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Original Research Article

Assessment of knowledge and utilization of antenatal care services among tribal women of Palakkad district, Kerala: a cross-sectional study

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ABSTRACT

Background: Nearly 800 women die out of preventable causes associated with pregnancy and childbirth worldwide every day, with low and middle-income countries contributing approximately 90% of the mortality. The majority of pregnancy-related deaths are preventable with the provisioning of cost-effective services like antenatal care (ANC). Despite Kerala having a good human development index compared to other states in India, marginalized groups like Dalit, Adivasi, and fisher folks are still behind the development process, including the utilization of ANC services. This study assessed the knowledge and utilization of ANC services among tribals in Kerala, India.
Methods: A cross-sectional study was conducted among 45 tribal women of Palakkad district, Kerala, who registered for ANC and delivered child. Convenient sampling was used to select study participants. Descriptive statistics were used to obtain frequency and percentage. The chi-square test was carried out to see the association between identified variables.
Results: Among 45 participants, 28.89% fell under the adequate ANC utilization. 64.46% did early ANC registration, 73.3% visited ANC more than four times, 75.56% completed the 2 tetanus toxoid (TT) injections, and 66.67% consumed more than 100 iron-folic acid tablets. About 73.3% of participants knew the importance of immunizing children against vaccine-preventable diseases.
Conclusions: Even in an egalitarian state like Kerala with high literacy, ANC service utilization among tribal communities is still below 70%. The issue is multifaceted and requires a more nuanced approach. The health system must adopt comprehensive, context-specific, and community-based approaches.

Keywords: Maternal health, ANC, Tribal women, Maternal mortality

INTRODUCTION

Nearly 800 women die out of preventable causes associated with pregnancy and childbirth worldwide every day, with LMICs (low and middle-income countries) contributing to more than 90% of the mortality.[1] There is a decline of 70% MMR (Maternal mortality rate) in India from 398/100000 live births in the year 1997-98 to 99/100000 in 2020.[2] Although the maternal death rates across all countries, including India, have dropped or declined, the reduction is less evident in resource-poor and underprivileged communities and among tribal communities of these countries.[3]

The majority of pregnancy-related deaths are preventable with the provisioning of cost-effective services such as ANC, delivery by skilled birth attendants, and postnatal care. ANC is one of the most successful interventions for reducing maternal mortality and morbidity.[4] Full/ Adequate ANC can be" defined as 4 or more antenatal visits, at least 1 TT injection and reported consumption of iron folic acid supplements (IFAS) for min of 100 days".[5]

According to national family health survey-5 (NFHS-5) (2019-2020), 67.9% of pregnant women registered ANC in the first trimester, and only 54.2%, approximately more than 1/3rd, had at least 4 ANC visits.[6] Of all other states of India, Kerala, the best-performing state in many health indicators, has reached a remarkable reduction in MMR. As per SRS (Sample registration system) data from 2018-2020, the MMR of Kerala is at 19/10000 live births.[7] One of the reasons for this achievement is the quality of ANC service utilisation.[8] According to NFHS 5 data, Kerala has 96.22% utilization of adequate quality ANC service.[9]

Although Kerala has achieved a good human development index compared to other states in India, certain marginalised groups such as dalit, adivasi, and fisher folks are still behind this development process.[10,11] Historically, scheduled tribes of Kerala have faced severe exploitation and social exclusion, which isolated them from broader socioeconomic development. This isolation, coupled with poverty and lack of access to health facilities, has made them susceptible to numerous health issues.[12,13] Hence, within Kerala, gross social and geographic disparity exists in health and health-seeking behaviour of tribes. Studies have also shown that in Kerala, there is difference in utilization of ANC between tribal populations compared to non-tribal populations.[13–15]

Factors contributing to this difference among tribal women are multifaceted; a few reasons are fear, accessibility issues, mistrust of health departments, financial constraints, and cultural beliefs.[16] They also view themselves as being excluded from decision-making processes, with their ideas ignored by their stakeholders. Along with this attempt made by the health system stakeholders for the better utilization of health care facilities being devoid of these cultural understandings and contexts, many times are not serving the envisaged purpose, and the beneficiaries are not getting the needful. Another factor is the centralization of healthcare services and force compliance, such as mandated monthly visits for pregnant women without consideration for their daily life routine.[16] Failure to address broader social determinants and structural inequality reduces utilization and access to healthcare.[17-19]

