

newborn care practices (ENC).^[7] The ENC interventions need to be tailored to the local needs of the people and delivered through community-based approaches.

Childbirth is regarded as an important cultural event with rooted traditional beliefs. Effective behavior change strategies related to neonatal care require thorough understanding of local knowledge and practices (KP) relating to the newborn period, as locally defined.^[8] It has been documented that sound knowledge and favorable attitudes do not necessarily translate into preventive action with respect to neonatal mortality at the individual and community levels. Thus, this calls for behavioral change targeting inappropriate practices. Accredited social health activists (ASHAs) have been introduced into the Indian public health system primarily to link communities with health system as well as to motivate community members to adopt healthy practices, especially those related to maternal and child health practices. The present study was conducted to assess the knowledge, practices, and factors related to ENC among mothers in a rural community in northern India and test its association with ASHAs visits during antenatal and postnatal care. This represents the formative phase of the community intervention trial for reducing neonatal mortality.

METHODS

Study area and participants

A house-to-house survey of recently delivered mothers was conducted between March and September 2012 in the 67 villages under the four primary health centers in Ballabgarh block of Faridabad district, Haryana, India, covering a population of around 1.8 lakhs.^[9] The sample included all mothers who delivered within a period of 1–6 months before the interview irrespective of the current status of the child. This was based on the criteria that at the time of interview the neonatal period should be over and the recall period should not be beyond 6 months. Considering the proportion of expected estimate as 50% and 5% relative precision, we estimated a sample size of 1537 using the formula $n = z^2(pq)/d^2$. Based on population of 1.8 lakhs and birth rate of 21.3/1000 population, the estimated number of total pregnancies in the study area in a 5-month period would be 1598. We thus planned to include all the eligible women (universal sampling) and recruited 1298 eligible mothers. The study was approved by the Ethical Committee, All India Institute of Medical Sciences, New Delhi.

Trained-field workers collected the data using a semi-structured questionnaire to measure KP related to antenatal, natal, postnatal, and neonatal care. Following eleven domains were included: (a) Demographic profile of the respondents, (b) antenatal care (ANC), (c) natal care, (d) sources of health and neonatal information, (e) preparing for delivery, (f) cord care, (g) thermal care of newborn, (h) breastfeeding practices, (i) baby handling, (j) recognition of danger signs, and (k) treatment-seeking behavior. Under each domain, questions related to key KP were asked. A modified version of the previously administered tool in Ballabgarh study was

used.^[10] Pilot testing of modified tool was done, and necessary changes in language were made. Participants were contacted at their place of residence, explained about the study, and a written consent was obtained. If the participant was not available for interview in the first visit, two more visits were made. No mother refused to participate in the study.

Epi info 3.5.1 Centers for disease control (CDC), Atlanta, Georgia USA was used for data entry and data processing and imported in STATA 12 StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP for analysis. The distribution of neonatal practices by independent variables was given in proportions with 95% confidence interval (CI). A knowledge score of 14 was derived from questions in following domains: breastfeeding (4), cord care (1), thermal care (4), knowledge about recognition of danger signs (3), restrictive baby handling (1), and knowledge about free transport for neonatal care (1). A cutoff score of 9 (median) was considered appropriate for grading of KP score as median remains unaffected with extreme values. Scores lower than 9 were considered as low KP level and vice versa. Factors associated with not practicing favorable behaviors were identified using univariate and multivariate logistic regression. Variables considered for regression analysis were baby's sex, mother's age, mother's education, father's education, caste, parity, gestation, place of delivery, mode of delivery, and ASHA visit. $P = 0.05$ and less was considered statistically significant. Logistic regression analysis was carried out to find the association of low KP score with determinants of newborn care. ASHA, the front line worker and primary healthcare provider (HCP) at the village level visit home till up to 6 weeks in postnatal period for providing newborn care. House visits comprise of activities such as Weight and temperature measurement, counseling of mother regarding breastfeeding, first bath, kangaroo mother care, hand washing, cord care, and prompt identification of danger signs and referral.^[2] During the survey, mothers were asked how many times ASHA had visited them after delivery.

