

**ORIGINAL ARTICLE****Health System Preparedness and Implementation of Home-Based Newborn Care (HBNC): A Study from Tribal District of India****Priti Solanky<sup>1\*</sup>, Hitesh Shah<sup>1</sup>, Krunal Varia<sup>2</sup>****OPEN ACCESS**

**Citation:** Priti Solanky, Hitesh Shah, Krunal Varia. Health System Preparedness and Implementation of Home-Based Newborn Care (HBNC): A Study from Tribal District of India. *Ethiop J Health Sci.* 2026;36(2):84. doi:<http://dx.doi.org/10.4314/ejhs.v36i2.4>  
**Received:** June 4, 2025

**Accepted:** January 29, 2026

**Published:** March 1, 2026

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**Funding:** State Health Systems Resource Centre, Gujarat

**Competing Interests:** The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

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**ABSTRACT**

**BACKGROUND:** Home-Based Newborn Care (HBNC) is a cost-effective strategy introduced by the Government of India to ensure postnatal care for mothers and neonates in rural and tribal regions. HBNC is implemented through field-level healthcare providers known as ASHA (Accredited Social Health Activist). The baseline situation of the health system and resources is necessary to ascertain effective HBNC implementation.

**Methods:** This cross-sectional study was carried out in a tribal district of India. For assessing health system preparedness for HBNC, district-level records, verification of HBNC kits, and baseline knowledge and skill assessment of ASHAs were conducted. For the field-level HBNC implementation component, process evaluation of HBNC among ASHAs was carried out in the selected villages.

**Results:** Human resources, capacity building, and logistics-related components in the district were adequate with regard to HBNC. Kit verification showed deficiencies in essential items, e.g., soap, digital wristwatch, and sling bag for weight measurement. Knowledge regarding the frequency of HBNC visits, initiation of breastfeeding, and complications in postnatal mothers was found satisfactory among ASHAs (95.6%). In the skill component, 47.5% of ASHAs could correctly count respiratory rate, while none could enlist the steps of correct positioning and attachment in breastfeeding. In the process evaluation of HBNC, major findings included the inability of ASHAs to identify appropriate actionable measures based on observations during HBNC visits.

**Conclusion:** This study highlights the importance of adequate resources, regular capacity building of healthcare providers, along with supportive supervision, for effective HBNC implementation in the community.

**KEYWORDS:** Home-Based Newborn Care, Tribal health, Maternal and Child Health

**INTRODUCTION**

Almost three-fourths of infant deaths occur during the neonatal period, i.e., the first twenty-eight days of life. The neonatal period is therefore considered the most crucial phase of a newborn's life. A total of 2.3 million neonatal deaths were reported worldwide in 2023 (1). In India, as per the Sample Registration System 2022, the neonatal mortality rate is 20 per thousand live births. In rural areas,

the neonatal mortality rate is 23 per thousand live births, while in urban areas it is 12 per thousand live births (2). This rural–urban disparity highlights the need for strengthening the healthcare system for maternal and child health (MCH) components in rural areas.

Major causes of neonatal deaths include prematurity and low birth weight, infections such as sepsis and pneumonia, and birth asphyxia (3). Proper attention from healthcare providers during this critical period is essential, particularly in cases of home delivery. The Government of India introduced an evidence-based, cost-effective strategy to address neonatal care through Home-Based Newborn Care (HBNC) in 2011 (4).

Accredited Social Health Activists (ASHAs), field-level healthcare providers in India, are responsible for HBNC implementation in villages. In HBNC, ASHAs conduct regular home visits (on the 1st, 3rd, 5th, 7th, 14th, 21st, 28th, and 42nd days for home deliveries; and the 3rd, 7th, 14th, 21st, 28th, and 42nd days for institutional deliveries) (4). During each visit, ASHAs are expected to perform activities such as weighing the child, measuring newborn temperature, ensuring warmth, promoting hygiene, providing skin, cord, and eye care, and supporting exclusive breastfeeding by teaching proper positioning and attachment. They are also expected to diagnose and counsel in case of breastfeeding problems (5). Health service provision through HBNC becomes even more vital in tribal regions where healthcare facilities are underdeveloped. This study was conducted in Dang district, a predominantly tribal district located in southern Gujarat, India. The district has hilly, forested terrain, with the majority of the population (95%) belonging to tribal indigenous communities (6). Private healthcare facilities are almost negligible, and services are mainly provided by the government health system. Health service delivery is particularly challenging due to geographical and socio-cultural factors, as reflected in MCH indicators—home deliveries (25.5%), home births conducted by skilled personnel (4.4%), and children born at home who received a health facility check-up within 24 hours (13.1%) (7). These indicators highlight the importance of HBNC in this region, where a higher proportion of births occur at home. However,