Moreover, studies conducted in various settings have shown that factors such as maternal age, number of parity, literacy status, occupation, religion, socioeconomic status, previous complicated obstetrical history, and lack of ANC knowledge were significantly associated with utilizing ANC services.[14,20-22]

Though many health services and efforts to increase accessibility and availability of health services, there still exists a gap in the utilization of ANC among disadvantaged populations of Kerala. In Kerala, only a few studies have been conducted regarding the utilization of ANC service, with most of the studies concentrating on the highest tribal population within the state, such as Wayand, Idukki, and Attapady (within Palakkad district).[13-15] It's been noted that most of the studies have focused on Attapady, with a 30,038 tribal population, as an area of the Palakkad district excluding Attapady, has 18,934 tribal populations not yet explored.

Studies of this kind are essential to understanding the status of utilization of ANC services, which could help in addressing inequities and inequalities in providing health services among marginalized and disadvantaged population groups like tribals. Hence, this study aims to assess the knowledge and utilization of ANC service among tribal women in the Palakkad district. Through such studies, it is possible to identify the reasons for the low ANC utilization among Adivasis groups.

METHODS

Study design

This is a community-based cross-sectional study conducted in the Palakkad district of Kerala from April to March 2022.

Study population

The study was conducted on tribal women of Palakkad district aged 15-45. The inclusion criteria were fulfilled by 45 tribal pregnant mothers who registered for the ANC before April 2021 and completed their full ANC and delivery after March 2022. Women who could not participate due to illness/lack of interest were excluded.

Study setting

According to the scheduled tribe population census 2011, 484,839 is the total tribal population of Kerala. The total tribal population is spread out in Palakkad district in 2 areas, Attapadi and the remaining of Palakkad. There are 48,972 tribes in the Palakkad district, including Attapadi (the third highest district with tribal population), and 18,934 in the tribal population, excluding Attapadi (9,348 males and 9,586 females).[23] Thus, the study comprises approximately 40% of the tribal population of the Palakkad district, which is located in an area outside Attapadi.

Sampling method

The participants are selected for this study using a convenient sampling method. The study targeted three tribal blocks: Chittur, Palakkad, and Kollamkode. Within these blocks, we selected panchayats with the highest tribal populations, such as Malampuzha Panchayat,

Pudussery Panchayat, Perumathy Panchayat, and Muthalamada Panchayat with a tribal population of 1132, 1084, 2883, and 5872 respectively. These four blocks together represent 58% of the total tribal population, excluding Attapady. To ensure comprehensive coverage, we conducted household, hospital visits and institutional visits, including sub-centres, targeting to include all eligible participants. Within these study sites, a total of 45 deliveries happened, with the initiation and completion of the ANC period between April 2021 and March 2022, thus resulting in a final sample size of 45 participants. ST promoters, Asha workers, and Anganwadi workers assisted in identifying eligible participants.

Data collection tool

The study used a pre-validated quantitative questionnaire covering socio-demographic information, pregnancy history, ANC service utilization, and knowledge assessment. Socio-demographic details included age, education, occupation, income, and family type. Pregnancy history addresses age at marriage, first pregnancy, number of parties, and abortion history. ANC data incorporated registration time, number of antenatal visits, TT injections, and IFAS consumption. Knowledge variables included the knowledge regarding the ideal timing of ANC registration, the recommended number of ANC visits, consumption of IFAS, TT injection, and awareness of danger signs during pregnancy.[24]

Study variables

The study's outcome variables were knowledge and utilization of ANC. Adequate and inadequate ANC utilization were categorized based on the fulfilment of a composite index comprising four components: early ANC registration, having at least four ANC visits, consumption of 100 or more IFAS, and receiving two doses of TT injections.[1] The participants who met all four components were grouped under adequate ANC utilization, and those who failed to fulfil at least one component were grouped under inadequate ANC utilization.

Ethical considerations

Ethical approval was obtained from the university ethics committee for human trials of M. S. Ramaiah university of applied sciences before the start of the study (reference number EC-2022/EX/20). Prior to data collection, participants gave written consent after being briefed on the importance of the research and their rights.

Statistical analysis

The collected data were cleaned, anonymized, and entered into Excel Spreadsheets 2007 before being exported to SPSS software version 26.0 for analysis. Descriptive statistics, including frequency and percentage, were calculated, with a significance level of 5%. The chi-square test evaluated associations between ANC utilization and other variables.

