Clinical Epidemiology and Global Health 34 (2025) 102062

Contents lists available at ScienceDirect

Clinical Epidemiology and Global Health

journal homepage: www.elsevier.com/locate/cegh

Original article

Perception and predictors of antenatal services utilization by left-behind wives of marginal solo outmigrants-empirical evidence from India

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ARTICLE INFO

Keywords:
Left behind
Women
Maternal
Antenatal
Health
Male migration

ABSTRACT

Background: Although antenatal care (ANC) services are offered free of charge at public healthcare facilities in India, Bihar state has a low ANC utilization rate due to service quality gaps. This study examines these gaps from the perspective of Left-Behind Wives (LBWs) residing in urban low socioeconomic environments in the absence of husbands. The research also aims to identify the predictors for efficient use of ANC services at government health centres and the effect of source of information on perception towards ANC services.

Method: A cross-sectional survey was carried out to capture responses from 165 respondents residing in low socioeconomic regions of two administrative blocks of the Patna district of India. Effective utilization was measured as a binary variable, based on antenatal check-ups, iron-folic acid consumption, institutional delivery, and tetanus vaccination. Regression analysis was used to assess the predictors of utilization of ANC services. Analysis of Variance (ANOVA) was used to analyze the effect of source of information on perception towards ANC services.

Results: The most significant aspect that predicts the efficient use of ANC services at government health centres was 'human resource' (AOR = 3.35, R^2 = 0.80), followed by 'counselling service' (AOR = 2.41) and 'infrastructure and equipment condition' (AOR = 1.76). There was no significant effect of source of information on perception ($p > 0.05$).

Conclusion: This study reveals reasons for underutilization, perception, and opportunities related to ANC services at government centres. It also provides vital insights for policymakers for the development of maternal healthcare in underperforming states of India, ultimately contributing to the health empowerment of LBWs.

1. Introduction

Ensuring adequate maternal and perinatal health is one of the biggest healthcare challenges in India as well as other LMIC (Low- and Middle-Income Countries). As per the WHO (World Health Organization), globally in 2017, approximately 830 females died daily due to avoidable issues related to pregnancy and delivery. Furthermore, 6700 neonatal mortalities and 7000 stillbirths occur worldwide daily. Ninety-four percent of these mortalities occur in underdeveloped and developing nations, India being no exception.[1]

ANC (Antenatal Care) is one of the most crucial pillars of the RCH (Reproductive and Child Health) program for minimizing adverse outcomes occurring before and after delivery. As per the WHO, at least four ANC check-ups are required. Other important components of ANC services are tetanus vaccination and IFA (Iron and Folic Acid) supplementation.[2] However, a national-level survey revealed that in India, 42 % of women do not undergo the recommended number of ANC check-ups. About 8 % of pregnant women are not protected against tetanus, and 56 % of pregnant women haven't consumed IFA supplementation efficiently in India. These proportions are staggeringly high in the case of Bihar. About 75 % of all women who deliver a child do not undergo the recommended number of ANC checkups, and 82 % do not take IFA supplementation for the minimum recommended period during pregnancy.[3] In the case of other reproductive health indicators, Bihar's performance is below the national average. However, it is noteworthy to mention that different rounds of NFHS (National Family Health Survey) have revealed a trend of improvement in the value of health indicators. Nevertheless, many researchers argue that the pace of improvement is

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https://doi.org/10.1016/j.cegh.2025.102062
Received 17 January 2025; Received in revised form 4 May 2025; Accepted 7 May 2025
Available online 12 May 2025

not adequate.

The present study, with the help of published literature, attempts to identify the reason for low ANC utilization (i.e. quality perception of available service) in one of the pertinent population segments in Bihar. The present paper justifies the importance of LBWs as one of the vulnerable segments of Indian women and offers an analysis of their perception of the available ANC service based on the primary data. Additionally, in the present paper, we identified the predictors of successful utilization of ANC services at government health centres and suggested certain actions to enhance the utilization.

Previous studies have reported a positive correlation between the number of ANC checkups and favourable pregnancy outcomes. Researchers have found that the MMR (Maternal Mortality Rate) in LMIC decreases with an increase in ANC service utilization.[4] Further, it is well established that the effect of ANC service utilization is not confined to the mother but transcends to the health of the offspring. Various studies have reported that these affect different phases of the life of a child. Studies in LMIC (Low- and Middle-Income Countries) have found that there is a significant reduction (by 39 %) of neonatal mortality even when one ANC service is availed by mothers.[5] Past studies have indicated that there is an association between perception towards healthcare and the degree of health service utilization. Therefore, in order to increase ANC services, it is crucial to understand how the end-users of the services perceive these available public healthcare services.

The literature review suggested that LBWs (Left Behind Wives), females who are married to a migrant and living without husbands, are more vulnerable and underprivileged as compared to married women living with their husbands.[6] As the present study focuses on the perception of LBWs towards government ANC services in Bihar state, it is a prerequisite to understand what the current scenario of Bihar is, how migration is affecting the reproductive health of this group of women, and how LBWs group has emerged as one of the most vulnerable sections of society.

