

Comparison of knowledge and skills of Home-Based Newborn Care (HBNC) among Accredited Social Health Activists (ASHA) and health workers (SAKHI) of Ambuja Cement Foundation

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ABSTRACT

Context: Ambuja Cement Foundation (ACF) started replicating the famous “Gadchiroli” model to reduce neonatal mortality in Chandrapur in 2005. ACF conducted the Home-Based Newborn Care (HBNC) model through trained female health workers, viz., “SAKHIs.” In 2008, Government of India introduced community health worker, viz., Accredited Social Health Activist (ASHA). ACF withdrew its services steadily and few SAKHIs were hired as ASHAs. **Aims:** We assessed and compared the knowledge level and skills of trained ASHA workers with SAKHIs in providing HBNC. **Methods and Material:** A cross-sectional study was conducted in three blocks of Chandrapur district of Maharashtra, India. A structured questionnaire consisting of 34 questions was used for knowledge assessment and checklists assessed hand washing, weight recording, temperature recording, kangaroo mother care (KMC) position, suction and bag and mask ventilation (BMV) skills on manikins. **Results:** 135 healthcare workers participated. The mean (SD) score of current SAKHIs (23.89 (1.9)) was significantly higher than former SAKHIs (currently ASHAs) (17.97 (2.92)), former SAKHIs (currently not engaged in HBNC) (16.73 (2.95)) and ASHAs not worked as SAKHIs in the past (16.19 (3.19)) [all $P < 0.001$]. Similar trend was seen in all skill sets. The skills of ASHAs not worked as SAKHIs previously were abysmal, with no ASHA being able to perform BMV and KMC skills, and only 4 (7.5%) who could perform suctioning. A typical trend was observed with current SAKHIs faring best followed by former SAKHIs (currently ASHAs), former SAKHIs (currently not in HBNC), and ASHAs not worked as SAKHIs faring worst. **Conclusion:** The skills and knowledge of ASHA workers are far deficient compared to SAKHIs despite similar training components, potentially hampering neonatal mortality reduction. Quality of training and supportive supervision mechanism of ASHAs should be explored.

Keywords: ASHA, home-based newborn care, knowledge, skills

Introduction

Despite witnessing major improvements in maternal and childcare especially in the last decade, India missed the Millennium Development Goals (MDGs) targets 4 and 5. With about 0.76 million neonatal deaths per year, India has maximum

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neonatal deaths in the world. Unfortunately, the reduction in neonatal mortality rate is slower as compared to Infant Mortality Rate (IMR) and under 5 Mortality Rate, resulting in increased proportion of neonatal mortality in overall childhood mortality.^[1] The latest figures reveal that neonatal mortality contributes to 70% of infant mortality and 57% of under-five mortality.^[2] Neonates and under 5 children die of preventable diseases like sepsis, asphyxia, prematurity and low birth weight, pneumonia, diarrhea, etc., with poor nutritional status contributing to the vicious cycle.^[3] The present scenario suggests that India should move forward and try to achieve Sustainable Development Goals of Health 2035 by continuing to replicate proven interventions coupled with improving delivery mechanisms and coverage.

A significant development in the last decade was the replication of the home-based newborn care (HBNC) model that was developed by Dr. Abhay Bang. This model provided the theoretical framework for reduction in neonatal mortality through HBNC.^[4] This model has been successfully replicated within and outside India with some relevant contextual changes.^[5] The learnings from the model have been incorporated in the National Rural Health Mission (NRHM), a systemic health reform launched by the Government of India in 2005. A key strategy under NRHM has been the development of a workforce of community health worker (CHW), viz., Accredited Social Health Activist (ASHA) with a goal of increasing community participation and access to the healthcare system.^[6] To tackle high neonatal mortality, HBNC guidelines were released in 2011 and ASHA workers were mobilized for providing maternal and immediate newborn care. The guidelines were revised in 2014 and expect ASHAs to make timely institutional referral during pregnancy and home visits to promote and provide essential newborn care, identify illness, and refer infants if needed.^[7] For the training of ASHA workers, new modules (6 and 7) focusing on development of specific competencies in maternal and newborn care have been introduced. The training plan consists of a total of 20--24 days, in four rounds of 5 or 6 days each.^[8]

Ambuja Cement Foundation (ACF) is the Corporate Social Responsibility wing of Ambuja Cements Ltd. that works with the rural communities surrounding Ambuja's manufacturing sites.

It is a non-profit organization listed as a credible NGO in India by Indian Institute of Corporate Affairs. Participatory needs assessment study in the surrounding villages of Ambuja's unit at Gadchandur, Chandrapur, Maharashtra, revealed that very high infant and maternal mortality in villages of three blocks, namely, Rajura, Korpana, and Jiwati was the main concern of the community. To address the issue, ACF initiated HBNC program in 2005 by training women as community health workers (CHW), who were called SAKHIs (literally meaning "Female Friend"), in three blocks of select villages of Chandrapur district in Maharashtra. Initiated in only 12 villages in 2005, the program was scaled up to include 160 villages by 2009, and subsequently it was scaled down as NRHM was rolled out and ASHAs were recruited in many villages. The program was scaled down to

avoid duplication of work by SAKHI and ASHA in the same village, and also because some SAKHIs were absorbed as ASHAs through NRHM. Presently, SAKHIs continue to provide HBNC in 13 villages that are remotely located with lesser access to health care in Jiwati Block.