RESULTS

Socio-demographic profile and selected obstetric characteristics of the respondents

Among the 45 participants, 44.4% are 20-24 (mean age 24.4±3.99). Among the participants, 37.78% completed primary education, and 31.11% completed secondary education, whereas among spouses, 31.11% completed primary education and 22.2% completed secondary education. Among the participants and spouses, 13.33% have higher secondary education, and 6.67% hold a graduate degree. Although the illiteracy rate among the spouses is higher (26.67%) when compared with the participants (11.11%), in contrast, more than 90% of the spouses were employed (93.33%), while 60% of the participants were unemployed. Socioeconomically, more than half of the participants (60%) belong to the lower middle class (per month income 986-1971 INR).

More than half of the participants married after 18 (60%), and 48.89% had at least two children. Notably, 28.89% of the participants had a history of abortion. More than two-thirds of the participants experienced their first pregnancy after 18 years of age. Closely half of the participants (44.44%) kept a minimum gap of 3 years between subsequent pregnancies (Table 1).

Utilization of antenatal services by the study population

About 64.44% of the participants did early ANC registration (registering within the first 12 weeks of pregnancy), with 73.33% attending ANC more than four times. Except for 11, all others (75.56%) completed the recommended two doses of TT injections. Regarding IFAS, two-thirds consumed over 100 tablets, indicating strong medication adherence (Table 2). On categorizing ANC utilization based on the composite index, 28.89% fall under adequate utilization, fulfilling all four components of the composite index and 71.11% under inadequate ANC utilization.

During data analysis, a few notable associations were evident between the two categories of ANC utilization (Adequate and inadequate utilization) and the socio-demographic and obstetrics history variables.

Most participants (80%) were aged between 20-29 years, yet only 27% exhibited adequate ANC utilization. An association was found regarding the educational status and ANC utilization among the participants and their spouses, those who have attained secondary education and above, with approximately 89% and 50%, respectively. This shows that the higher the educational level, the higher the ANC utilization rate. Furthermore, 60% of the participants who married at the age of 18 and above had higher ANC utilization. A lower ANC utilization was reported among one-sixth of the participants (30%) with a history of abortion.

Statistical analysis was done by focusing on variables that showed notable association with the utilization of ANC during data analysis. Among those variables, a statistical significance was established ($p<0.05$) for the literacy status of the participants ($p=0.000$), literacy status of their spouse ($p=0.000$), and age of marriage ($p=0.003$) (Appendix).

Association between variables and utilization of ANC services

A statistical analysis was conducted on the four variables of the composite index, along with other variables, to assess significant associations. Among these, the number of ANC visits showed the most important associations with the age of marriage ($p=0.041$), number of children ($p=0.042$), and age of a pregnancy ($p=0.003$). Furthermore, statistical significance was observed between the early registration and the literacy status of the participants and their spouses ($p=0.039$). However, none of the variables demonstrated a significant association with the number of TT doses or the number of IFAS consumption (Table 3).

Assessment of knowledge about ANC

The majority of the participants (73.33%) know the importance of immunizing children against VPD. Followed by 60% who see the danger signs during pregnancy. More than 50% of the participants know the ideal timing of ANC registration and IFAS consumption. In contrast, only 26.6% know about the required TT injection dose, and only 40% know the ideal minimum number of ANC visits (Table 4).

Table 1: Socio-demographic profile and selected obstetric characteristics of the respondents, (n=45).

Variables	N (%)
Age of the participants (in years)	
Less than 20	4 (8.89)
20-24	20 (44.44)
25-29	17 (37.78)
More than 30	4 (8.89)
Mean age±SD-24.4±3.99	
Literacy status of the participants	
Illiterate	5 (11.11)
Primary education	17 (37.78)
Secondary education	14 (31.11)
Higher secondary	6 (13.33)
Degree	3 (6.67)
Literacy status of the husband	
Illiterate	12 (26.67)
Primary education	14 (31.11)
Secondary education	10 (22.22)
Higher secondary	6 (13.33)
Degree	3 (6.67)
Occupation of the participants	
Employed	18 (40)
Unemployed	27 (60)
Occupation of the husband	
Employed	42 (93.33)
Unemployed	3 (6.67)
Income per month (BG Prasad classification)	
Middle class	8 (17.78)
Lower middle class	27 (60)
Lowest class	10 (22.22)
Type of family	
Nuclear family	23 (51.11)
Joint family	22 (48.89)
Age of marriage (in years)	
Below 18	18 (40)
18 and above	27 (60)
Number of children	
One child	11 (24.44)
2 children	22 (48.89)
More than two	12 (26.67)

Continued.