1.1. Impact of male out-migration

Migration plays a critical role in altering the socioeconomic structure of any state, which ultimately gets reflected in health indicators. Some researchers have reported that migration originating from low socioeconomic regions does bring economic benefits to the household, which helps in elevating the overall standard of living and health.[7] Nevertheless, a study conducted on a group of women residing in financially shoddy regions of Uttar Pradesh indicated that spousal out-migration could be highly unpredictable, as it could either deteriorate or improve the health status, living standard, and financial condition of left-behind household members.[8] However, previous research found that increased remittance received by the households does not always signify an improvement in the status of women in the family or community, as other family members (like in-laws) may assume the position of financial decision-maker for the received remittance in the absence of the husband.[8,9] On the contrary, other researchers argue that autonomy and physical well-being are closely related to increased household wealth.[10]

It is worth mentioning that previous research (only examining psychological health) revealed a detrimental effect of male out-migration on LBW's mental health in the form of despair, anxiety, and psychological stress from additional domestic duties.[11]

1.2. The vulnerability of LBWs

When factors like the absence of a spouse, patriarchal norms, and poor economic status overlap, one of the most vulnerable groups of society is formed.[12] As per the IHDS (India Human Development Survey) data, LBWs form a significant proportion (7 %) of women in Bihar. As migration has increased in the last decade, it could be assumed that this proportion has also increased further. Besides the large count of LBWs, there exists a knowledge rift regarding LBW's perception towards available ANC services in Bihar. However, there exists evidence regarding reproductive health behaviour from Nepal, which has an open border with Bihar state and a similar socioeconomic environment. The evidence suggests that, despite greater autonomy, LBWs are less likely to use contraceptives and ANC services as compared to women cohabiting with spouses.[13,14] Further, LBWs in LMIC are less inclined to discuss family planning and reproductive health issues with their husband as compared to wives of non-migrants.[15] In the case of Bihar, the migration rate is high, further, the frequency and duration of the husband's visits back at home are lesser due to travel expenditure, and stays are shorter due to daily wage loss. This adds to exacerbating the condition of LBWs. Researchers have argued that to understand the existing quality of health facilities, it is pivotal to understand the perception of available health services from the end-user perspective.[16] Hence, in the case of public sector ANC services, capturing the perception of LBWs is of utmost importance. The ultimate aim of the present research is in line with SDG (Sustainable Development Goals) 3 and 5.

The literature review revealed that few studies have been conducted highlighting the perception of women in general towards RCH and ANC services in Bihar. But no studies were found that captured the perception of LBWs towards existing government health centres offering ANC services in Bihar. The present study aims to capture and analyze the perception of LBWs residing in the urban slums of Patna, Bihar, towards ANC services offered at public health facilities. The selection of urban slums as a focus area stems from a noticeable lack of evidence within the literature, particularly when juxtaposed with studies on rural or entirely urban (medium to high socioeconomic status) populations. Secondly, the study aims to identify predictors for availing ANC services at public health facilities by LBWs, and lastly, explore the effect of primary source of information on the perception towards public ANC services.

2. Methodology

2.1. Study design and setting

A cross-sectional survey was conducted from August 2023 to December 2023, where a multistage sampling design was employed. Patna district has a total of 23 blocks. For the selection of blocks, we considered the assumption that males migrating without their wives leads to a higher sex ratio at the place of origin. It is critical to point out that past researchers have suggested that the sex ratio can be considered as a proxy indicator to locate male outmigration hotspots, as it has a significant bearing on the sex ratio.[17,18] Researchers in past have used this assumption to ensure the area selected has a higher density of LBWs.[6] Based on this assumption, we listed the top 10 blocks with the highest sex ratio (as per census 2011 data), out of which two blocks were purposively selected that had urban population agglomeration.

2.2. Sampling design and sample size

As per the available reports, the urban slum population of Bihar is widely underreported.[19] Therefore, a field visit was conducted to identify slum areas based on the criteria established by UN-Habitat.[20] A list of all identified urban slums in selected blocks was prepared. We purposively selected the two largest slums from both blocks. After household listing (in concurrence with inclusion criteria) in four identified areas, sample selection was done using systematic random sampling.

The sample size (n = 165) was determined using Cochran's formula, where the prevalence of married women currently in reproductive age married to out-migrants in Bihar was considered 7.2 % (as per IHDS-2, 2015) at a confidence level (Z) of 95 % with a margin of error (d) of 5 %, and non-response (N_R) of 10 %. Design-effect coefficient ($DEEF$ = 1.5) was applied to prevent undersampling.

$$\text{Sample Size} = \frac{(Z^2 * p * q * DEEF)/d^2 + N_R}{= \left[\{1.96^2 * 0.07 * (1 - 0.07) * 1.5\}/0.05^2\right] + 15 = 165}$$

2.3. Inclusion criteria

We included respondents who were married women aged between 15 and 49 years, with a migrated husband who was currently residing outside the Patna district for economic activity (for at least last one year). Further to align with our objective of ANC service perception, those respondents were included who had delivered at least once in the last five years from the date of the interview.