After focusing on service for almost a decade, ACF decided to evaluate the impact of the HBNC program. The main intention was to capture learning's from the experience to facilitate development of a replicable model in the region. ACF invited Central Research Services (CRS) of the Charutar Arogya Mandal, Karamsad, Gujarat, an independent research organization affiliated with an academic institution for evaluation of the HBNC program. CRS team made a field visit and interacted with ACF supervisors, SAKHIs and ASHAs. The verbal and non-verbal communication revealed that SAKHIs are more confident, vocal, and empowered compared to ASHAs.

The concurrent development of ACF's HBNC program and NRHM's deployment of ASHAs for providing HBNC offers an opportunity to understand, from two different program contexts, the extent to which CHWs acquire the knowledge and skills required for effectively providing HBNC. It also provides a unique opportunity to identify pros and cons of both the systems—from training to delivery that may guide developing a new system which is more effective than both the systems. One of the research options included a cross-sectional study which was conducted to assess and compare the knowledge and skills of SAKHIs and ASHAs in delivering HBNC.

Methods

Study settings: A cross-sectional study was conducted in Korpana, Rajura, and Jiwati blocks of Chandrapur district of Maharashtra, India during November, 2015 after acquiring permission from state health care authorities.

Sample size: The main comparison of knowledge and skills was between female health workers trained by ACF (SAKHIs) and Government health system (ASHAs). In absence of any baseline information on knowledge level, a sample size of 44 per group was required to attain a power of 80% at 5% alpha considering a moderate effect size of 0.60. Information gathered (not included in the study) through field observations and interactions with SAKHIs, ASHAs, and ACF implementation team revealed that SAKHIs perceive themselves far better than ASHAs even in basic skills like hand washing, weight measurement, and temperature measurement. Considering SAKHIs perception regressively, we hypothesized that 80% SAKHIs and 50% ASHAs have adequate basic skills mentioned above. With these proportions, a sample size of 39 per group was required to attain a power of 80% at 5% alpha level. Considering a response rate of 70--80%, the sample size was increased accordingly. To further understand the effect of transition of SAKHIs, they were divided into three groups, viz., current SAKHIs, former SAKHIs (currently ASHAs), and former SAKHIs (currently not engaged in HBNC). In general,

50–60 participants were invited in all the groups depending on availability.

Sampling: All the villages of Korpana, Rajura, and Jiwati blocks were mapped to identify the four categories of respondents. SAKHIs who were converted to ASHAs and SAKHIs who are not currently engaged in HBNC were selected randomly. All the 13 SAKHIs currently working on HBNC program run by ACF in Jiwati block were included. ASHAs were selected randomly from villages that were not proximate to villages where ACF had implemented or is currently implementing the HBNC program to minimize contamination. STATA (14.2) was used for randomization.

Assessment: A structured questionnaire to assess knowledge levels was prepared by CRS team based on the training modules 6 and 7. It consisted of 30 multiple-choice questions with one correct answer and 4 direct objective questions. It was translated into vernacular (Marathi) language and back translated to ascertain quality of translation. It was pre-tested on six SAKHIs who were not included in the study.

The SAKHIs and ASHAs were evaluated for skills of hand washing, weight recording, temperature recording, kangaroo mother care (KMC) position, and bag and mask ventilation (BMV). The checklists used for hand washing, measuring temperature, and weighing the baby were as per Annexure 7, 8, and 9 of training module 6, respectively. The checklists for BMV and KMC were prepared according to the Navjat Shishu Suraksha Karayakam (NSSK) manual.^[9] All the five checklists were circulated among 10 experienced pediatricians from Anand and critical steps were identified for each skill. The assessment of skills was done using a manikin and the assessor posed as a family member during assessment of KMC position.

Each participant received one point for correctly performing a step and zero points for not performing/incorrectly performing a step. Performance in a particular skill was considered satisfactory if a participant correctly performed at least 80% of the enlisted steps without missing any critical step of the skill.

Self-reported field performances of these health workers (SAKHIs as well as ASHAs) over the past 1 year in maternal and neonatal health, as well as sociodemographic variables such as age, experience, education, etc., were collected.

All the participants were apprised regarding the study in local language (Marathi) and included in the study only after obtaining a written informed consent. All the participants who completed the assessment were paid INR 250/- (~US\$4) as a compensation for a lost workday along with the actual travel cost.

English version of all the study tools is provided in *Annexure 1*.

People from the local community with minimum 10 + 2 years of education were invited as independent assessors. Out of

15 applicants, 12 were selected based on performance in an interview. CRS team conducted a training program for the 12 independent assessors during 6–8 October, 2015. The training included basic knowledge about post-natal care through lectures followed by a demonstration of skills to be assessed. Hands-on training during the assessment was provided by six SAKHIs not included in the study. The assessors were evaluated for their evaluation skills by the SAKHIs as well as the Supervisory Staff of ACF.

Bias: The ACF team was not involved in the design of assessment tools, sampling, and the assessment procedure. The data was collected by independent assessors who were associated with neither ACF, nor with CRS. The CRS team received the data with codes for SAKHI/ASHA and the codes were revealed only after all the data analysis was complete.

Statistical Analysis: Descriptive statistics [Mean (SD), Frequency (%)] was used to depict the knowledge and skills, sociodemographic variables, and self-reported field performance of the participants. Analysis of variance (ANOVA) with post-hoc comparisons was used to compare the knowledge level across groups. Chi-square test was used to compare the skills across groups. The data was analyzed using STATA SE (14.2).

The joint ethics committee of Narotam Sekhsaria Foundation approved the study.