Variables	N (%)
History of abortion	
Yes	13 (28.89)
No	32 (71.11)
Age of first pregnancy (in years)	
Below 18	8 (17.78)
18 and above	37 (82.2)
The interval between the first child and subsequent pregnancy (in years)	
Not applicable	11 (24.44)
1	1 (2.22)
2	6 (13.33)
3	20 (44.44)
More than 4	7 (15.56)

Table 2: Utilization of antenatal services by the study population, (n=45).

Variables	N (%)
Registration of pregnancy	
1st trimester	29 (64.44)
2nd trimester	15 (33.33)
3rd trimester	1 (2.22)
Number of the times visited ANC	
Less than 4	12 (26.67)
Four and above	33 (73.33)
TT injection taken or not	
Yes	45 (100)
No	0
Dosage of TT injection	
1	11 (24.44)
2	34 (75.56)
IFAS taken or not	
Yes	45 (100)
No	0
Number of IFAS tablets taken	
Less than 100 tablets	15 (33.33)
More than 100 tablets	30 (66.67)

Table 3: Association between variables and utilization of antenatal care services.

Variables	ANC service utilization, N (%)		Chi-square ($\chi 2$)	P value
	Inadequate utilization	Adequate utilization		
Age category (in years)				
Less than 20	4 (67)	2 (33)	1.38328565	0.74
20-24	15 (60)	10 (40)		
25-29	20 (74)	7 (26)		
More than 30	7 (64)	4 (36)		
Literacy status of the participants				
Illiterate	8 (80)	2 (20)	22.60592671	0.000
Primary education	16 (84.21)	3 (15.79)		
Secondary education	20 (80)	5 (20)		
Higher secondary	2 (16.67)	10 (83.33)		
Degree	0 (0)	3 (100)		
Literacy status of husband				
Illiterate	13 (92.86)	1 (7.14)	21.476	0.000
Primary education	21 (87.5)	3 (12.5)		
Secondary education	5 (31.25)	11 (68.75)		
Higher secondary	6 (54.55)	5 (45.45)		
Degree	1 (25)	3 (75)		

Continued.

Variables	ANC service utilization, N (%)		Chi-square ($\chi 2$)	P value
	Inadequate utilization	Adequate utilization		
Occupation of participants				
Employed	17 (56.67)	13 (43.33)	2.388	0.122
Unemployed	29 (74.36)	10 (25.64)		
Occupation of husband				
Employed	40 (63.49)	23 (36.51)	3.286	0.168
Unemployed	6 (100)	0 (0)		
Income (Per month)				
Middle class	8 (66.67)	4 (33.33)	1.629	0.443
Lower middle class	26 (61.9)	16 (38.1)		
Lowest class	12 (80)	3 (20)		
Type of family				
Nuclear	20 (64.52)	11 (35.48)	0.117	0.732
Joint family	26 (68.42)	12 (31.58)		
Age of marriage (in years)				
Above 18	23 (88)	3 (12)	8.918	0.003
Below 18	23 (53)	20 (47)		
Number of children				
One child	6 (55)	5 (45)	2.950	0.410
Two children	17 (77)	5 (23)		
More than two	9 (75)	3 (25)		
Currently pregnant	14 (58)	10 (42)		
History of abortion				
Yes	18 (78)	5 (22)	2.087	0.148
No	28 (61)	18 (39)		
Age of 1st pregnancy (in years)				
18 or below	10 (83)	2 (17)	4.178	0.110
19-29	34 (67)	17 (33)		
Above 30	2 (33)	4 (67)		
The interval between 1st child and subsequent pregnancy				
Not applicable	6 (55)	5 (45)	5.210	0.254
One	2 (100)	0 (0)		
Two	6 (86)	1 (14)		
3	26 (72)	10 (28)		
More than 4	6 (46)	7 (54)		

Table 4: Assessment of knowledge about ANC.

