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MATERNAL MORBIDITY AND ITS DETERMINANTS IN RURAL ASSAM": A CROSS SECTIONAL COMMUNITY BASED STUDY

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ABSTRACT

Background: Maternal morbidity continues to be a significant global public health issue, particularly in low- and middle-income countries. In rural India, including Assam, maternal health faced numerous challenges in the early 2000s, including inadequate healthcare infrastructure, poor transportation, and low antenatal care (ANC) utilization. **Objective:** This study, conducted before the implementation of the National Health Mission, aims to document the prevalence and determinants of maternal morbidities in Rani Block, Kamrup District, Assam, and provide a baseline for maternal health reform.

Materials and Methods: A community-based cross-sectional study was conducted from August 2002 to July 2003 in Rani Block, Kamrup District. A sample of 320 women, including those in their second and third trimesters and postnatal women, was selected using simple random sampling from 30 villages.

Results: The study revealed that 64.3% of women experienced at least one morbidity during pregnancy, with anaemia (65.6%) being the most common condition, followed by vomiting (26.6%) and lower abdominal pain (22.6%). During the intranatal period, 12% of women experienced prolonged labour, and 10% reported excessive bleeding. In the postnatal period, 60% of women experienced morbidities, including postnatal haemorrhage (18%), foul-smelling vaginal discharge (18%), and breast problems (18%). Significant associations were found between morbidity and factors such as age, gravidity, educational status, ANC attendance, and place of delivery. Women who had fewer ANC visits or delivered at home had a higher incidence of morbidities.

Conclusion: The study demonstrates the high prevalence of maternal morbidities in rural Assam, particularly during pregnancy and the postnatal period. Addressing socio-demographic factors and improving ANC services could significantly reduce morbidity rates. Future public health interventions should focus on strengthening healthcare access and awareness to mitigate maternal health risks in underserved areas.

Keywords: Maternal, Morbidity, Anaemia, Antenatal, Intranatal, Postnatal, Determinants.

INTRODUCTION

Maternal morbidity and mortality remain pressing global public health concerns, disproportionately affecting women in low- and middle-income countries. In the early 2000s, rural India—including the northeastern state of Assam—faced significant challenges in providing equitable and accessible maternal healthcare. Contributing factors included poor transportation infrastructure, low antenatal coverage, inadequate emergency obstetric care, and underutilization of institutional delivery services.

During 2002–2003, the Indian government had not introduced the National Health Mission (NHM), a landmark initiative that later strengthened community health infrastructure by deploying Accredited Social Health Activists (ASHAs), improving referral linkages, and launching financial

assistance schemes to encourage institutional deliveries and reduce maternal deaths and morbidities.

Globally, an estimated 529,000 women died each year from causes related to pregnancy and childbirth, with 99% of these deaths occurring in developing countries.[1] However, for every maternal death, approximately 16 to 30 women suffer from maternal morbidities, many of which are severe and long-lasting.[2,3] The World Health Organization (WHO) defines maternal morbidity as "any health condition attributed to and/or aggravated by pregnancy and childbirth that has a negative impact on the woman's well-being".[4] Common morbidities such as pre-eclampsia, postnatal haemorrhage, puerperal sepsis, and prolonged labour are largely preventable with timely and adequate care.[5]

In the early 2000s, India reported a high maternal mortality ratio (MMR)—about 301 per 100,000 live births, with rural states such as Assam facing even higher rates due to geographic, socioeconomic, and health system constraints.[6] Although national programs like the Child Survival and Safe Motherhood (CSSM) and Reproductive and Child Health (RCH) initiatives were operational, most available data came from facility-based studies. Community-based evidence on maternal morbidities—especially in remote or tribal regions—was scarce. Existing literature tended to focus on specific conditions such as anaemia or only on intrapartum complications, while ignoring the broader spectrum of maternal morbidities experienced throughout pregnancy, childbirth, and the postnatal period.

This community-based study was conducted in Rani Block, Kamrup District, Assam, during 2002–2003, prior to NHM implementation. It aimed to document the incidence and prevalence of maternal morbidities and to identify associated socio-demographic and health-system determinants. The findings offer a valuable pre-reform baseline for maternal health in a rural setting and are expected to inform targeted public health interventions in similar underserved areas.