RESULTS

All the 1298 women who were approached for the survey agreed to participate. The mean age of the interviewed mothers was 23.98 years (standard deviation [SD] 5.6). Nearly two-thirds (63.9%) of the mothers were below 24 years. Median years of completed education of mothers was 8 years (interquartile range [IQR] 5) and mean 7.5 years (SD 6.2) with one-fourth (23.9%) being illiterate. Median and mean years of Father's education were 10 (IQR 4) 9.90 (SD 4.1), respectively. Around one-third (38.5%) of the neonates were of birth order one. Almost all (98%) the mothers were homemakers. There were a total of 18 neonatal deaths during the study of which 11 deaths were within the 1st week of birth. About 22% of the newborn had low birth weight. 87.2% of the mothers had sought ANC with 69.4% of the mothers having had more than three ANC visits. 86.7% were institutional deliveries of which 47.7% were in

government institutions. The mode of delivery was through a cesarean section in 9.3% of the deliveries. A little more than one-third (37.9%) of the mothers were aware about a free ambulance facility by the government related to delivery.

Table 1 illustrates the KP of the mothers pertaining to newborn care. 52.3% newborns were breastfed within 1 h of birth, and 96.6% were given colostrum. Prelacteal feeds were given in 20.4% of the newborns. At 1 month, exclusive breastfeeding was only 64.9%. Similarly, only 42.3% of the mothers did not apply anything on the cord. Most babies were dried (80.6%) and wrapped immediately (97.4%). Only 8.7% of babies were kept in skin-to-skin contact with the mother after delivery. A total of 29.7% were bathed within 3 days of delivery. A negligible number (0.7%) of parents posed any restriction on handling the baby and regular handwashing before handling the baby was reported by 63.7% mothers.

Mothers perceived their child to be ill if symptoms included discharge from eye/ear/belly button (97.4%), fits (97.4.1%), jaundice (94.6%), stridor/difficulty in

breathing (93.3%), [Table 1]. Decreased breastfeeding was the least likely symptom to be perceived as a danger sign. Nearly 316 (24.3%) mothers reported a newborn illness during the 1st month after birth. Of these, only 16.8% sought immediate medical help with remaining 83.2% preferring to observe the condition and waited for at least 1 day at home [Table 2]. Around 5.7% household practiced home treatment, and the rest followed a combination of home remedies and outside treatment from medical practitioner or traditional healer. Only 4.7% caregivers resorted help from government facility for treatment of newborn.

Based on the cutoff of nine, 58.5% of mothers were reported to be having lower knowledge score. Those mothers with no contact with HCPs were likely to have lower KP score ($P < 0.01$) [Table 1].

Contact with healthcare providers

Those mothers with no contact with HCPs (ASHA/auxiliary nurse midwife) were likely to have lower KP score ($P < 0.01$). Knowledge regarding the availability

Table 1: Prevalence of knowledge and practices in rural Ballabgarh ($n=1298$)

Knowledge/practices	Total ($n=1298$)	Percentage (95% CI)	No contact with primary HCP ($n=178$)	Contact with primary HCP ($n=1120$)	<i>P</i>
Knowledge related to free transport	492	37.9 (35.2-40.6)	35 (19.6)	457 (40.8)	<0.01
Breastfeeding practices					
Breast feeding within 1 h	680	52.3 (49.6-55.1)	88 (49.4)	592 (52.8)	0.3
Prelacteal feed not given	1034	79.6 (77.3-81.8)	136 (76.4)	898 (80.1)	0.2
Colostrum given	1254	96.6 (95.4-97.5)	171 (96.0)	1083 (96.7)	0.6
Exclusive breast feeding for 1 month	843	64.9 (62.2-67.5)	92 (51.6)	751 (67.1)	<0.01
Cord care practice					
Nothing applied on cord	550	42.3 (39.6-45.1)	80 (44.9)	470 (41.9)	0.4
Thermal care practices					
Baby dried immediately after birth	1047	80.6 (78.4-82.7)	142 (79.7)	905 (80.8)	0.7
Baby wrapped immediately after birth	1265	97.4 (96.4-98.2)	169 (94.9)	1096 (97.8)	0.02
Baby kept in skin-to-skin contact	114	8.7 (0.7-10.4)	11 (6.1)	103 (9.2)	0.1
First bath of baby > 3 days	386	29.7 (27.2-32.3)	50 (28.1)	336 (30.0)	0.6
Restrictive handling					
Baby handling restrictions present	10	0.7 (0.3-1.4)	0 (0.0)	10 (0.8)	-
Hand washing practice	827	63.7 (61.0-66.3)	94 (52.8)	733 (65.4)	<0.01
Knowledge of danger signs					
Decreased breast feed	992	76.4 (74.0-78.7)	143 (80.3)	849 (75.8)	0.1
Discharge from belly button/eye/ears	1265	97.4 (96.4-98.2)	168 (94.3)	1097 (97.9)	<0.01
Difficult breathing	1211	93.3 (91.7-94.5)	161 (90.4)	1050 (93.7)	0.1
Fits	1265	97.4 (96.4-98.2)	169 (94.9)	1096 (97.8)	0.02
Cold touch	1124	86.5 (84.6-88.4)	156 (87.6)	968 (86.4)	0.6
Hot touch	1171	90.2 (88.4-91.7)	160 (89.9)	1011 (90.2)	0.8
Chest in-drawing	1221	94.0 (92.6-95.2)	162 (91.0)	1059 (94.5)	0.06
Jaundice	1228	94.6 (93.2-95.7)	162 (91.0)	1066 (95.1)	0.02
Less movements of limbs	1154	88.9 (87.0-90.5)	157 (88.2)	997 (89.0)	0.7
KP score ≤ 9	760	58.5 (55.8-61.2)	122 (68.5)	638 (56.9)	<0.01