Response	N (%)
Knowledge about the ideal timing of registration of ANC	
Yes	24 (53.33)
No	21 (46.67)
Knowledge about the minimum no of ANC visit	
Yes	18 (40)
No	27 (60)
Knowledge about two doses of TT injection	
Yes	12 (26.67)
No	33 (73.33)
Knowledge about IFAS consumption	
Yes	26 (57.78)
No	19 (42.22)
Knowledge about danger signs during pregnancy	
Yes	27 (60)
No	18 (40)
Knowledge regarding the importance of immunizing children against vaccine-preventable diseases	
Yes	33 (73.33)
Don't know	12 (26.67)

DISCUSSION

The current study aimed to evaluate the knowledge and utilization of ANC among tribal women and explore its correlation with their socio-demographic characteristics. In the study, 28.89% of study participants utilized ANC services adequately, based on the composite index used in the study, while 71.11% showed inadequate utilization. A similar study conducted in the Wayanad district of Kerala shows 85.7% utilization of ANC service among the tribes.[14] ANC coverage in India has seen notable progress, rising from 51.6% (NFHS-4) to 59.25% (NFHS-5).[9] Conversely, a study in the tribal regions of Madhya Pradesh revealed that only 39.5% utilized ANC services.[21] In contrast, another study in India's EAG states (Empowered action group) found that merely 11% of tribal women received comprehensive ANC service.[24]

Notably, a clear trend indicates higher ANC utilization with increased literacy. In this study, it is evident that ANC utilization is better among the literate participants than among the illiterate. 6.67% and 13.3% of the participants have acquired a degree and higher secondary education, respectively; among them, the ANC utilization is 100% and 83.3%. Conformable findings holding this observation have been reported in research conducted in Kerala, Madhya Pradesh and Odisha.[14,17,20,25]

A similar association was noticed in the education status of spouses. Specifically, the participants with an illiterate spouse demonstrated lower ANC utilization. In this study, 92.8% of inadequate ANC utilization was seen among the participants with an illiterate spouse. In contrast, 75% of adequate ANC utilization was seen among spouses with the highest educational status.

Meanwhile, similar findings were evident in studies conducted in Maharashtra. ANC service uptake notably rose among wives of men with 97%, 99%, and 100% completion in primary, secondary, and tertiary education, respectively.[27] In Madhya Pradesh, 90% full ANC utilizations was seen among the participants with their spouse's highest education and 45.95% inadequate ANC utilizations among illiterate. The rising education level of men positively influences the increasing utilizations of maternal health care services.[27,28] Hence, educating the tribal population is a crucial approach to enhance the utilization of maternal health services. Research indicates that educating them about pregnancy complications and the importance of ANC visits correlates positively with ANC service utilization. Having a good understanding of maternal care and pregnancy complications enables them to actively engage in making decisions. This could lead them to promote health facility births, ultimately enhancing maternal health service utilization.

Concerning early marriage, which is comparatively common among the tribal community. A study in Maharashtra and Nepal showed a high percentage of early marriage, with 98% and 73%, respectively.[27,29] In contrast, in this study, 60% of women married after attaining legal age, but the ANC utilization was low at 12%. Similarly, a study in Bangladesh showed that 78.9% of women married after 18 years, but their ANC utilization (69%). This disparity could be due to their poverty, sociocultural factors, fear, stigma, and lack of awareness.[17]

Studies showed that early marriage correlates with reduced use of spacing methods, lower maternal health care utilization, and higher maternal mortality risk, especially among lower caste women, who often marry before legal age due to poverty and sociocultural factors. Additionally, the woman's autonomy to make decisions on her sexual and reproductive health is limited. Older young women have higher decision-making autonomy, which is positively associated with greater use of maternal health care services.[28,29]

In our study, about 73% of the participants had made more than 4 ANC visits, and 75% had taken two doses of TT immunization. The data reveals a positive correlation between the number of ANC visits and TT immunization. Those who attended at least four ANC visits were significantly more likely to receive adequate doses of TT immunization than those with fewer visits.

NFHS data from 1 to 5 in India, especially in Kerala, reveals a consistent trend: more ANC visits correspond to higher TT immunization coverage. However, NFHS 5 data for Kerala shows a deviation from this trend due to natural disasters and disease outbreaks, disrupting the usual positive correlation between ANC visits and TT immunization coverage.[32]

For example, in NFHS 4 for Kerala, ANC visits were 90.1%, and TT immunization coverage was 96.3%. In NFHS 3, ANC visits were 94%, with TT immunization coverage at 88.2%, highlighting a positive correlation between the two indicators.[32,33] This trend is consistent with findings from studies in Pakistan, India (NFHS 4), and Sierra Leon.[5,34,35] The association could be attributed to women attending more ANC visits being better informed about the importance of TT immunization and thus more likely to receive it.