Results

All 13 SAKHIs of Jiwati block currently working on HBNC project and all 41 SAKHIs who were absorbed as ASHA were invited to participate in the study. Randomly selected 60 SAKHIs not performing HBNC work currently and 60 ASHAs were also invited. A total of 12 of 13 current SAKHIs, 34 of 41 former SAKHIs (converted to ASHA), 52 of 60 former SAKHIs (not involved in HBNC currently), and 53 of 60 ASHAs (trained by Government health system only) responded.

During the data cleaning process, it was observed that four ASHAs who participated in the study had not been trained in module 6 and 7 of the NRHM. Further one current SAKHI was anxious during the skill assessment by a stranger and despite emotional support offered by ACF supervisor, she was unable to remain calm and comfortable. While distributing the compensation, ACF supervisors identified two current SAKHIs who should not have been invited. One had tuberculosis and had not attended any refresher course meeting of ACF in the last 6 months. The other SAKHI had been unemployed for the last 3 years and had rejoined just 1 month ago. Therefore, it was decided not to include these seven records in the final analysis for above-mentioned reasons. Finally, nine current SAKHIs, 34 former SAKHIs (converted to ASHA), 52 former SAKHIs (not involved in HBNC currently), and 49 ASHAs were included in the analysis.

The mean (SD) age of the participants was 34 (6.4), whereas the mean (SD) experience was 6.3 (2) years. Most of the participants [134 (95%)] were married. The age, experience, and marital status were very similar across groups [Table 1].

The mean (SD) total score on basic knowledge of maternal and childcare of current SAKHIs [23.89 (1.9)] was significantly higher than those of former SAKHIs (currently ASHAs) [18 (2.9)], former SAKHIs (currently not engaged in HBNC)[16.23 (3.1)], and ASHAs (trained by Government health system only) [16.24 (3.2)] [all $P < 0.001$] [Table 2] [Figure 1].

The mean (SD) scores on objective structured clinical examination (OSCE) as well as the % having satisfactory skill levels of current SAKHIs were significantly higher than others in all the skill sets evaluated. A typical trend was observed in which current SAKHIs fared best followed by former SAKHIs (currently ASHAs) followed by former SAKHIs (currently not engaged in HBNC), with ASHAs (trained by Government health system only) faring the worst. The skills of ASHAs (trained by Government health system) were abysmal

with not a single ASHA being able to perform bag and mask and KMC skills satisfactorily, and only 2 (4.1%) who could suction properly. ASHAs were also deficient in basic skills like weight measurement and temperature measurement [Table 3].

A large variability was observed in the self-reported performance of the female health workers (ASHAs as well as SAKHIs). Albeit the pregnant women identified were similar, the reporting by health workers of home deliveries, sick newborns, and newborns weighing less than 2 kg was almost non-existent in Government health system [Table 4].

Discussion

The CHWs trained by ACF, viz., SAKHIs were found to have better knowledge and skills in HBNC as compared to ASHAs who were trained by Government health system. However, SAKHIs did not possess expected knowledge and skills, which further deteriorated when they entered into government health system or stopped practicing HBNC. Albeit self-reported, huge variability was noted in the field performance of SAKHIs and ASHAs, while ASHAs appeared to under report the problems.

In developing countries, adequate maternal and perinatal care involves an integrated approach, which includes female education, family education, women empowerment and modulating and improving decision-making capabilities of the mother and the family.^[10] Bang *et al.*^[4] demonstrated the impact of CHWs in improving the maternal and infant health care indices. CHWs can additionally facilitate access to health care by enhancing cultural linkages between local community and health care system, and by reducing the cost of health care.^[11] Taking cues from the success of Gadchiroli model,^[4] Government of India included maternal and child care in NRHM through CHWs, viz., ASHA. A recent study from Rajasthan revealed that ASHA's motivation and performance are affected by variety of factors including various personal (e.g., education, health, family background), professional (e.g., training, job security, incentives, recruitment, relationship with co-workers), organizational (e.g., infrastructure, supervision), and external work environment (difficult field situations) factors.^[12]

Two previous studies, although limited by small size and a less detailed knowledge check and skill assessment, have shown

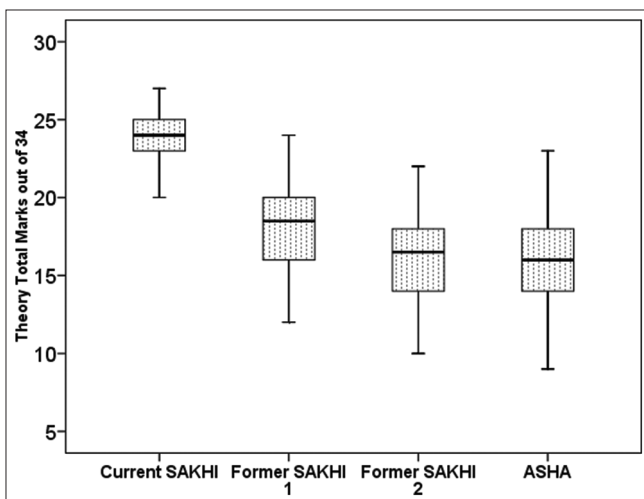


Figure 1: Box plot depicting performance of SAKHIs and ASHAs. Current SAKHI: SAKHI Still working with ACF. Former SAKHI 1: SAKHI previously worked with ACF but now Absorbed as ASHA in Government Health System. Former SAKHI 2: SAKHI previously worked with ACF but not involved in HBNC currently. ASHA: Accredited Social Health Activist working in and trained by Government Health System