2.4. Study tools

After reviewing the literature, an interview schedule was developed based on variables that influence ANC service perception of women. The questionnaire consisted of 3 parts: (i) demographic characteristics, (ii) antenatal health and behavioural aspects, and (iii) perception towards quality (33 items). Parasuraman and Zeithaml's SERVQUAL model was adopted, and modifications were made to design the third part of the questionnaire. The quality perception variables were grouped into 6 domains for analysis purposes. Pilot testing of the tool was conducted on 30 respondents. Internal reliability was analyzed, and required modifications were made (Cronbach's Alpha = 0.79). The interviews were conducted by a trained female investigator, and responses were recorded in electronic form using CS-Pro (version 7.3).

2.5. Analysis

Statistical analysis was done in IBM-SPSS (version 22.0). Adopting methodology from past studies having similar objectives, in the present study, the responses for each quality variable were recorded as a score (5-point Likert scale). The mean of overall scores and the mean of each quality domain were calculated.[21–23] Binary logistic regression was carried out to determine the predictors of efficient utilization of delivery services at public health facilities by LBWs. The mean value for each quality domain for each of the respondents was calculated and considered as an independent variables. The dependent variable was the efficient utilization of ANC services. A respondent was considered to have efficiently utilized government ANC services if she had completed the four criteria during the last delivery: (i) three ANC check-ups, (ii) consumed IFA tablets for at least 100 days or 3 IFA syrup bottles, (iii) institutional delivery, (iv) completed tetanus vaccination. A new dummy variable was created, and score '1' was assigned if the respondent was found to have efficiently utilized ANC services, whereas score '0' was assigned if not efficiently utilized; this served as the dependent variable. For exploring the effect of primary sources of information on the perception ANOVA (Analysis of Variance) method was employed.

3. Results

3.1. Sample characteristics

A total of 165 LBWs were interviewed in the present study. Descriptive analysis revealed that the majority of the respondents (55.8 %) were from the peak reproductive age group, i.e., 20–29 years. About 87 % of respondents were living in joint families with in-laws, whereas respondents having a nuclear family were strikingly low, at about 13 %. Further analysis revealed, about two-thirds of the respondents who were living in joint families had parents-in-law living with them. Slightly over two-thirds of the respondents (64.3 %) were illiterate. About one-third of the respondents were able to read or write, of whom about 69 % of the respondents had attended school. Further analysis revealed, out of respondents who attended school (n = 97), only 36 % completed primary schooling. The majority of the respondents (64.8 %) followed Hinduism. About 30 % of the respondents belonged to Islam, whereas a minor portion of respondents (4.3 %) followed other religions, namely Sikh and Christian. Overall, the majority of the respondents (59 %) belong to reserved caste groups. Out of the reserved caste respondents, the majority of the respondents (44.3 %) belonged to the OBC category. Out of Hindu respondents (n = 107), about 60 % belong to reserved caste, whereas out of Muslim respondents (n = 50), 56 % belonged to reserved caste categories. Data revealed that inter-state outmigration was most prevalent (56.4 %) among respondents' husbands, followed by intra-state outmigration (26.1 %). Cross-border (international) outmigration for economic activity was found to be the least, at about 17.6 %. Overall, the majority of the husbands were working as labourers in the non-agricultural sector. It is noteworthy to mention that for each type of migration, labour work in the non-agricultural sector was most prevalent, such as construction workers and factory workers. The comparison of mean perception scores within each variable subgroup was conducted. It is worth mentioning that the respondents' demographic background characteristic did not influence their satisfaction as the subgroups of each variable were comparable, except for the age of respondents (Table 1).

3.2. Antenatal behaviour

ANC behaviour of respondents was recorded for the last completed pregnancy, which revealed, only 19 % of respondents had recommended numbers of ANC visits (at least 4 visits), whereas 90 % of respondents were protected against tetanus during pregnancy. About 65 % of the respondents utilized government health facilities for their last delivery, and 10 % went to private health facilities. About 25 % of respondents had non-institutional deliveries. Approximately 19 % of the respondents consumed IFA supplementation for at least 100 days. Lastly, about 13 % of respondents experienced negative outcomes during the last conception, out of which spontaneous abortion contributed the most (46.7 %).

3.3. Perception and its predictors

Analysis of quality perception was performed for each perception variable by frequency and mean of scores, as explained in detail in Table 2. Overall, the respondents perceived the ANC services as slightly below a satisfactory level (i.e. 3 out of 5). The mean overall score of perception score was 2.6 (SD = 1.07). The means of perception score for the ANC service-related six quality domains were: 2.5 for infrastructure and equipment condition, 2.6 for human resource factor, 2.7 for medicines and consumables, 2.6 for counselling services, 2.7 for referral and emergency response, and 2.5 for documentation services. Of all the individual quality variables, 'quality of consumables' had the highest score (2.9), whereas 'quality of equipment and machine used' had the lowest score (2.27).