The study result also suggests that although the consumption of IFAS is low, participants still demonstrate good adherence to IFAS compared to other studies. This is attributed to the persistent efforts of healthcare workers such as ASHA and Anganwadi workers. It is important to note that this report is based on anecdotal evidence. Another reason might be the current practice of supplying IFA for only one month at each visit, making it challenging to achieve the recommended duration. Regular ANC visits remain crucial for improving TT vaccination and managing obstetric complications during pregnancy and delivery.

In this study, there is no positive relationship between the knowledge component and utilization, suggesting that no evidence supports the idea that having more knowledge leads to increased utilization or application of that knowledge.

In our study, 53.3% of participants were knowledgeable about early registration of ANC, and 64% registered early. For IFAS tablet consumption, 57.7% were knowledgeable, with 67% consuming over 100 tablets. While 75% received two doses of TT immunization, only 26% knew about it. Similar trends were seen in Uttar Pradesh, with 70% and 76% showing higher knowledge in early registration and IFAS tablet consumption, respectively.[36] This finding was supported by a study in North India, where 86.20% of respondents were familiar with early registration, yet only 10.90% had awareness of the recommended minimum number of ANC visits.[37]

In a study conducted in Karnataka, low levels of knowledge regarding early registration and the number of ANC visits were noted (17% and 14%, respectively). However, there was comparatively high awareness regarding TT immunization (63%) and IFAS tablet consumption (89%), with utilization rates also notably higher at 86% and 76%, respectively, compared to our study.[23]

Although our study indicates high percentages for ANC visits (73%) and TT immunization (75%), compared to other variables such as early registration and IFAS consumption, knowledge levels are lower at 40% and 27%, respectively. This could be attributed to the active involvement of ASHA workers within the villages, as observed by the researcher. A notable achievement of ASHA workers was that all mothers included in the study were encouraged by ASHA workers to utilize health centre services, resulting in all mothers completing their ANC registrations.

Early understanding of maternity complications, general understanding, and necessary actions can empower women and their families to take proactive steps for better pregnancy outcomes. In our study, 60% of women demonstrated knowledge about pregnancy danger signs, whereas a study in Maharashtra revealed that 83.7% of tribal women were aware of specific maternity danger signs.[38]

In contrast, a study in Chhattisgarh found low awareness among women regarding danger signs (30%). This study identified significant associations with the husband's education, ANC visits, early ANC registration, primary contact with health providers, and skilled attendance at the last birth. Notably, those lacking knowledge of danger signs are 77% less likely to have their husband as a birth companion. Given that husbands often make household decisions, this decreases the likelihood of practicing birth preparedness.[36]

Limitations

The study results are based on the information given by the participants, which might have recall bias. Furthermore, the study was conducted over a short span with a small sample size using a cross-sectional study; hence, there is a limitation in exploring the causal relationship. A large sample representative of a set of populations could better help to establish casual relationships.

CONCLUSION

The present study showed 28.89% under the category of adequate ANC utilization, which is lower than the NFHS 5 data. 50% of the participants knew the ideal timing of ANC registration and IFAS consumption. In contrast, only 26.6% know about the required TT injection dose, and only 40% know the ideal minimum number of ANC visits. Most participants (73.3%) knew the importance of immunizing children against vaccine-preventable diseases. The current study findings showed that health service utilization among tribal communities, even in an egalitarian state like Kerala, is still far behind the anticipated expectation. Despite achieving a high literacy rate comparable to health indices in developed countries, the study points towards the underutilization of ANC services among tribal women. Moreover, with the overlap in the data collection period of NHFS 5 and the post-COVID era, a monitoring mechanism is required to assess and understand the long-term post-COVID impact and evaluate the utilization of health services during these periods. Hence, for better contextual understanding, more research is required from an interdisciplinary perspective. The system's perspective should also be studied to understand the challenges and enablers. This will give better insight to the policymakers to address the reproductive health status of pregnant women in tribal communities.