Table 1: Profile of study participants

	Current SAKHIs (n=9)	Former SAKHIS (currently ASHAs) (n=34)	Former SAKHIS (currently not engaged in HBNC) (n=51)	ASHAs (trained by Government health system only) (n=49)	Overall	P
Current Age	33.3 (8.7)	34.5 (6.1)	34.7 (7.0)	33.1 (5.4)	34 (6.4)	0.61
Age When Start Work	27.1 (8.8)	27.6 (5.4)	28.3 (6.9)	27.2 (5.3)	27.7 (6.2)	0.82
Experience (in yrs.)	6.2 (0.7)	6.8 (2.9)	6.4 (1.8)	5.9 (1.8)	6.3 (2.0)	0.23
Marital Status						
Married	9 (100%)	29 (90.6%)	51 (98.1%)	45 (93.8%)	134 (95%)	0.19
Divorced	0	2 (6.3%)	0	0	2 (1.4%)	
Widow	0	1 (3.1%)	1 (1.9%)	3 (6.3%)	5 (3.5%)	

Table 2: Basic Knowledge of maternal and child care

	Current SAKHIs (n=9)	Former SAKHIS (currently ASHAs) (n=34)	Former SAKHIs (currently not engaged in HBNC) (n=52)	ASHAs (trained by Government health system only) (n=49)
When should the pregnant women get registered in antenatal clinic	0	4 (11.8%)	11 (21.2%)	4 (8.2%)
How many antenatal check-ups are minimum necessary after initial registration	8 (88.9%)	7 (20.6%)	30 (57.7%)	19 (38.8%)
Birthweight of new born baby should be measured by	9 (100%)	32 (94.1%)	45 (86.5%)	43 (87.8%)
When to start breast-feeding	8 (88.9%)	34 (100%)	51 (98.1%)	49 (100%)
How long exclusive breast-feeding is necessary	9 (100%)	34 (100%)	44 (84.6%)	46 (93.9%)
When to start complementary feeding	9 (100%)	34 (100%)	49 (94.2%)	46 (93.9%)
Meconium should be passed within hours	9 (100%)	33 (97.1%)	50 (96.2%)	48 (98%)
Urine should be passed within hours	0	0	1 (1.9%)	1 (2%)
Following are the danger signs in sick neonates for referral except	9 (100%)	12 (35.3%)	22 (42.3%)	16 (32.7%)
Following are steps to be followed during referral of sick neonate to the PHC except	9 (100%)	15 (44.1%)	29 (55.8%)	14 (28.6%)
Vegetables, fruits, ghee, milk and jiggery will harm pregnant women	9 (100%)	31 (91.2%)	47 (90.4%)	43 (87.8%)
Birthweight below which risk of getting sick is considered very high	0	7 (20.6%)	3 (5.8%)	4 (8.2%)
Abnormal baby is born in a facility, how long should the mother be advised to stay in the hospital, if there are no complications to either of them	0	7 (20.6%)	9 (17.3%)	16 (32.7%)
For abnormal weight baby born at home, minimum visits in the first month should be	1 (11.1%)	12 (35.3%)	18 (34.6%)	29 (59.2%)
To declare a baby as still-birth when should a baby be assessed	8 (88.9%)	21 (61.8%)	26 (50%)	25 (51%)
After birth, the soft white substance with which the baby is covered, should be immediately removed	9 (100%)	24 (70.6%)	14 (26.9%)	16 (32.7%)
When should the examination of the baby done	9 (100%)	34 (100%)	50 (96.2%)	48 (98%)
Range of birthweight coming in yellow zone	5 (55.6%)	9 (26.5%)	17 (32.7%)	10 (20.4%)
Which zone babies can be managed at home	8 (88.9%)	7 (20.6%)	16 (30.8%)	15 (30.6%)
If there is pus discharge from the eyes, how many days antibiotic ointment is to be applied	9 (100%)	11 (32.4%)	17 (32.7%)	10 (20.4%)
How frequently mother should breastfed her child in 24 h	1 (11.1%)	13 (38.2%)	14 (26.9%)	17 (34.7%)
Minimum adequate weight gain per week after first week of life in normal new born	9 (100%)	28 (82.4%)	37 (71.2%)	31 (63.3%)
Which of the following conditions can affect the breastmilk supply	7 (77.8%)	14 (41.2%)	11 (21.2%)	16 (32.7%)
Above what temperature baby is considered to have fever	9 (100%)	21 (61.8%)	15 (28.8%)	15 (30.6%)
Below what temperature baby is considered getting too cold	9 (100%)	30 (88.2%)	24 (46.2%)	29 (59.2%)
Criteria of a high risk baby include	3 (33.3%)	14 (41.2%)	14 (26.9%)	17 (34.7%)
High risk babies should be breastfed	9 (100%)	33 (97.1%)	49 (94.2%)	43 (87.8%)
Minimum weight after which baby can be given a bath	0	1 (2.9%)	2 (3.8%)	3 (6.1%)
Tell parents to call you immediately in all the following conditions except	9 (100%)	14 (41.2%)	26 (50%)	24 (49%)
When will you continue visiting once a week in the second month	8 (88.9%)	23 (67.6%)	32 (61.5%)	32 (65.3%)
Mature milk can be stored at room for how much time	8 (88.9%)	12 (35.3%)	14 (26.9%)	11 (22.4%)
How much milk is to be given to the LBW on the first day	6 (66.7%)	7 (20.6%)	8 (15.4%)	6 (12.2)
Dose and duration of co-trimoxazole to be given to preterm babies with neonatal sepsis	0	0	0	2 (4.1%)
Umbilical cord should be kept clean and dry	9 (100%)	34 (100%)	49 (94.2%)	48 (98%)
Total Score (Mean (SD)) out of 34	23.89 (1.9)	18 (2.9)	16.23 (3.1)	16.24 (3.2)
Overall P Value for ANOVA			<0.001	