MATERIALS AND METHODS

This community-based cross-sectional study was conducted in the Rani Community Development Block, Kamrup District, Assam, over a one-year period from August 2002 to July 2003. The block lies 28 km south-west of Guwahati city and encompasses both hilly and plain terrains, with mixed road infrastructure and variable access to healthcare services. As per the 1991 Census, the block had a population of 63,128 across 90 revenue villages, with approximately 14% belonging to tribal communities (Bodos, Ravas, Kochari, Garos). The area had one Community Health Centre (CHC), one Mini PHC, 27 sub-centres (22 functional), and one state dispensary.

Study Population

The study included pregnant women in their second and third trimesters and women up to six weeks postnatal. Women in the first trimester were excluded due to difficulties in identifying early pregnancies during community visits.

Sample Size and Sampling

Using the 15% estimated prevalence of maternal complications,[7] and an absolute error of 4%, the calculated sample size was 320, considering time, manpower, and resource constraints. A simple random sample of 30 villages was selected from the 90 villages in the block. Eligible women were identified through house-to-house surveys in selected villages.

Data Collection Tools and Procedure

Data were collected using a pre-designed and pre-tested structured schedule through face-to-face interviews during household visits. Local health workers (Auxiliary Nurse Midwives, Anganwadi workers, and elderly ladies) assisted in locating eligible participants. Informed oral consent was taken before data collection. Each participant was interviewed once. For postnatal women, data were collected retrospectively for the pregnancy, childbirth, and postnatal period. For currently pregnant women, morbidities experienced in the ongoing pregnancy were documented. The schedule included sections on socio-demographic details, antenatal/intranatal/postnatal care, and common pregnancy-related morbidities perceived during pregnancy and childbirth. These subjective self-reported morbidities were supplemented with limited clinical and laboratory tests for anaemia, blood pressure, and urinary protein. The available medical record of the current pregnancy was also reviewed to document morbidity.

Clinical Assessment

- Anaemia was assessed using Sahli's method; haemoglobin <11 g/dL was classified as anaemia.[8,9]
- Pregnancy-induced hypertension (PIH) was diagnosed based on two blood pressure readings (≥140/90 mm Hg, 30 minutes apart) after 20 weeks of gestation. If PIH was suspected, urine was tested for proteinuria using the heat coagulation test. The presence of both hypertension and proteinuria was considered pre-eclamptic toxaemia.[10]
- Pedal oedema was assessed by pressing above the medial aspect of the ankle with one finger for 10 seconds and noting the occurrence of pitting.
- For postnatal women, these conditions were assessed based on history and recall.

The study design incorporated key features to ensure validity in a resource-limited rural setting. By combining household survey techniques with targeted clinical assessments (e.g., Sahli's method for haemoglobin, BP measurements, urine protein testing), the study provided more objective morbidity data than many purely interview-based surveys.[11-13] Inclusion of tribal communities,

difficult terrain populations, and data from deceased mothers' families allowed broader representation. Additionally, the integration of self-reports, clinical findings, and available medical records ensured greater diagnostic accuracy and contextual relevance, making it methodologically more comprehensive than earlier community-based studies in rural Maharashtra,[11] Tamil Nadu,[12], and West Bengal,[13]

RESULTS

The majority of participants were aged 18–25 years (66%), multigravida (59%), and lived in joint families (54.0%). A large proportion identified as Hindu (87.5%). The Scheduled Tribe category represented the largest caste group (51.56%). Most women had a family size of 3–6 members (64%) and reported a monthly income of 228–500 INR (43.75%). The highest proportion of women had completed High School (47.50%), and most were housewives (97.19%). it is found that 84.4% of women availed at least one Antenatal check up (ANC) during their pregnancies, 15% had Nil check up and only 30% had desired three or more check ups.

The antenatal period exhibited the highest morbidity prevalence, with 64.3% of women experiencing at least one morbidity (Table 1). In contrast, we observed lower morbidity prevalence during the postnatal (60%) and intranatal (35%) periods. Few women had more than 1 morbidities during their different periods of pregnancy. The distribution of the number of morbidities per woman during the antenatal period was as follows: no morbidity (35.7%), one morbidity (34.7%), two morbidities (17.2%), three morbidities (9%), and four or more morbidities (3.4). Similarly 32% women reported one morbidity and only 3% reported two morbidities during intranatal period. 32% women reported one morbidity, 26% reported two morbidities and only 2% women reported 3 morbidities during postnatal period. [Table 2]

Table 1: Prevalence of morbidity in different period of Pregnancy (Antenatal, Intranatal, Postnatal)