Recommendations

Although ANC utilization is less when evaluated through a composite index, it is better than most other studies when evaluating individual components like early ANC registration, number of ANC visits, TT immunization, and IFAS consumption. From the present study, it is clear that the role of education is inevitable**.** Educating the tribal population and improving their socioeconomic status could positively impact them. The interaction with grass-level workers, who have given basic information for this study, has played a pivotal role; therefore, inclusivity of the grass-root level workers within the community could be more effective in knowing the contextual specifications. However, the participants lacked knowledge regarding the components of ANC; hence, educating the women about the necessity of each component in ANC rather than insisting on taking up the service is essential.

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APPENDIX

Table 1: The utilization of ANC during data analysis.

Variables		Adequate utilization of ANC		Inadequate utilization of ANC								Inadequate utilization of ANC
				Registration of pregnancy		No. of times visited		TT dose		IFAS dose		
				Late registration	Early registration	Less than 4	More than 4	1 dose	2 doses	<100 tablets	>100 tablets	
Age of the sample (in years)	Less than 20 (4)	1 (7.69)	2.22	0 (0)	3 (100)	1 (33.33)	2 (66.67)	1 (33.33)	2 (66.67)	2 (66.67)	1 (33.33)	3 (100)
	20-24 (20)	7 (53.85)	15.56	6 (46.15)	7 (53.85)	3 (23.08)	10 (76.92)	5 (38.46)	8 (61.54)	7 (53.85)	6 (46.15)	13 (100)
	25-29 (17)	3 (23.08)	6.67	9 (64.29)	5 (35.71)	6 (42.86)	8 (57.14)	4 (28.57)	10 (71.43)	5 (35.71)	9 (64.29)	14 (100)
	More than 30 (4)	2 (15.38)	4.44	1 (50)	1 (50)	2 (100)	0 (0)	1 (50)	1 (50)	1 (50)	1 (50)	2 (100)
Literacy status of respondent	Illiterate (5)	1 (7.69)	2.22	3 (75)	1 (25)	3 (75)	1 (25)	3 (75)	1 (25)	2 (50)	2 (50)	4 (100)
	Primary education (17)	3 (23.08)	6.67	7 (50)	7 (50)	5 (35.71)	9 (64.29)	4 (28.57)	10 (71.43)	6 (42.86)	8 (57.14)	14 (100)
	Secondary education (14)	1 (7.69)	2.22	5 (38.46)	8 (61.54)	4 (30.77)	9 (69.23)	4 (30.77)	9 (69.23)	7 (53.85)	6 (46.15)	13 (100)
	Higher secondary (6)	5 (38.46)	11.11	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)
	Degree (3)	3 (23.08)	6.67	5 (45.45)	6 (54.55)	3 (27.27)	8 (72.73)	4 (36.36)	7 (63.64)	5 (45.45)	6 (54.55)	11 (100)
Literacy status of spouse	Illiterate (12)	1 (7.69)	2.22	7 (58.33)	5 (41.67)	7 (58.33)	5 (41.67)	6 (50)	6 (50)	5 (41.67)	7 (58.33)	12 (100)
	Primary education (14)	2 (15.38)	4.44	2 (50)	2 (50)	1 (25)	3 (75)	0 (0)	4 (100)	2 (50)	2 (50)	4 (100)
	Secondary education (10)	6 (46.15)	13.33	2 (50)	2 (50)	0 (0)	4 (100)	1 (25)	3 (75)	3 (75)	1 (25)	4 (100)
	Higher secondary (6)	2 (15.38)	4.44	0 (0)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)
	Degree (3)	2 (15.38)	4.44	4 (33.33)	8 (66.67)	4 (33.33)	8 (66.67)	4 (33.33)	8 (66.67)	7 (58.33)	5 (41.67)	12 (100)