*Figures in round brackets represent column wise percentages; Figures in square brackets represent 95% CI of percentages, #All *P* values calculated using Chi-square test/Fischer exact test, †Primary healthcare provider: ASHA/ANM. HCP: Healthcare provider, CI: Confidence interval, KP: Knowledge and practice, ASHA: Accredited Social Health Activists, ANM: Auxiliary nurse midwives

Table 2: Treatment-seeking behavior among newborns reported ill (n=316)

Treatment seeking	Total (n=316)	Percentage (95% CI)	No contact with primary HCP (n=40)	Contact with primary HCP (n=276)	P
Practiced home treatment	18	5.7 (3.4-8.8)	5 (13.5)	13 (5.0)	0.04
Type of provider					
Hospital	108	34.1 (28.9-39.6)	11 (45.8)	97 (55.7)	0.3
Health center	8	2.5 (1.0-4.9)	0 (0)	8 (5.3)	-
Private clinic	166	52.5 (46.8-58.1)	22 (70.9)	144 (64.2)	0.4
Drug shop	6	1.8 (0.6-4.0)	2 (10.5)	4 (2.7)	0.09
Traditional healer	2	0.6 (0.1-2.2)	0 (0)	2 (1.3)	-
Other	7	2.2 (0.8-4.5)	0 (0)	7 (11.2)	-
Sought treatment after 1 day	263	83.2 (78.6-87.1)	34 (85.0)	229 (82.9)	0.7
First facility government	15	4.7 (2.6-7.7)	4 (10)	11 (3.9)	0.09

*Figures in round brackets indicate column-wise percentages. Figures in square brackets indicate 95% CI of the percentage. HCP: Health-care provider, CI: Confidence interval

of free ambulance for transport of sick child, exclusive breastfeeding, wrapping of baby after birth, and hand washing practices was found significantly lesser in those reporting no contact with HCPs.

Predictors of knowledge and practices

Variables considered for regression analysis [Table 3] were baby's sex, mother's age, mother's education, father's education, caste, parity, gestation, place of delivery, mode of delivery, and ASHA visit. The KP score was significantly less in mothers who delivered at home (adjusted odds ratio [AOR]: 1.78 95% CI: 1.22–2.59), or underwent cesarean section (AOR: 1.67 95% CI: 1.12–2.53) or did not have contact with ASHA (AOR: 1.64 95% CI: 1.17–2.29) or were primiparous (AOR: 1.49 95% CI: 1.15–1.93).