Binary logistic regression was carried out, and AOR (Adjusted Odds Ratio) was calculated. The Omnibus test revealed that the generated model is overall significant ($p < 0.05$). The model variance was determined by calculating the regression coefficient (Nagelkerke R-square), which revealed a strong association between the outcome variable and the predictors ($R^2 = 0.78$).

Analysis revealed that three out of six domains had a significant effect on ANC service utilization ($p < 0.05$). 'Human resource' was the strongest predictor of efficient utilization of ANC service (AOR = 3.35), followed by 'counselling service' (AOR = 2.41) and 'infrastructure and equipment condition' (AOR = 1.76). 'Medication and consumables', 'referral and emergency services', and 'documentation' were found to be statistically insignificant in predicting efficient utilization of ANC services (Table 3).

Table 1
Respondents' social and demographic characteristics (N = 165).

Variables	n (%)	Mean Perception Scores	S.D.	P value
Age group				
15–19 years	10 (6.1 %)	4.22	0.29	<0.001*
20–29 years	92 (55.8 %)	2.54	0.72	
30 years and above	63 (38.1 %)	2.53	0.75	
Type of family				
Joint	144 (87.3 %)	2.63	0.81	0.777
Nuclear	21 (12.7 %)	2.69	0.93	
Literacy status				
Illiterate	106 (64.3 %)	2.58	0.78	0.344
Literate with formal schooling	41 (24.8 %)	2.68	0.85	
Able read or write but no formal education	18 (10.9 %)	2.88	0.96	
Religion				
Hinduism	107 (64.8 %)	2.62	0.82	0.325
Islam	50 (30.3 %)	2.74	0.87	
Others	8 (4.3 %)	2.30	0.17	
Caste				
General	68 (41.2 %)	2.81	0.92	0.082
Other backward class	43 (26.1 %)	2.41	0.61	
Scheduled caste	41 (24.8 %)	2.57	0.77	
Scheduled tribe	13 (7.9 %)	2.69	0.89	
Place of Husband's Migration				
Other states/UTs of India	93 (56.4 %)	2.66	0.81	0.431
Outside Patna but in Bihar	43 (26.1 %)	2.51	0.75	
Outside India	29 (17.6 %)	2.76	0.94	
Husband's Occupation				
Labourer in non-agricultural sector	62 (37.6 %)	2.58	0.76	0.402
Owns business	35 (21.2 %)	2.52	0.67	
Salaried employ at private firm	23 (13.9 %)	2.88	0.95	
Agricultural labour in others land	15 (9.1 %)	2.54	0.82	
Agricultural labour in own land	12 (7.3 %)	2.94	1.02	
Unpaid family work	9 (5.5 %)	2.40	0.87	
Government employee	9 (5.5 %)	2.88	1.01	

*Statistical significance at $p < 0.05$.

3.4. Effect of source of information on perception

Respondents were grouped on the basis of their primary source of ANC-related information, namely; (i) doctor, (ii) ASHA, (iii) ANM, (iv) nurses, (v) husband, (vi) mother-in-law/sister-in-law, (vii) mother/sister, (viii) relative/neighbours/friends, and (ix) mass media/internet. ANOVA analysis (one-way) was conducted to compare the overall perception mean score among these groups. No significant effect of source of information on perception towards ANC was found (at 95 % confidence level) [$F(8156) = 0.634$, $p > 0.05$].

4. Discussion

The recorded ANC behaviours of LBWs are consistent with NFHS-5 Bihar findings in terms of proportions, such as the proportion of IFA consumption, tetanus vaccination, and institutional delivery. However, a few characteristics are not consistent with NFHS findings. For instance, as per the present study illiteracy rate is strikingly high among LBWs residing in Bihar.[3] This could be attributed to the fact that the literacy rate of a community is directly proportional to the socioeconomic condition, which acts as a confounder in this case because of the selected population. As the present study is conducted in slum areas of Patna, this explains the discrepancy. Further, the sociodemographic findings revealed that, except age variable, there exists no association between the general characteristics of the respondents and their perception towards government ANC services. The reason behind this could be attributed to the fact that in the lower age group, service quality experience and expectations are lower.

Our findings are critical because they show the perception's impact on ANC behaviour, which ultimately impacts other aspects of women's health, such as mental health.[29] The overall perception was low and reflected mild dissatisfaction; the reason behind this could be the gaps between expected and actual quality. This is in contrast with the study conducted at a government-owned territory-level teaching hospital, which reported overall high satisfaction, for instance, about 95 % of the patients were satisfied by the available doctors, and the average rating of doctors given by the patient was 8.3 out of 10.[30] The present study predominantly captures the perception of women regarding services available at the primary and secondary level of public healthcare centres.