Occupation of the respondent	Employed (18)	6 (46.15)	13.33	12 (60)	8 (40)	8 (40)	12 (60)	7 (35)	13 (65)	8 (40)	12 (60)	20 (100)
	Unemployed (27)	7 (53.85)	15.56	13 (44.83)	16 (55.17)	12 (41.38)	17 (58.62)	9 (31.03)	20 (68.97)	13 (44.83)	16 (55.17)	29 (100)
Occupation of the spouse	Employed (42)	13 (100)	28.89	3 (100)	0 (0)	0 (0)	3 (100)	2 (66.67)	1 (33.33)	2 (66.67)	1 (33.33)	3 (100)
	Unemployed (3)	0 (0)	0	3 (50)	3 (50)	3 (50)	3 (50)	3 (50)	3 (50)	2 (33.33)	4 (66.67)	6 (100)
Income per month	Middle class (8)	2 (15.38)	4.44	8 (47.06)	9 (52.94)	5 (29.41)	12 (70.59)	5 (29.41)	12 (70.59)	10 (58.82)	7 (41.18)	17 (100)
	Lower middle class (27)	10 (76.92)	22.22	5 (55.56)	4 (44.44)	4 (44.44)	5 (55.56)	3 (33.33)	6 (66.67)	3 (33.33)	6 (66.67)	9 (100)
	Lowest Class (10)	1 (7.69)	2.22	10 (58.82)	7 (41.18)	6 (35.29)	11 (64.71)	6 (35.29)	11 (64.71)	6 (35.29)	11 (64.71)	17 (100)
Type of family	Nuclear family (23)	6 (46.15)	13.33	6 (40)	9 (60)	6 (40)	9 (60)	5 (33.33)	10 (66.67)	9 (60)	6 (40)	15 (100)
	Joint family (22)	7 (53.85)	15.56	7 (43.75)	9 (56.25)	8 (50)	8 (50)	4 (25)	12 (75)	7 (43.75)	9 (56.25)	16 (100)
Age of marriage (in years)	Below 18 (18)	2 (15.38)	4.44	9 (56.25)	7 (43.75)	4 (25)	12 (75)	7 (43.75)	9 (56.25)	8 (50)	8 (50)	16 (100)
	Above 18 (27)	11 (84.62)	24.44	3 (50)	3 (50)	0 (0)	6 (100)	2 (33.33)	4 (66.67)	6 (100)	0 (0)	6 (100)
No. of children	One child (11)	5 (38.46)	11.11	6 (35.29)	11 (64.71)	9 (52.94)	8 (47.06)	5 (29.41)	12 (70.59)	8 (47.06)	9 (52.94)	17 (100)
	2 children (22)	5 (38.46)	11.11	7 (77.78)	2 (22.22)	3 (33.33)	6 (66.67)	4 (44.44)	5 (55.56)	1 (11.11)	8 (88.89)	9 (100)
	More than 2 (12)	3 (23.08)	6.67	5 (45.45)	6 (54.55)	3 (27.27)	8 (72.73)	3 (27.27)	8 (72.73)	6 (54.55)	5 (45.45)	11 (100)
History of abortion	Yes (Abortion) (13)	2 (15.38)	4.44	11 (52.38)	10 (47.62)	9 (42.86)	12 (57.14)	8 (38.1)	13 (61.9)	9 (42.86)	12 (57.14)	21 (100)
	No (Abortion) (32)	11 (84.62)	24.44	3 (42.86)	4 (57.14)	6 (85.71)	1 (14.29)	3 (42.86)	4 (57.14)	3 (42.86)	4 (57.14)	7 (100)
Age of 1st pregnancy (in years)	18 or below 18 (8)	1 (7.69)	2.22	12 (50)	12 (50)	6 (25)	18 (75)	7 (29.17)	17 (70.83)	11 (45.83)	13 (54.17)	24 (100)
	Between 19-29 (32)	8 (61.54)	17.78	1 (100)	0 (0)	0 (0)	1 (100)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)
	Above 30 (5)	4 (30.77)	8.89	3 (50)	3 (50)	0 (0)	6 (100)	2 (33.33)	4 (66.67)	6 (100)	0 (0)	6 (100)
Interval between 1st child and subsequent pregnancy (in years)	Not applicable (11)	5 (38.46)	11.11	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)
	1 (1)	0 (0)	0	2 (40)	3 (60)	2 (40)	3 (60)	2 (40)	3 (60)	2 (40)	3 (60)	5 (100)
	2 (6)	1 (7.69)	2.22	8 (50)	8 (50)	8 (50)	8 (50)	6 (37.5)	10 (62.5)	5 (31.25)	11 (68.75)	16 (100)
	3 (20)	4 (30.77)	8.89	2 (50)	2 (50)	1 (25)	3 (75)	0 (0)	4 (100)	1 (25)	3 (75)	4 (100)
	More than 4 (7)	3 (23.08)	6.67	2 (12.5)	2 (12.5)	1 (8.33)	3 (15)	0	4 (19.05)	1 (6.67)	3 (17.65)	4 (100)