operationalizing HBNC effectively at the field level remains a challenge. Therefore, this study was conducted to assess the preparedness of the health system for operationalizing HBNC and to evaluate its field-level implementation.

## MATERIALS AND METHODS

This Cross-sectional study was conducted in Dang district of southern Gujarat, India. There are three blocks in Dang district—Ahwa, Waghai, and Subir—with a total of 10 PHCs (Primary Health Centers). The district population is 2,28,291 (6). Study period was April 2021 to March 2022.

For assessing health system preparedness components, we adopted various methods such as secondary data analysis of district data, including review and verification of records, HBNC kit assessment, knowledge and skill assessment of ASHAs for HBNC with the help of questionnaire and video-based exercises etc. Parameters assessed were human resource availability, turnover, and capacity building in terms of HBNC (round-wise training of Modules 6 and 7). These modules, introduced under the National Health Mission, focus on maternal and child health service delivery and are translated into the local language for use as field reference materials (8, 9).

We also checked the availability and functional status of HBNC kit along with knowledge and skills of ASHAs essential for HBNC implementation. Study tools adopted for assessment were checklist for secondary data review, checklist for physical verification of HBNC kits and the questionnaire for knowledge and skill assessment of ASHAs.

The secondary data was collected from the Dang district health department. For HBNC kit, knowledge, and skill assessment, the secondary data on MCH indicators (e.g., antenatal visits, institutional deliveries, postnatal visits, low birth weight, immunization) were analyzed for all the PHCs in the district. The PHCs were scored and categorized as “well-performing” or “poor-performing.” One PHC from each category was selected. These two included PHCs (20% of total) in our study represent approximately one-fifth of the district population. Fifty percent of ASHAs from each PHC were randomly selected for assessment.

For assessing field-level implementation of HBNC, we carried out community-based assessment of HBNC process in selected villages under the included PHCs. Basic skills related parameters were assessed such as weight measurement of the neonate, temperature measurement of mother and baby, breastfeeding assessment, physical examination, and communication skills. Study tool adopted for this assessment was a checklist designed by the study authors to evaluate HBNC visits. Two villages from each PHC were selected from which recent births (within one month prior to the data collection process) were included. Each ASHA assessed one neonate and the entire process of this HBNC visit was observed by the investigators.

All study tools were pre-designed, pre-tested, and validated before implementation.

**Data collection, entry, and analysis:** Data entry and analysis were conducted using Microsoft Excel (Office 365, v16.0). Quantitative data are presented as frequencies and proportions. Statistical tests (chi-square and Fisher's exact test) were applied, with  $p < 0.05$  considered statistically significant.

**Ethical consideration:** Approval was obtained from the Institutional Human Ethics Committee

(IHEC) (No. MCV/IHEC/03/21, dated 08/01/2021). Written informed consent was obtained from all participants, and confidentiality was maintained.

## RESULTS

**Health system preparedness component:** Secondary data for 2020–21 was reviewed (Table 1) regarding various input indicators. Almost all the sanctioned posts of ASHAs and ASHA facilitators were filled. As per guidelines, all the ASHAs after selection must undergo induction training for their capacity building. Induction training is for 23 days, consisting of multiple training spanned over the period of one year. In the study area, all the selected ASHAs had completed induction training (10). All the ASHAs were provided kits to carry out HBNC visits and were provided with timely incentives for conducted HBNC visits.

**HBNC kit verification:** As per methodology, 50% ASHAs were selected from two PHCs for their HBNC kit verification. A total of 14 ASHAs were selected from well performing PHC and 9 ASHAs were selected from poor performing PHC.