In India, Bihar is also considered as an underdeveloped state and a member of EAG (Empowered Action Group) states, which is reflected in the maternal health indicators of Bihar. A qualitative study revealed that backward caste women of Bihar exhibit high levels of dissatisfaction regarding available government RCH and ANC health services. It was found that women perceive waiting time as prolonged and the quality of health personnel as poor for free-of-cost treatment offered by the government.[31] The reason reported was discriminatory behaviour by health personnel and asking for unauthorized payments from women.

The pieces of evidence regarding predictors of ANC services are very limited in past literature, however, the available studies corroborate the present findings by highlighting the impact of 'human resource' and 'infrastructure and equipment' quality parameters on health service utilization.[23]

The present study also analyzes the role of the source of information in the perception of ANC services, the results revealed no such association. There is no available study that has analyzed the impact of the source of information on the perception of end users. However, evidence regarding the impact of source of information on maternal behaviour shows a significant association.[32] The empirical results of ANOVA analysis need to be triangulated by doing an in-depth qualitative study or SNA (social-network analysis) of LBWs.

Past studies reported a positive impact of MOM (Male Out-Migration) on the reproductive health of LBWs,[24] whereas others found that a spouse's absence has detrimental consequences on many aspects of the health and life of left-behind family members, especially wives.[25] A significant number of studies reported mixed findings, with few emphasizing that the positive effects of male migration are outweighed by negative effects.[26] The reproductive health of an LBW is not a secluded aspect but is shaped by a variety of circumstances that also influence other areas of health and quality of life.[27] Past studies have identified these factors, which include remittance sent back home, societal norms, household size, pre-existing economic conditions, societal system, etc. These factors vary from region to region and family to family.[28,33]

We agree with the findings and emphasize the effect of MOM, as about thirty percent of LBWs are hesitant in sharing their sexual health issues with anyone. The reason highlighted was the perception of reproductive disease as a social stigma. Spousal presence in the household leads to problem discussion and more health services utilization.

Table 2
Descriptive statistics of elements of perception of respondents (N = 165).