unsatisfactory performance of ASHA workers.^[13,14] Coincidentally, the study conducted in Gujarat using the same proforma showed identical mean knowledge scores but slightly better skills of ASHAs in providing HBNC.^[15] While mean (SD) scores is a good tool for cross-comparisons, it does not provide sufficient information on attainment of satisfactory skills. A study of 25 ASHAs from Delhi revealed that although ASHA workers performed most of the steps of weight measurement, only 4 out of 25 performed the critical step of ensuring no zero error, and in the end only 11 measured the weight correctly.^[13]

The questions regarding minimum birth weight below which risk of getting sick is highest, baby weight before recommending bathing, dose and duration of co-trimoxazole for sepsis, age of first urination, and when antenatal registration should be done- received lowest correct responses from the participants suggesting an inability of the CHWs in recognizing high-risk babies. A recent study from Haryana also demonstrated serious deficiency among health workers in assessing danger signs.^[16] On the contrary, questions regarding exclusive and complementary breastfeeding were correctly answered by most

Table 3: Skill assessment of ASHA workers

Skill	Current SAKHIs (n=9)	Former SAKHIs (currently ASHAs) (n=34)	Former SAKHIs (currently not engaged in HBNC) (n=52)	ASHAs (trained by Government health system only) (n=49)	P
Temperature Measurement					
Mean (SD) Score out of 9	8.2 (0.8)	7.4 (1.5)	5.5 (2.7)	3.4 (2.7)	<0.001
Satisfactory skills	9 (100%)	26 (76.5%)	24 (46.1%)	6 (12.2%)	
Hand Washing					
Mean (SD) Score out of 6	5.7 (0.5)	5.6 (0.7)	4.4 (1.7)	4.6 (1.6)	0.001
Satisfactory skills	6 (66.7%)	26 (76.5%)	15 (28.8%)	20 (40.8%)	
Weight Measurement					
Mean (SD) Score out of 10	9.8 (0.4)	8.3 (1.8)	6.8 (2.5)	4.1 (2.6)	<0.001
Satisfactory skills	8 (88.9%)	25 (73.5%)	21 (40.4%)	2 (4.1%)	
Kangaroo Mother Care					
Mean (SD) Score out of 5	4.6 (1.0)	2.1 (1.7)	1.1 (1.5)	1 (1.0)	<0.001
Satisfactory skills	8 (88.9%)	4 (11.8%)	5 (9.6%)	0 (0%)	
Bag & Mask Ventilation					
Mean (SD) Score out of 7	6.4 (0.9)	3.5 (2.3)	2.7 (2.3)	0.04 (0.3)	<0.001
Satisfactory skills	6 (66.8%)	6 (17.6%)	6 (11.5%)	0 (0%)	
Suctioning (Bilta pump)					
Mean (SD) Score out of 7	6 (0.5)	4.8 (1.7)	3.5 (2.5)	1.1 (2.0)	<0.001
Satisfactory skills	8 (88.9%)	12 (35.3%)	12 (23.1%)	2 (4.1%)	