Table 1: Details of Input indicators regarding HBNC as per district data.

Components	Input indicators	Frequency (%)	
Human resource	ASHA	Sanctioned posts	334
		Filled Posts	331 (99.1%)
	ASHA facilitators	Population per ASHA	921
		Sanctioned posts	32
		Filled Posts	31 (96.9%)
Capacity building	Induction training of ASHAs	331 (100%)	
	Refresher training of ASHAs	325 (98.2%)	
	No. of ASHAs who were provided with an HBNC kit by the district after training	331 (100%)	
Logistics	Time lag between HBNC training and provision of kit	No	
Finance	Timely disbursement of incentives to ASHAs for HBNC	Yes	

Table 2 describes the key points observed during HBNC kit verification and its comparison between both PHCs. All the study participants were given HBNC kits after training. Sling bag to be used along the weighing scale was not available with study participants at the time of

data collection. The sling bag given in HBNC kit after the training from district got torn after using it for many years. So currently they are using cloth such as dupatta available at mother's home to weigh the baby. This practice has chances of erroneous weight estimation of the neonates by

the ASHAs during field visit. None of the kits contained simple essential items such as soap, digital watch or baby blanket. All these items are

crucial for the safe and effective implementation of HBNC. Both the PHCs showed almost similar findings regarding HBNC kit functionality.

Table 2: Details of HBNC kit verification.

Name of the item in HBNC kit	Function of the item	Functional availability		Test statistics
		Well performing PHC (N= 14)	Poor performing PHC (N= 9)	
Soap, soap case	Hand washing	0 (0)	0 (0)	-
Sling bag	Weight measurement	0 (0)	2 (22.2%)	Fisher exact test statistic value: 0.14
Weighing scale		14 (100%)	9 (100%)	Fisher exact test statistic value: 1
Thermometer	Temperature measurement	14 (100%)	7 (77.78%)	Fisher exact test statistic value: 0.14
Digital watch	Time estimation for respiratory rate counting and temperature measurement	0 (0)	0 (0)	-
Mucus extractor	Removing mucus from baby's oropharynx	0 (0)	0 (0)	-
Baby blanket	For demonstration purpose of how to keep the baby warm	0 (0)	0 (0)	-
HBNC forms	Documenting the observations and action based on findings	14 (100%)	9 (100%)	Fisher exact test statistic value: 1

**Knowledge and skill assessment:** Table 3 and 4 show the details of knowledge and skill components assessed among the ASHAs at both PHCs. Knowledge regarding frequency and exact days of HBNC visits post-delivery, breast-feeding initiation and postnatal complications in mother seemed satisfactory among majority of study participants. However, gaps were noted in crucial components like frequency of breast feeding, exact cut-off for fast breathing, fever and conditions requiring referral.

**Field-level implementation:** Total 13 neonates were assessed – 7 from villages under well performing PHC and 6 from villages under poor

performing PHC. The selected ASHAs assessed neonates and filled in the HBNC form. None of them washed their hands with soap and water before commencing the HBNC visit. All ASHAs inquired about the diet of mothers and breastfeeding, but none of them carried out breastfeeding assessment- i.e. correct positioning and attachment of baby. ASHAs asked mothers about frequency of changing menstrual pads per day which was a good point observed. But after asking this question, the majority had no idea about what action needs to be taken if the number of pads exceeds the given cut-off as per guideline.

Table 3: Details of knowledge of HBNC among study participants.

Parameter	Correct responses			Test statistics
	At performing PHC (N= 14)	well performing PHC (N=9)	poor performing PHC (N= 23)	
HBNC visits (exact number of visits and days of visit)	13 (92.8%)	9 (100%)	22 (95.6%)	Fisher exact test statistic value: 1
Initiation of breast feeding after delivery	13 (92.8%)	9 (100%)	22 (95.6%)	Fisher exact test statistic value: 1
Breast feeding frequency	7 (50%)	6 (66.7%)	13 (56.5%)	chi-square statistic: 0.13
Low birth weight	12 (85.7%)	6 (66.7%)	18 (78.3%)	p-value: 0.72
Complications in mother post delivery	13 (92.8%)	9 (100%)	22 (95.6%)	chi-square statistic: 0.32
Complications in infants which require urgent referral	8 (57.1%)	6 (66.7%)	14 (60.9%)	p-value: 0.57
Temperature measurement (cut-off for fever)	10 (71.4%)	3 (33.3%)	13 (56.5%)	Fisher exact test statistic value: 1
Respiratory rate (cut-off for fast breathing in infants)	7 (50%)	3 (33.3%)	10 (43.5%)	chi-square statistic: 0.0004
				p value: 0.98
				chi-square statistic: 1.87
				p value: 0.17
				chi-square statistic: 0.13
				p value: 0.72