Elements of Quality Perception	Frequency and proportion, *n* (%)					Mean	SD
	Score 5 Very Good	Score 4 Good	Score 3 Neutral	Score 2 Bad	Score 1 Very Bad		
Infrastructure and Equipment Condition							
Quality of equipment and machines used	6 (3.6 %)	19 (11.5 %)	28 (17 %)	73 (44.2 %)	39 (23.6 %)	2.27	1.06
Cleanliness of healthcare facility	10 (6.1 %)	18 (10.9 %)	37 (22.4 %)	89 (53.9 %)	11 (6.7 %)	2.56	0.98
Electricity supply at healthcare facility	8 (4.8 %)	11 (6.7 %)	54 (32.7 %)	43 (26.1 %)	49 (29.7 %)	2.31	1.11
Ventilation inside healthcare facility	10 (6.1 %)	19 (11.5 %)	43 (26.1 %)	67 (40.6 %)	26 (15.8 %)	2.52	1.08
Physical condition of building	14 (8.5 %)	29 (17.6 %)	20 (12.1 %)	88 (53.3 %)	14 (8.5 %)	2.64	1.13
Human Resource Factors							
Availability of doctor	11 (6.7 %)	19 (11.5 %)	7 (4.2 %)	109 (66.1 %)	19 (11.5 %)	2.36	1.05
Availability of paramedic staff	14 (8.5 %)	15 (9.1 %)	51 (30.9 %)	75 (45.5 %)	10 (6.1 %)	2.68	1.02
Skill of doctor	19 (11.5 %)	18 (10.9 %)	53 (32.1 %)	71 (43 %)	14 (8.5 %)	2.62	0.98
Skill of paramedic staff	6 (3.6 %)	32 (19.4 %)	55 (33.3 %)	65 (39.4 %)	7 (4.2 %)	2.79	0.93
Behaviour of doctor	18 (10.9 %)	13 (7.9 %)	26 (15.8 %)	97 (58.8 %)	11 (6.7 %)	2.58	1.09
Behaviour of paramedic staff	25 (15.2 %)	8 (4.8 %)	49 (29.7 %)	67 (40.6 %)	16 (9.7 %)	2.75	1.18
Waiting time to consult a HCW	18 (10.9 %)	8 (4.8 %)	61 (37 %)	63 (38.2 %)	15 (9.1 %)	2.70	1.07
Medicines, Consumables and Services							
Availability of medication	12 (7.3 %)	10 (6.1 %)	64 (38.8 %)	63 (38.2 %)	16 (9.7 %)	2.63	1.00
Quality of medication	8 (4.8 %)	9 (5.5 %)	30 (18.2 %)	108 (65.5 %)	10 (6.1 %)	2.38	0.87
Availability of consumable	14 (8.5 %)	36 (21.8 %)	47 (28.5 %)	36 (21.8 %)	32 (19.4 %)	2.78	1.23
Quality of consumable	21 (12.7 %)	7 (4.2 %)	84 (50.9 %)	43 (26.1 %)	10 (6.1 %)	2.92	1.03
Availability of IFA supplementation	19 (11.5 %)	12 (7.3 %)	64 (38.8 %)	56 (33.9 %)	14 (8.5 %)	2.79	1.08
Quality of IFA supplementation	14 (8.5 %)	14 (8.5 %)	65 (39.4 %)	59 (35.8 %)	13 (7.9 %)	2.74	1.02
Availability of diagnostic/lab services	21 (12.7 %)	10 (6.1 %)	47 (28.5 %)	77 (46.7 %)	10 (6.1 %)	2.73	1.10
Quality of diagnostic/lab services	18 (10.9 %)	17 (10.3 %)	55 (33.3 %)	45 (27.3 %)	30 (18.2 %)	2.68	1.20
Quality of IPD services	19 (11.5 %)	12 (7.3 %)	69 (41.8 %)	50 (30.3 %)	15 (9.1 %)	2.82	1.08
Counselling Services							
Advice on nutrition	15 (9.1 %)	13 (7.9 %)	61 (37 %)	61 (37 %)	15 (9.1 %)	2.71	1.05
Advise on planning the birth	14 (8.5 %)	16 (9.7 %)	52 (31.5 %)	53 (32.1 %)	30 (18.2 %)	2.58	1.15
Advise on contraception use	21 (12.7 %)	11 (6.7 %)	47 (28.5 %)	74 (44.8 %)	12 (7.3 %)	2.73	1.12
Advise on breastfeeding advise	13 (7.9 %)	17 (10.3 %)	73 (44.2 %)	34 (20.6 %)	28 (17 %)	2.72	1.11
Advise on immunization services	6 (3.6 %)	20 (12.1 %)	61 (37 %)	62 (37.6 %)	16 (9.7 %)	2.62	0.95
Psychological counselling	12 (7.3 %)	16 (9.7 %)	51 (30.9 %)	56 (33.9 %)	30 (18.2 %)	2.54	1.12
ANC related counselling by HCW	15 (9.1 %)	14 (8.5 %)	42 (25.5 %)	83 (50.3 %)	11 (6.7 %)	2.63	1.04
Referral and Emergency Response							
Emergency response	10 (6.1 %)	36 (21.8 %)	33 (20 %)	71 (43 %)	15 (9.1 %)	2.73	1.09
Referral process	13 (7.9 %)	9 (5.5 %)	73 (44.2 %)	56 (33.9 %)	14 (8.5 %)	2.70	0.98
Condition of ambulance vehicle	20 (12.1 %)	8 (4.8 %)	74 (44.8 %)	47 (28.5 %)	16 (9.7 %)	2.81	1.09
Documentation							
Patient record keeping	9 (5.5 %)	14 (8.5 %)	38 (23 %)	70 (42.4 %)	34 (20.6 %)	2.36	1.07
Utility of MCP (Mother and Child Protection) card	17 (10.3 %)	12 (7.3 %)	60 (36.4 %)	61 (37 %)	15 (9.1 %)	2.73	1.07

Table 3
Predictors of efficient ANC service utilization by LBW.

Domains of ANC Healthcare Quality	AOR	Confidence Interval		Model Summary		
		Lower	Upper	Adjusted R^2	Hosmer and Lemeshow test P value	Omnibus test P value
Infrastructure and equipment condition	1.76*	1.36	4.32	0.78	0.18	<0.001*
Human resource	3.35*	1.97	3.79			
Medication and consumables	0.23	0.15	1.12			
Counselling services	2.41**	1.56	3.85			
Referral and emergency services	3.10	0.84	7.87			
Documentation	0.77	0.32	2.26			

Statistical significance: *$p < 0.01$, **$p < 0.05$.

Moreover, about two-thirds of such females do not seek medical help due to financial pressure and self-negligent behaviour in the absence of their husbands.[23]

The point of contact with the respondents was at their household, research team tried to make respondents comfortable and safe. Nevertheless, in very few instances, responses were altered by the occasional interference of a family member while interviewing. Secondly, only the last delivery was taken into account during predictor analysis. To ensure the study is not prone to recall bias, inclusion criteria were established that shortened the recall period to ensure LBWs could recollect their experience of the antenatal care services. Further, as multistage sampling was employed, precautions were taken to prevent selection biases. Randomization was employed while selecting respondents from the sampling frame (household list), and a design-effect coefficient of 1.5 was factored in to increase the sample size.

The regression findings of the study could not be generalized beyond the urban slum of Patna and neighbouring districts. Further research could be done in other parts of Bihar as well as in other EAG (Empowered Action Group) states of India to analyze if there is any variation in the perception and predictors. The present research takes into account only LBWs from urban slums. Therefore, it is recommended to conduct a larger mixed-method study that encompasses sample representation from both rural and urban regions. In such studies, other key stakeholders in addition to LBWs (such as healthcare providers, block level officials and husbands) could be included to gain deeper insights (qualitative data via in-depth interviews and FGDs) about the perception

and predictors of ANC services in the public sector. This will help in ensuring the validity of the present study and reaching to more generalizable results.