Table 4: Self-reported field performance of the participants

	Current SAKHIs (n=9)		Former SAKHIs (currently ASHAs) (n=34)		Former SAKHIs (currently not engaged in HBNC) (n=52)		ASHAs (trained by Government health system only) (n=49)	
	Median [IQR]	Mean (SD)	Median [IQR]	Mean (SD)	Median [IQR]	Mean (SD)	Median [IQR]	Mean (SD)
Pregnant women - Identified	6 [3-21]	11.6 (9.1)	10 [6-14.5]	10.4 (6.1)	5.5 [3-10.25]	9.1 (14.8)	8 [5.25-12.75]	10.2 (8.1)
Pregnant women - registered <12 weeks	7 [3-13]	8.3 (6.3)	6 [3.75-10]	7.4 (6.1)	3 [0.75-7]	5.5 (8.7)	4 [3-10]	7.5 (8.0)
Pregnant women - registered >12 weeks	4 [0.5-6.5]	4.3 (4.7)	5 [0-9]	5.8 (6.7)	0 [0-5]	3.5 (7.4)	2 [1-7.5]	5.9 (8.6)
Home deliveries	2 [1-4.5]	2.7 (1.9)	0 [0-0]	0.6 (1.8)	1 [0-2]	1.4 (1.6)	0 [0-0]	0.2 (0.8)
Hospital deliveries - Total	7 [1.5-18]	10.1 (10.0)	9.5 [6-14]	9.7 (5.6)	3 [2-8]	6.8 (13.8)	7 [4-10]	15 (44.4)
Accompanied	6 [1.5-16]	9.1 (9.8)	7 [3.5-10.5]	8.2 (6.1)	2 [0-4]	4.4 (12.4)	5 [2-9]	13 (39.9)
New born weighted on 1st day	6 [3-17]	10.3 (9.8)	7 [4-10]	8.2 (5.7)	3 [1-6]	5.7 (12.8)	4 [2-7]	7.7 (11.3)
Newborns weighed within 3 days	3 [0-3]	2.1 (1.8)	7 [4-10]	8 (5.1)	2 [0-4]	4.8 (12.8)	4 [2-7.5]	7.7 (11.6)
Babies <2 Kg identified	2 [1-6]	3.4 (3.3)	0 [0-2]	1.1 (1.6)	0 [0-1]	1 (1.9)	0 [0-1]	0.7 (1.1)
Babies <2 Kg referred	2 [1-4.5]	2.9 (2.6)	0 [0-1.5]	0.9 (1.2)	0 [0-1]	0.8 (2.3)	0 [0-1]	0.6 (0.9)
Babies <2 Kg accompanied	2 [0-5]	2.3 (2.4)	0 [0-1]	0.7 (1.0)	0 [0-1]	0.8 (2.3)	0 [0-1]	0.6 (1.5)
Follow up 2 days	2 [1-4.5]	2.4 (2.1)	0 [0-1.5]	0.8 (1.1)	0 [0-1]	0.7 (1.7)	0 [0-0]	0.4 (0.9)
Sick newborns identified	6 [2.5-8]	5.8 (4.5)	1 [0-3]	1.4 (1.6)	0 [0-1]	0.7 (1.2)	0 [0-1]	0.7 (1.5)
Sick newborns referred	4 [2.5-6]	4.1 (2.4)	1 [0-3]	1.4 (1.8)	0 [0-1]	0.6 (1.1)	0 [0-1]	0.6 (1.6)
Sick newborns accompanied	2 [0-4]	2.3 (2.1)	0 [0-1]	0.7 (1.2)	0 [0-0]	0.4 (0.9)	0 [0-0]	0.4 (1.1)
Sick newborns followed up	3[2-5]	3.7 (2.9)	1 [0-2.5]	1.3 (1.5)	0 [0-1]	0.4 (0.8)	0 [0-0]	0.5 (1.2)
Mothers counselled for breast feeding	8 [5-17]	11.2 (9)	7 [2.75-10.5]	7.5 (6.0)	4 [2-7]	6.5 (12.3)	6 [3-10]	8.8 (10.6)
Mothers counselled for complementary food	8 [3.5-14]	9.6 (7.5)	7.5 [3-12]	8.2 (5.9)	4 [2-7]	6.7 (12.2)	6 [4-10]	9.3 (9.4)
Unhealthy baby	5 [1-5.5]	4.6 (4.2)	0 [0-1.5]	1 (1.6)	0 [0-1]	0.8 (1.3)	0 [0-1]	0.7 (1.5)
Unhealthy referred	5 [1-5.5]	4.1 (3.1)	0 [0-1.5]	0.8 (1.4)	0 [0-1]	0.5 (0.9)	0 [0-1]	0.5 (1.6)
Unhealthy accompanied	1 [0.5-5]	2.9 (2.9)	0 [0-1]	0.7 (1.1)	0 [0-0]	0.3 (0.7)	0 [0-0]	1.3 (6.1)
Unhealthy followed up	2 [1-5]	3.3 (3.2)	0 [0-1.5]	0.7 (1.1)	0 [0-1]	0.6 (0.9)	0 [0-0]	0.2 (0.6)
Sick baby	6 [3-8.5]	5.8 (3.5)	0 [0-3.5]	1.9 (3.2)	0 [0-1]	0.8 (1.4)	0 [0-2]	2.6 (10.7)
Sick referred	4 [3-7.5]	5.1 (2.8)	0 [0-2.5]	1.9 (3.2)	0 [0-1]	0.7 (1.4)	0 [0-2]	2.4 (10.8)
Sick accompanied	4 [1.5-5]	3.4 (1.8)	0 [0-1]	0.7 (1.3)	0 [0-0]	0.3 (1.1)	0 [0-1]	1.3 (6.0)
Sick followed up	3 [1-5.5]	3.6 (2.4)	0 [0-2]	1.8 (3.2)	0 [0-1]	0.5 (0.9)	0 [0-1]	0.5 (1.0)

of the participants. Similar observation was reported from studies conducted in Maharashtra^[17] and West Bengal.^[18]

Among the various skills tested, the overall least satisfactory skills were found to be in BMV and KMC. Despite incorporation

of these skills in ASHA training modules 6 and 7, none of the ASHAs (trained by Government health system only) could perform them satisfactorily. Even SAKHIs had suboptimal performance in these skill sets. This observation is critical as India has the largest number of low-birth weight babies in the world (42% of the global burden)^[1] with birth asphyxia^[1] as one of its most common cause of neonatal mortality. While we discuss the BMV performance of SAKHIs and ASHAs as being poor, it is in no way a unique phenomenon, and may not be a problem that can be addressed easily. Though this skill assessment was conducted among health workers in developing countries, findings from these training sessions are also pertinent to paramedical, nurse practitioner, and physician assistants within the healthcare domain of developed countries. The ability to train such healthcare providers to dispense such important screening and preventative knowledge could help detect critical conditions in a timely manner, as well as promote regular enhancements of skill-based procedures. During airway management, leaks of more than 50%, and thus ineffective ventilation has been demonstrated among trained medical personnel in developed countries.^[19]

In a country like India, it is a cardinal sin to waste such trained manpower and SAKHIs should be involved in HBNC whenever possible. It appears that SAKHIs (CHWs working with ACF) have better knowledge and skills, and a more realistic field performance as compared to those ASHAs who were trained by government health system only. The large variability in the field performance may indicate the population distribution, and in tribal areas where the population is spread through small clusters, appointment of ASHA should be made considering geography and terrain rather than population size. Along with possessing optimal knowledge and skill sets, quality of training and supportive supervision mechanism of ASHAs needs to be explored regularly to maintain a standard level of care in the community.