Table 4: Details of skill assessment of HBNC among study participants.

Skill detail	Correct responses		Total (N= 23)	Test statistics
	At performing PHC (N= 14)	well performing PHC (N=9)		
Respiratory rate counting	8 (57.1%)	3 (33.3%)	11 (47.8%)	chi-square statistics: 0.47
Identifying chest indrawing	14 (100%)	9 (100%)	23 (100%)	p value: 0.49
Identifying correct positioning of baby in breast feeding	3 (21.4%)	2 (22.2%)	5 (21.7%)	Fisher exact test statistic value: 1
Enumerating all correct steps of positioning of baby in breast feeding	0 (0)	0 (0)	0 (0)	chi-square statistic: 0.22
Identifying correct attachment in breast feeding	2 (14.3%)	1 (11.1%)	3 (13.1%)	p value: 0.64
Enumerating all correct steps of attachment in breast feeding	0 (0)	0 (0)	0 (0)	-
				chi-square statistic: 0.17
				p value: 0.68
				-

## DISCUSSIONS

The input indicators assessed regarding HBNC were satisfactory and as per national guidelines such as ASHAs per population norms, timely training and incentive disbursement etc. The general norm for population is there should be one ASHA per one thousand population. In this district it is one ASHA per 921 people (10). Capacity building was completed for all the ASHAs. Cross-sectional study conducted by Srivastava D K et al showed the same observation of 100% completion rate of induction training among ASHAs (11).

After the training, each ASHA should be provided with resource material which would be helpful for the field level health service delivery. In this district, all the trained ASHAs were given the HBNC kit immediately after training without any delay, showing the commitment of the district health department for ensuring seamless service provision to the community (4). This observation contrasts with the findings of a study conducted by Bhardwaj et al in which 57.14% of the ASHAs responded of having received kit post training immediately (12).

Knowledge assessment results of ASHAs were similar to the findings by Shet et al in a mixed method study conducted in Karnataka where ASHAs were found to have satisfactory antenatal and postnatal care related components. 93% of the ASHAs were aware of the importance of colostrum and the majority were aware of exclusive breastfeeding and its duration (13). Study by Saxena S et al in Uttar Pradesh showed similar higher knowledge regarding breast feeding initiation within one hour (95.3%) among ASHAs while the study by Baghel A et al in Chhattisgarh showed that only 52.2% of ASHAs had correct knowledge regarding HBNC visits and 41.7% ASHAs were aware about correct messages to be conveyed to the mother regarding childcare (14, 15). Study by Kaur M et al showed that 59.72% ASHAs knew the correct number of postnatal visits to be conducted, 23.6% ASHAs knew about early initiation of breastfeeding and only 2.77% of ASHAs knew about the low birth weight correctly. Regarding cut-off for fever, the majority of the ASHAs (51.38%) were aware

(16). Similar higher knowledge about postnatal visits (90.8%) and knowledge regarding cord care (97.6%) was observed among the ASHAs in a study by Sugandha B K in Mysuru, while the knowledge about low birth weight was reported as less with only 30.2% of ASHAs giving correct responses (17).

While conducting HBNC visits, ASHA must assess breastfeeding components and teach mother about proper positioning of baby for effective breastfeeding. Lack of this essential skill, among majority of participants along with less than satisfactory knowledge about frequency of breast feeding, shows that such basic skill and knowledge need reiteration for its correct practice during HBNC visits. Less than half of the study participants could correctly count the respiratory rate, implying lack of practice at field level after training. Overall knowledge related findings corroborate with the observation in a systematic review which showed ASHA's maternal health knowledge as an average of 62% and neonatal and child health related knowledge as 69% (18). Study conducted by Ghosh A et al found that ASHAs lacked correct knowledge regarding complications and referral in high-risk pregnancy, suggesting the need for proper training (19).