5. Conclusion

The present study provides novel insights regarding the ANC services available at government health centres in Patna, Bihar. The overall findings suggest LBWs residing in Patna perceive available ANC health centres (and related services) as not satisfactory. The study also reports that 'human resource' is the most impactful predictor of efficient utilization of ANC services at the government health centre.

Health administrators, while designing RCH policies, developing programs, and planning resource allocation, should take LBWs into account, as they are vulnerable and form a sizable section of women residing in LMIC. The policymakers should develop new strategies to improve the quality of government ANC health facilities to increase the ANC services utilization. The primary focus should be towards ensuring the availability of healthcare professionals at health centres. The health of females plays a pivotal and fundamental role in female empowerment. Ensuring an adequate level of health of LBWs will contribute tremendously to overall women's health, which will contribute to gender equality, and to accomplish sustainable development of women in the long run.

Author's contribution

FA conceptualized the idea and led the planning and execution of the research. RS assisted in data collection and analysis. AD gave critical inputs in all phases of the study. All authors contributed to the manuscript preparation and review.

Ethical compliance statement

The study was reviewed and approved by the Institutional Review Board of the IIHMR University, Jaipur, India (reference no. IIHMU-IRB/2022/2, dated: December 9, 2022).

Funding

This study did not receive funding from any organization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The authors thank all the respondents who participated in this study. The authors also thank the block officials for their support during the field survey.

