias. Additionally, the cross-sectional design precludes establishment of causal relationships between socio-demographic factors and awareness. Self-reported responses may also be subject to social desirability bias, particularly when discussing sensitive issues such as gender preference and sex determination.

### **Conclusion**

The study concludes that approximately two-thirds of the antenatal women were aware of the PCPNDT Act. Higher educational status and multigravidity emerged as the strongest determinants of awareness, emphasising the importance of female literacy and empowerment in reducing gender-biased practices.

Strengthening women's awareness of the provisions and objectives of the Act may contribute to its effective implementation while promoting gender equity and discouraging prenatal sex

selection. Sustained community engagement, effective antenatal counselling, and inclusion of reproductive rights education within maternal health programs are crucial for improving awareness. A multi-faceted approach involving healthcare providers, legal authorities, and community networks is required for strict implementation of the PCPNDT Act.<sup>9,10</sup> Promoting the value of the girl child and addressing the socio-cultural roots of gender bias are essential steps toward achieving gender equity and balancing India's demographic structure.

#### Ethics approval and consent to participate

The study was approved by the Institutional Ethics Committee of Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth Deemed to be University, Puducherry. Written informed consent was obtained from all participants before enrolment in the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

#### Availability of data and materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Competing interests

The authors declare that they have no competing interests.

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#### Authors' contributions

Divya Alamelu N conceived and designed the study, supervised data collection, interpreted the findings, and critically revised the manuscript. Shaista collected the data, performed the literature review, and prepared the initial manuscript draft. Shahityaa N contributed to study design, statistical interpretation, manuscript revision, and approved the final version. All authors read and approved the final manuscript.

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