There have been attempts to empower ASHA with necessary knowledge and skill sets. National ASHA Mentoring Group consisting eminent scientists from diverse fields consistently guided the training as well as administrative components of work expected from ASHA. The group consistently highlighted need for reforms in training, handholding, and simplified administrative procedures.^[20] To leverage digital health in simplifying ASHA's function, an online system, viz., ASHA Soft (The Online Payment and Monitoring System) was launched in 2014 and implemented in many states of India. It appears as a very good construct for the purpose^[21] and ASHAs expressed positive feelings about the utility of the system.^[22,23]

Primary care physicians can act as catalyst not only in empowering ASHAs but also in handholding and supportive supervision. This is a win-win situation for them as a knowledgeable, skilful, and confident ASHA will minimize unnecessary referrals, thereby minimizing workload of already burdened health care system and help build rapport with the local communities allowing smooth implementation of Behaviour Change Communications (BCC).

Conclusion: The skills and knowledge of ASHA workers are far deficient compared to SAKHIs despite similar training components. Outsourcing the training component with handholding and supportive supervision involving all stakeholders along with leveraging digital health platforms for hassle free administration and performance appraisal should be tried to improve health of the societies.

Limitations of the study

We acknowledge some limitations in our study. This was a simulation-based skill assessment and direct observation of health workers in the field was not done. This may have led to some improved performance because of Hawthorne effect.

Prior Publication

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

Ambuja Cement foundation commissioned Dr. Somashekhar Nimbalkar and Mr. Ajay Phatak for conducting an evaluation of their Home-Based Newborn Care program. Dr. Somashekhar and Mr. Ajay received travel reimbursement for conducting the study. The study was commissioned to Dr. Somashekhar Nimbalkar as Principal Investigator and Mr. Ajay Phatak as Co-investigator and a Memorandum of Understanding for funding of the study including fees was signed between the institutions involved.

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ANNEXURE 1

Knowledge and Skill Assessment

Name:

Area:

Village:

Sub centre:

PHC:

1. When should the pregnant women get registered in antenatal clinic?
 - a) 12 – 16
 - b) 16 – 20
 - c) 20 – 24 weeks
 - d) <12 weeks

2. How many antenatal check ups are minimum necessary after initial registration?
 - a) 1
 - b) 2
 - c) 3
 - d) 4

3. Birth weight of newborn baby should be measured by ?
 - a) first two days of life
 - b) from 2nd day to 5th day of life
 - c) Any time within the first week
 - d) Any time within first 15 days

4. When to start breast-feeding?
 - a) within 1 hour
 - b) after 1 hour
 - c) after 1 day
 - d) after 2 days

5. How long exclusive breast-feeding is necessary?
 - a) 4 months
 - b) 6 months
 - c) 8 months
 - d) 9 months

6. When to start complementary feeding?
 - a) After 4 months
 - b) After 6 months
 - c) After 8 months
 - d) After 9 months

7. Meconium should be passed within _____ hours.
 - a) 24
 - b) 48
 - c) 72
 - d) 84

8. Urine should be passed within _____ hours.
 - a) 24
 - b) 48
 - c) 72
 - d) 84

9. Following are the danger signs in sick neonates for referral except
 - a) poor sucking
 - b) blood in stool
 - c) feels hot and cold to touch
 - d) Passing stool after each feed.

10. Following are steps to be followed during referral of sick neonate to the PHC except
 - a) Escort the mother and baby
 - b) Baby warmth
 - c) Fastest mode of transport
 - d) No breast feeding

11. Vegetables, fruits, ghee, milk and jaggery will harm pregnant women.
 - a) True
 - b) False

12. Birth weight below which risk of getting sick is considered very high? 1800 gm

13. A normal baby is born in a facility, how long should the mother be advised to stay in the hospital, if there are no complications to either of them?
 - a) 24 hrs
 - b) 36 hrs
 - c) 48 hrs
 - d) 72 hrs

14. For a normal weight baby born at home, minimum visits in the first month should be –
 - a) 5
 - b) 6
 - c) 7
 - d) 8

15. To declare a baby as still - birth when should a baby be assessed?
 - a) 30 seconds and 5 minutes
 - b) 60 seconds and 10 minutes
 - c) 20 seconds and 3 minutes
 - d) 30 seconds and 10 minutes

16. After birth, the soft white substance with which the baby is covered, should be immediately removed ?
 - a) True
 - b) False

17. When should the examination of the baby done?
 - a) within first 24 hours of life
 - b) within first 48 hours of life
 - c) within first 72 hours of life
 - d) within first 96 hours of life

18. Range of birth weight coming in yellow zone?
 - a) More than 2.5 kg
 - b) More than 3 kg
 - c) Between 2.5 and 1.8 Kg
 - d) Between 2 Kg and 1.5 kg