Period of pregnancy	Morbidity		Total
	Present	Absent	
Antenatal(N=320)	206(64.3%)	114(35.7%)	320
Intranatal(N=100)	35(35%)	65(65%)	100
Postnatal(N=100)	60(60%)	40(40%)	100

Table 2: Number of Morbidities per women in different period of Pregnancy (ante-natal, intranatal, postnatal)

Number of morbidity suffered	Ante natal (N=320)	intranatal (N=100)	postnatal (N=100)
0	114(35.7%)	65(65)	40(40)
1	111(34.7)	32(32)	32(32)
2	55(17.2)	3(3)	26(26)
3	29(9)		2(2)
>=4	11(3.4)		

Anaemia was the most frequent antenatal morbidity (65.6%,), followed by vomiting (26.56%,), and lower abdominal pain (22.60%,). 18.12% women reported to have oedema, 12.19 % reported symptoms of urinary infection. Backache and fever more than 3 days reported by 12.19% each. Few women also reported dangerous morbidities such as pregnancy induced hypertension (PIH) (9.4%), bleeding per vagina (6.87%), Malaria (4.69). leg cramps, Jaundice and constipation was also reported by 2.81%, 1.56%, and 1.25% respectively. Intra natal period is the most critical period and most of the complication arises during this period. In the present study the prolonged labour was found in 12% cases, 10% reported to have excessive bleeding during delivery. 9% women reported retained placenta, 6 % had perineal tear and eclampsia in 1% women. The prevalence of postnatal morbidities are foul-smelling vaginal discharge (18%), Lower abdominal pain (12%), Brest problem (18%), fever more than 3 days (11%) and symptomatic urinary infection (7%).

Trimester-Specific Morbidity

We found a significant difference in the prevalence of anaemia and oedema between the second and third trimesters (Table 4). Anaemia was significantly more prevalent in the third trimester (77%) than in the second trimester (65%) ($\chi 2 = 4.17$, df = 1, $P<0.05$). Similarly, oedema prevalence was significantly higher in the third trimester (31.39%) compared to the second trimester (9.70%) ($\chi 2 = 16.57$, df = 1, $P < 0.001$).

Table 3: Incidence and Prevalence of morbidities in different periods of Pregnancy

Period of pregnancy and postnatal	Morbidity	Frequency of morbidity	Percentage (%)
Antenatal(N=320)	Anaemia	210	65.6%
	Vomiting	85	26.56
	Lower abdominal pain	72	22.60
	Oedema	58	18.12
	Symptoms of urinary tract infection (UTI)	40	12.50
	Backache	39	12.19

	Fever of more than three days	39	12.19
	Pregnancy-induced hypertension (PIH)	30	9.4
	Bleeding per vagina	22	6.87
	Malaria	15	4.69
	Leg cramps	9	2.81
	Jaundice	5	1.56
	Constipation	4	1.25
Intranatal(N=100)	Prolonged labour	12	12.0
	Excessive bleeding per vagina	10	10.0
	Retained placenta	9	9.0
	Perineal tear	6	6.0
	Eclampsia	1	1.0
Postnatal period (N=100)	Postpartum Haemorrhage (PPH)	18	18.0
	Foul-smelling Vaginal Discharge	14	14.0
	Lower Abdominal Pain	12	12.0
	Symptoms of Urinary Tract Infection (UTI)	7	7.0
	Breast Problems	18	18.0
	Fever More Than Three Days	11	11.0

Table 4: Relation of morbidity to the different stages in Ante natal period

Morbidity	**2nd Trimester** (n = 134)	**3rd Trimester** (n = 86)	**Total** (N = 220)	**Chi-square (χ^2), df**	**P-value**
Anaemia	87(65%)	67(77%)	154(70%)	$\chi^2 = 4.17$, df = 1	**P < 0.05**
PIH	3 (2.23%)	7 (8.13%)	10 (4.50%)	$\chi^2 = 2.95$, df = 1	P > 0.05
Oedema	13 (9.70%)	27 (31.39%)	40 (18.00%)	$\chi^2 = 16.57$, df = 1	**P < 0.001**