References

1. World Health Organization - Health factsheet. *Newborns: Improving Survival and Well-Being*; 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality#:~:text=There%20are%20approximately%206%20700,to%202.4%20million%20in%202019. Accessed September 28, 2024.
2. World Health Organization. *WHO Recommended Interventions for Improving Maternal and Newborn Health*. Geneva: WHO Department of Making Pregnancy Safer; 2009. Available from: https://iris.who.int/bitstream/handle/10665/69509/WHO_MPS_07.05_eng.pdf;sequence=1. Accessed November 11, 2024.
3. International Institute for Population Sciences. *National Family Health Survey (NFHS)-5, India*. State factsheet Bihar; 2021. Available from: http://rchiips.org/nfhs/. Accessed March 12, 2024.
4. Zhao P, Han X, You L, Zhao Y, Yang L, Liu Y. Maternal health services utilization and maternal mortality in China: a longitudinal study from 2009 to 2016. *BMC Pregnancy Childbirth*. 2020;20:1–10. https://doi.org/10.1186/s12884-020-02900-4, 220.
5. Tekelab T, Chojenta C, Smith R, Loxton D. The impact of antenatal care on neonatal mortality in sub-Saharan Africa: a systematic review and meta-analysis. *PLoS One*. 2019;14(9), e0222566. https://doi.org/10.1371/journal.pone.0222566.
6. Afzal F, Das A. Predictors of antenatal health service utilization among left-behind wives of male outmigrants: evidence from Patna District, India. *Asian Pacific Journal of Reproduction*. 2023;12(5):220–228. https://doi.org/10.4103/2305-0500.386123.
7. De Haan A, Rogaly B. Introduction: migrant workers and their role in rural change. *J Dev Stud*. 2002;38(5):1–4. https://doi.org/10.1080/00220380412331322481.
8. Ganguly S. *Husbands Out Migration and Negotiated Role of Left behind Wives A Study of Rural Varanasi Uttar Pradesh*. Mumbai: IIPS; 2012. Available from: http://hdl.handle.net/10603/184651.
9. Ahmed S. Women left behind: migration, agency, and the Pakistani woman. *Gend Soc*. 2020;34(4):597–619. https://doi.org/10.1177/0891243220930698.
10. Abdullah F, Habib A, Gillani N. Migration, remittances and wellbeing of recipient families. *Migrant*. 2021;8(2):2021. Available from: https://jcreview.com/archives/volume-8/issue-2/8226.
11. Aryal N, Regmi PR, Van Teijlingen E, Trenoweth S, Adhikary P, Simkhada P. The impact of spousal migration on the mental health of Nepali women: a cross-sectional study. *Int J Environ Res Publ Health*. 2020;17(4):1292. https://doi.org/10.3390/IJERPH17041292.
12. Afzal F, Das A, Ali QA. Reproductive health of outmigrant's left-behind wives residing in Indian subcontinent–A systematic review encompassing mental stress, autonomy and patriarchy. *NeuroQuantology*. 2022;20(7):2719. https://doi.org/10.14704/nq.2022.20.7.NQ33349.
13. Afzal F, Aalam KP, Mehra S, Joshi S, Ahmad AA. Practice and awareness of migrant pregnant women living in urban slums towards tobacco consumption. *Med Sci*. 2022;26(125):1–9. https://doi.org/10.54905/disssi/v26i125/ms316e2332.
14. Shattuck D, Wasti SP, Limbu N, Chipanta NS, Riley C. Men on the move and the wives left behind: the impact of migration on family planning in Nepal. *Sex Reprod Health Matters*. 2019;27(1):248–261. https://doi.org/10.1080/26410397.2019.1647398.
15. Hendrickson ZM, Lohani S, Thapaliya Shrestha B, Underwood CR. Talking about reproduction with a migrating spouse: women's experiences in Dhading, Nepal. *Health Care Women Int*. 2018;39(11):1234–1258. https://doi.org/10.1080/07399332.2018.1505893.
16. Afzal F, Raychaudhuri PS, Afzal MA, Ahmad AA. Challenges faced by BPL population in availing public healthcare–analysing government initiatives, technology and cultural barriers in Aligarh district, UP. *South Asian J Soc Sci Humanit*. 2021;2(5):1–9. https://doi.org/10.48165/sajssh.2021.2501.
17. Tumbe C. Missing men, migration and labour markets: evidence from India. *Indian J Lab Econ*. 2015;58(2):245–267.
18. Choithani C. Understanding the linkages between migration and household food security in India. *Geogr Res*. 2017;55(2):192–205.
19. Nolan LB. Slum definitions in urban India: implications for the measurement of health inequalities. *Popul Dev Rev*. 2015;41(1):59–84. https://doi.org/10.1111/j.1728-4457.2015.00026.x.
20. Habitat UN. *State of the World's Cities 2012/2013: Prosperity of Cities*. Routledge; 2013. Available from: https://unhabitat.org/prosperity-of-cities-state-of-the-worlds-cities-20122013. Accessed October 20, 2024.
21. Sahota R, Das A, Afzal F. Determinants of data use for programmatic evidence-based decision making at peripheral public health care centres in Haryana, India. *Clin Epidemiol Glob Health*. 2024;29, 101713. https://doi.org/10.1016/j.cegh.2024.101713.
22. Woldeyohanes TR, Woldehaimanot TE, Kerie MW, Mengistie MA, Yesuf EA. Perceived patient satisfaction with in-patient services at jimma university specialized hospital, southwest Ethiopia. *BMC Res Notes*. 2015;8:1–8. https://doi.org/10.1186/s13104-015-1179-8.
23. Ham HS, Peck EH, Moon HS, Yeom HA. Predictors of patient satisfaction with tertiary hospitals in Korea. *Nurs Res Pract*. 2015;2015(1), 749754. https://doi.org/10.1155/2015/749754.
24. Imran K, Devadason ES, Kee Cheok C. Developmental impacts of remittances on migrant-sending households: micro-level evidence from Punjab, Pakistan. *J South Asian Dev*. 2019;14(3):338–366. https://doi.org/10.1177/0973174119887302.
25. Mahapatro SR. Impact of labour migration on socioeconomic position of left-behind women in Bihar. *Indian J Lab Econ*. 2018;61(4):701–718. https://doi.org/10.1007/s41027-019-00156-x.
26. Lei L, Desai S. Male out-migration and the health of left-behind wives in India: the roles of remittances, household responsibilities, and autonomy. *Soc Sci Med*. 2021;280, 113982. https://doi.org/10.1016/j.socscimed.2021.113982.
27. Bhagat RB, Ali I. Migration and impact of remittances on health. Muslims in telangana: a discourse on equity, development, and security. *Dyn Asian Dev*. 2021:197–210. https://doi.org/10.1007/978-981-33-6530-8_10.
28. Das M, Kumar K, Khan J. Does remittance protect the household from catastrophic health expenditure in India. *Int J Migrat Health Soc Care*. 2020;16(4):481–493. https://doi.org/10.1108/IJMHSC-03-2020-0023.
29. Deierlein AL, Park C, Patel N, Gagnier R, Thorpe M. Mental health outcomes across the reproductive life course among women with disabilities: a systematic review. *Arch Womens Ment Health*. 2024:1–8. https://doi.org/10.1007/s00737-024-01506-5.
30. Kumar S, Kumar A, Bhavana K, Kumar P, Kumar D. A study of patient satisfaction and expectation in a newly established tertiary-care teaching hospital: a cross-sectional study. *Int J Med Sci Publ Health*. 2016;5(4):1487–1491. https://doi.org/10.5455/ijmsph.2016.27102015302.

31. Patel P, Das M, Das U. The perceptions, health-seeking behaviours and access of Scheduled Caste women to maternal health services in Bihar, India. *Reprod Health Matters*. 2018;26(54):114–125. https://doi.org/10.1080/09688080.2018.1533361.
32. Alsajri A. A novel motivation tool to encourage smoking cessation in Iraq. *Shifaa*. 2024;2024:29–33. https://doi.org/10.70470/SHIFAA/2024/003.
33. Singh P, Singh KK, Singh P. Maternal health care service utilization among young married women in India, 1992–2016: trends and determinants. *BMC Pregnancy Childbirth*. 2021;21(122):1–13. https://doi.org/10.1186/s12884-021-03607-w.