19. Which zone babies can be managed at home?
 - a) Only Green zone
 - b) Both Green and Yellow

- c) Only Red zone
 - d) All can be managed at home
20. If there is pus discharge from the eyes, how many days antibiotic ointment is to be applied?
- a) 5
 - b) 6
 - c) 4
 - d) 3
21. How frequently mother should breastfed her child in 24 hours?
- a) 8-10
 - b) 10-12
 - c) 12-14
 - d) 6-8
22. Minimum adequate weight gain per week after first week of life in normal newborn?
- a) 150 -200 grams
 - b) 100-150 grams
 - c) 200-300 grams
 - d) More than 300 grams
23. Which of the following conditions can affect the breast milk supply?
- a) Age of mother
 - b) Caesarean section
 - c) Return of menstruation
 - d) None
24. Above what temperature baby is considered to have fever? above 99 degree Fahrenheit (37.2 degree Celsius)
25. Below what temperature baby is considered getting too cold? <95 degree Fahrenheit (35.0 degree Celsius)
26. Criteria of a high risk baby include –
- a) Birth weight less than 2 Kg
 - b) Preterm delivery
 - c) Baby not taking feeds on day 1
 - d) All
27. High risk babies should be breast fed –
- a) every 2 hours
 - b) every 3 hours
 - c) every 4 hours
 - d) every 6 hours
28. Minimum weight after which baby can be given a bath— 2000 gm
29. Tell parents to call you immediately in all the following conditions except –
- a) excessive crying of the baby
 - b) limb becomes limp
 - c) cold to touch
 - d) fever
30. When will you continue visiting once a week in the second month?
- a) Weight on 28th day less than 2300 grams
 - b) Weight on 28th day less than 2500 grams
 - c) Weight on 14th day less than 2300 grams
 - d) Weight on 14th day less than 2500 grams

31. Mature milk can be stored at room for how much time?
 a) 6-8 hours
 b) 4-6 hours
 c) 8-10 hours
 d) one day
32. How much milk is to be given to the LBW on the first day?
 a) 40 ml/kg
 b) 60 ml/kg
 c) 50 ml/kg
 d) 100ml/kg
33. Dose and duration of co-trimoxazole to be given to preterm babies with neonatal sepsis?
 a) ¼ teaspoon twice a day for 7 days
 b) ¼ teaspoon twice a day for 10 days
 c) ½ teaspoon twice a day for 7 days
 d) ½ teaspoon twice a day for 10 days
34. Umbilical cord should be kept clean and dry –
 a) Yes
 b) No. Antiseptic powdered routinely applied.

CHECKLIST FOR SKILL OF TEMPERATURE MEASUREMENT

CHECKLIST FOR SKILL OF TEMPERATURE MEASUREMENT	
SKILL	YES/NO
Take thermometer out of its storage case, hold at broad end, and clean the shinning tip with cotton ball soaked in spirit. Press the pink button once to turn the thermometer on. You will see “188.8” flash in the centre of the display window, then a dash (-), then the last temperature taken and then three dashes (- - -) and a flashing “F” in the upper right corner Hold the thermometer upward and place the shinning tip in the centre of the armpit. Place arm against it. Do not change the position. You will hear a beep sound every 4 seconds while the thermometer is recording the temperature. When you hear 3 short beeps, look at the display. When “F” stops flashing and the number stop changing, remove the thermometer. Read the number in the display window. Record the temperature reading on the form. Turn the thermometer off by pushing the pink button one time. Clean the shinning tip of the thermometer with a cotton ball soaked in spirit. Place thermometer back in its storage.	

Yes = 1 point ; No =0 point

Total points out of 9=

Satisfactory Criterion: Score of 7+ out of 9 AND essential components (Steps 2,3&4) correctly performed

CHECKLIST FOR SKILL OF HANDWASHING

Steps	Yes/No
Remove bangles and wrist watch	
Wet hands and forearms up to elbow with clean water	
Apply soap and scrub forearms, hands and fingers (especially nails) thoroughly (6 steps of hand washing as per the module of book 7)	
Rinse with clean water	
Air-dry with hands up and elbow facing the ground	
Do not touch with your hands the ground, floor or dirty objects after washing your hand	

Yes = 1 point ; No =0 point

Total points out of 6 =

Satisfactory Criterion: Score of 5+ out of 6 AND essential components (Steps 1&2) correctly performed

CHECKLIST FOR SKILL OF WEIGHT MEASUREMENT

SKILL	YES/ NO
Place the sling on scale	
Hold scale by top bar off the floor, keeping the adjustment knob at eye level	
Turn the screw until its top fully covers the red and ‘O’ is visible	
Remove sling on hook and place it on a clean cloth on the ground	
Place body with minimum clothes on, in sling and replace the sling on hook.	
Holding top bar carefully, as you stand up, lift the scale and sling with baby off the ground, until the knob is at eye level.	
Read the weight.	
Gently put the sling with baby in it, on the ground and unhook the sling.	
Remove the baby from the sling and hand it over to its mother	
Record the weight.	

Yes = 1 point ; No =0 point

Total points out of 10 =

Satisfactory Criterion: Score of 8+ out of 10 AND essential components (Steps 3,5&6) correctly performed

Performance checklist for Kangaroo Mother Care

Step	Performed
Baby should be placed between the mother’s breasts in an upright position	
Head should be turned to one side and in a slightly extended position	
Hips should be flexed and abducted in a “frog” position; the arms should also be flexed.	
Baby’s abdomen should be at the level of the mother’s epigastrium	
Support the baby’s bottom with a sling/binder	

Yes = 1; No = 0

Total points out of 5

Satisfactory Criterion: Score of 4+ out of 5 AND essential components (Steps 1&2) correctly performed

Performance checklist for bag and mask ventilation

Step	Performed
Selection proper sized mask	
Making sure airway is clear	
Position the baby's head	
Position herself at the bedside	
Proper positioning the bag and mask on the face	
Initiation of ventilation and correct rate of ventilation	
Ensuring chest rise; if no - then Ventilation corrective steps followed	

Yes = 1; No = 0

Total points out of 7. All steps are considered essential steps.