Socio-demographic Factors Associated with Morbidity

Age group, gravidity, caste, educational status, antenatal check-up (ANC) and occupation demonstrated significant associations with morbidity. Women aged <18 years exhibited a higher morbidity rate (78.9%) compared to women aged 26–31 (47.9%) ($\chi2 = 11.38$, df = 3, P = 0.010), suggesting an elevated risk of morbidity in the youngest age group. Primigravida women had significantly higher morbidity rate (68.7%) than multigravida women (61.4%) ($\chi2 = 4.52$, df = 1, P = 0.033). Morbidity rates also varied significantly across caste groups ($\chi2 = 10.32$, df = 3, P = 0.016) and educational levels ($\chi2 = 14.57$, df = 5, P = 0.012), with illiterate women showing a morbidity rate of 71.4% and women with HSLC passed showing 85.7% morbidity. House wife had a morbidity rate of 65.3% ($\chi2 = 6.19$, df = 2, P = 0.045). There is a strong association between the number of ANC availed. The incidence of morbidities were higher among women who had nil checks(80%) or one to two check up(72%). The incidence of morbidity was 42% in women who had 3 or more ANC. In contrast, family type, religion, family size, and monthly income did not show significant association with morbidity.

Place of Delivery and postnatal Morbidities

We observed significant association between the place of delivery and in both postpartum haemorrhage (PPH) ($\chi2 = 4.2$, df = 1, P = 0.040) and foul-smelling vaginal discharge ($\chi2 = 3.88$, df = 1, P = 0.049), with higher rates of both complications among women who delivered at home. We found no significant association between the place of delivery and lower abdominal pain, symptoms of urinary infection, breast problems, or fever lasting more than three days.

Table 5: Relationship Between Place of Delivery and Postnatal Morbidities

Type of Morbidity	**Hospital (n = 38)**	**Home (n = 62)**	**Total**	**Chi-square (χ^2), df**	**P-value**
Postpartum haemorrhage (PPH)	3 (7.89%)	15 (24.0%)	18	$\chi^2 = 4.2$, df = 1	**P < 0.05**
Foul-smelling Vaginal Discharge	2 (5.26%)	12 (19.35%)	14	$\chi^2 = 3.88$, df = 1	**P < 0.05**
Lower Abdominal Pain	2 (5.26%)	10 (16.0%)	12	Yates' $\chi^2 = 1.7$, df = 1	P > 0.05
Symptoms of urinary infection	2 (5.26%)	5 (8.0%)	7	Yates' $\chi^2 = 0.38$, df = 1	P > 0.05
Breast Problems	8 (21.0%)	10 (16.0%)	18	Yates' $\chi^2 = 0.01$, df = 1	P > 0.05
Fever > 3 Days	4 (10.5%)	7 (11.29%)	11	$\chi^2 = 0.04$, df = 1	P > 0.05

Birth Attendant and postnatal Morbidities

Postpartum haemorrhage was higher with untrained birth attendants (PPH) and was significantly associated among women attended by untrained persons ($\chi2 = 3.95$, df = 1, P = 0.047). We found no significant association between birth attendants and foul-smelling vaginal discharge, lower abdominal

pain, symptoms of UTI, breast problems, or fever lasting more than three days.

DISCUSSION

In our study conducted in 2002–2003 in Rani Block, Kamrup District (Assam), we found a high burden of maternal morbidities across all three phases of pregnancy. The antenatal period recorded the highest prevalence, with 64.3% of women experiencing at least one morbidity. This was followed by 60% in the postnatal period, and 35% during the intranatal period. Notably, 35.7% of women had no antenatal morbidity, while the remaining 64.3% had one or more morbidities, 34.7% had one, 17.2% had two, 9% had three, and 3.4% had four or more morbidities. These findings underscore the multi-morbidity nature of pregnancy-related health issues in rural populations.

Anaemia was the most common antenatal condition, affecting 65.62% of women. This is markedly higher than the 49.7% reported in NFHS-2 (1998–99),[14] indicating severe nutritional deficiencies in the study area. Our findings are consistent with regional reports from West Bengal and Uttar Pradesh during the same era, which recorded antenatal anaemia in 60–70% of women.[15,16]

However, recent data suggest some improvement. NFHS-5 (2019–21) reported an overall anaemia prevalence of 52.2% among pregnant women in India. Assam, where our study was located, still showed a high prevalence (65.9%).[17] A cohort study from Assam in 2016 also confirmed that moderate to severe anaemia remained highly prevalent in pregnant women and was associated with adverse outcomes.[18] Although national averages have improved slightly, anaemia remains endemic, especially in northeastern and rural India.