The knowledge and skill of ASHAs were not translating into practice and similar findings were observed by Kori S et al in a study conducted in North India. ASHAs were assessed for knowledge regarding antenatal and postnatal care components and the need for improving knowledge of the ASHAs through on job training was suggested (20).

In the skill component, action based on observation part was missing, similar to the findings of a study by Bhardwaj et al among the ASHAs of rural northern India. (21). Observation in a study By Sindhu J V in South India differed with ASHA's average knowledge score as 86.1%, average practice at field level reported as 94.9%, and association between knowledge of the ASHA and practice at field level by applying the knowledge (22). Study from West Bengal by Pal J et al showed similar observation of only 16.32% ASHAs correctly responding about proper attachment in breastfeeding, while field level practice was observed in good proportion of

ASHAs in this study with 95% of ASHAs counselling mothers about breastfeeding and 98.9% of the ASHAs counselling postnatal mothers about hygiene and nutrition (23). Poor skill performance was observed in a study by Phatak A et al in Maharashtra, where satisfactory temperature measurement skill was shown by only 12.2% of the ASHAs, proper hand washing was done by 40.8% of the ASHAs, and proper weight measurement was performed by only 4.1% of the ASHAs. The rate of identification and referral of the sick newborns by the ASHAs was also found to be as low as 1.5% (24). Practicing skill is of the utmost importance but the message of “taking action based on observations” is forgotten after the training. Emphasis on this aspect during each supportive supervision visit is needed for improving HBNC visit quality.

Postnatal care covers the most crucial period of maternal and neonatal life and can significantly reduce preventable maternal and newborn deaths; but it remains neglected component in developing countries, specifically in rural areas. A community-based study by Ibrahim M et al showed that only 45.1% of mothers had attended PNC (postnatal care) visits even though 35.5% had suffered postpartum complications (25). Regions with higher neonatal mortality requires proper community-based health interventions during postnatal period for early identification and referral as highlighted by a study conducted in Ethiopia in which care seeking by parents or caregivers for neonates and young infants was delayed as they could not identify serious symptoms such as poor breastfeeding (49.8%), abnormal body movements (5%), jaundice (2%) etc. (26) Key determining factors for actively seeking postnatal care by mothers, as shown by a systematic review and meta-analysis of research studies conducted in a developing country, are antenatal care provision by skilled healthcare providers and familiarity of mothers with the health system and its care providers. This again highlights importance and active involvement of field level healthcare providers in ensuring antenatal and postnatal care (27).

Considering the adverse MCH related indicators and geographically hard-to-reach hilly forested terrain for health services provision, HBNC implementation becomes even more important in this indigenous community. By assessing the district and field level situation, this study has provided a comprehensive overview of HBNC regarding its input and process level indicators that could affect the outcome in terms of MCH indicators. Methods adopted in this study could be useful to assess HBNC in other rural and tribal regions. Larger scale studies could be planned in future with more sample size to validate the findings and explore further with longitudinal designs. Though sample size is smaller considering the operational constraints on the part of the authors, this is the first study ever attempted to assess HBNC implementation scenario in this region in such a comprehensive manner. Despite its limitations, this study serves as a baseline for future studies with larger samples size and gives sensitization snapshot for the district administration for the improvement needed in HBNC program at field level.

In conclusion, the findings of this study highlight that effective HBNC implementation requires adequate resources and strengthened capacity (knowledge and skills) of healthcare providers. To improve HBNC in this tribal region, the following recommendations are proposed:

**Capacity building:** Regular, small-scale, skill-based training using simulations and local-language materials, emphasizing decision-making and action.

**Logistics:** Establish mechanisms for timely replacement and auditing of HBNC kits.

**Supportive supervision:** Conduct joint supervision visits with on-site training and regular monitoring at the PHC level.

#### ACKNOWLEDGMENTS

The authors sincerely thank the Dang district health department for their support, all field-level healthcare providers for their participation, and the State Health Systems Resource Centre, Gujarat, for financial support.

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