Other common antenatal issues in our study included vomiting (26.6%), lower abdominal pain (22.6%), oedema (18.1%), and symptoms of urinary infection (12.19%). Similar symptom patterns were reported in a 2004 community study in rural Maharashtra, which emphasized inadequate ANC and nutritional counselling as contributing factors.[19]

During the intranatal period, we recorded prolonged labour in 12%, excessive bleeding in 10%, and retained placenta in 9% of women. These complications are similar in magnitude to those reported in a hospital-based 10-year study in Pondicherry, where haemorrhage and obstructed labour were dominant causes of maternal morbidity and mortality.[20]

In the postnatal period, 60% of women experienced morbidities. Postpartum haemorrhage(18%) Foul-smelling vaginal discharge (18%), Breast problems (18%), and lower abdominal pain (12%) were most frequent. These findings are consistent with a rural study from Rajasthan(2012), where 4–7% of women experienced postnatal infections and breast issues.[21] Our findings suggest under-recognized postnatal needs before two decades, though recently focus has been shifting to home based postnatal care

A recent large-scale community study in India (2022) observed that although institutional deliveries increased, postnatal morbidities remained common, especially among women from Scheduled Tribes and rural areas.[22] This continuity indicates that while facility access has improved, quality of postnatal care still lags behind.

We found significant association between maternal morbidities and age, gravidity, education, caste, occupation, and ANC utilization. Women under 18 years and primigravida women showed significantly higher morbidity. These findings reflect trends identified in the Million Death Study (2001–03), where adolescent mothers and first pregnancies carried higher risks.[23] A more recent study (2019) from Madhya Pradesh reaffirmed that early age at first birth (<20 years) remains a key predictor of maternal complications.[24]

We also found that women with nil ANC had the highest morbidity rate (80%), compared to 72% in those with one or two visits, and only 42% among those with three or more ANC visits. This underlines the preventive role of ANC. WHO's updated 2016 ANC guidelines recommend a minimum of eight contacts,[25] indicating that even our "adequate" group (3+ visits) falls short of modern standards.

We found that home deliveries were significantly associated with postpartum haemorrhage (PPH) and infections, particularly when attended by untrained birth attendants. These findings support national data from NFHS-2, which reported poor maternal outcomes with home births,[14] and are reinforced by recent evidence from NFHS-5 showing continued disparities in maternal outcomes among home vs institutional deliveries, especially in marginalized populations.[17]

A 2021 national study showed that although institutional deliveries now account for over 88% in India, quality of intrapartum and immediate postnatal care is uneven, with Assam still lagging in skilled attendants and emergency obstetric care.[26]

Table 6: Relationship between Birth Attendants and postnatal Morbidities

Type of Morbidity	Trained Persons (n = 49)	Untrained Persons (n = 51)	Total	Chi-square (χ^2), df	P-value
Postpartum haemorrhage (PPH)	5 (10.2%)	13 (25.3%)	18	$\chi^2 = 3.95$, df = 1	**P < 0.05**
Foul-smelling Vaginal Discharge	4 (8.16%)	10 (19.2%)	14	$\chi^2 = 2.71$, df = 1	P > 0.05
Lower Abdominal Pain	5 (10.2%)	7 (13.46%)	12	Yates' $\chi^2 = 0.29$, df = 1	P > 0.05
Symptoms of UTI	2 (4.0%)	5 (9.8%)	7	$\chi^2 = 0.53$, df = 1	P > 0.05

Type of Morbidity	Trained Persons (n = 49)	Untrained Persons (n = 51)	Total	Chi-square (χ^2), df	P-value
Breast Problems	8 (16.3%)	10 (19.3%)	18	$\chi^2 = 0.18$, df = 1	P > 0.05
Fever > 3 Days	5 (10.2%)	6 (11.7%)	11	$\chi^2 = 0.06$, df = 1	P > 0.05

CONCLUSION

We documented a high burden of maternal morbidities in a rural Assam population in 2002–03, including frequent multi-morbidity, especially during the antenatal period. Although national trends over the past two decades show improvement in institutional delivery and ANC coverage, our comparison with recent data confirms that core issues such as anaemia, early pregnancy, and inadequate postnatal care persist, particularly in rural and tribal areas. Our findings emphasize the need for continuous improvement in both access and quality of maternal healthcare, with a specific focus on early ANC, birth preparedness, skilled delivery, and postnatal follow-up.

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