DISCUSSION

The current study provides an insight into the local cultural milieu of home-based neonatal care KP. The trends of prelacteal feeding (21.4%) and supplementary feeding practices (35.1%) have been on decline as compared to 49.2% and 79.8%, respectively, seen previously in Ballabgarh.^[10] However, harmful cord care practices persist with 57.7% mothers reportedly applying something on cord as is seen in many other parts of India.^[11] Most common substances applied on cord were oil/ghee (43%). Early bathing of babies within 3 days of birth is a widely practiced cultural norm.^[6,12-14] and remains

high in study area. However, the benefits of skin-to-skin care are still widely unknown and not practiced not only in India but many other countries too Uganda and Egypt.^[14,15] Baby handling by multiple personnel significantly increases the risk of infections in the baby. In this study, there were negligible restrictions to handling baby but regular handwashing was reported by two-thirds mothers.

Nearly half of the interviewed mothers reported their baby to have some illness during the neonatal period, similar to that documented by Willis *et al.*^[16] in a rural community of Lucknow, Uttar Pradesh. Delay in seeking care was seen due to prevalent beliefs about home treatment and nonavailability of a male decision-maker in the family. Although a free 24 × 7 transport facility by Haryana government is available, a major portion of the people still depended on private vehicles for seeking care for sick neonates. Unawareness about accessing the government facility and further unavailability of private transport such as autorickshaw, bus at night poses difficulty in seeking timely care. The family members preferred private nursing homes/clinics with a qualified doctor as compared to government facility due to dearth in skilled health personnel and equipment in the latter. Similar findings were reported by Waiswa *et al.* in rural Uganda.^[17] Private clinics with single doctor provide an array of health services in rural population. Training and technical support of these private practitioners can help in standardizing their services and may aid in curbing neonatal mortality.^[18]

Mothers who were not visited by ASHA workers were at significant risk of having lower KP. A similar effect was however not seen through other health workers. This suggests need for training and capacity building, especially in advocating health messages by taking cognizance of the prevailing norms and the reference social support network of mothers for culturally centered neonatal care practices. Like the Ethiopian study,^[19] we found that ANC visits were significantly associated with uptake of KP. With 58.5% mothers falling below the midpoint of KP score indicates that the community is lagging in capacity for newborn care and may benefit from an evidence-based social behavior change communication strategy targeting newborn care.

The study findings were based on reported newborn care practices and could be subject to measurement or social desirability bias. An attempt was made to decrease the recall bias by interviewing mothers within a 4-week timeframe immediately after the completion of the neonatal period.

CONCLUSION

There is a considerable KP gap in the community related to newborn care especially in domains like baby handling restrictions, skin-to-skin care, delayed bathing of baby, knowledge of free transport and cord care practices. Visits by ASHAs appears beneficial suggesting a scale-up of culturally sensitive, social norm-based approach for

Table 3: Association of health system components with knowledge and practice score

Variables	Total (n=1298)	KP score ≤9 (n=760), n (%)	KP score >9, (n=538), n (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender of baby					
Boy	724	418 (57.7)	306 (42.3)	0.93 (0.74-1.16)	0.96 (0.76-1.20)
Girl	572	341 (59.6)	231 (40.4)		
Mother's age					
<25 years	830	476 (57.3)	354 (42.7)	0.87 (0.69-1.10)	0.80 (0.62-1.04)
25 years and above	468	284 (60.7)	184 (39.3)		
Mother's education					
Primary or lower	453	285 (62.9)	168 (37.1)	1.32 (1.05-1.67)	1.30 (0.98-1.73)
Secondary or higher	845	475 (56.2)	370 (43.8)		
Father's education					
Primary or lower	191	116 (60.7)	75 (39.3)	1.11 (0.81-1.52)	0.94 (0.66-1.35)
Secondary or higher	1107	644 (58.2)	463 (41.8)		
Caste					
Rajput caste	385	214 (55.6)	171 (44.4)	1	1
OBC caste	444	261 (58.8)	183 (41.2)	1.24 (0.94-1.63)	1.15 (0.85-1.54)
SC/ST caste	469	285 (60.8)	184 (39.2)	1.09 (0.83-1.42)	1.03 (0.77-1.37)
Parity					
Primiparous	501	311 (62.1)	190 (37.9)	1.27 (1.01-1.59)	1.49 (1.15-1.93)
Multiparous	797	449 (56.3)	348 (43.7)		
Period of gestation (weeks)					
≥37	1164	674 (57.9)	490 (42.1)	0.78 (0.53-1.14)	0.81 (0.55-1.19)
<37	127	81 (63.8)	46 (36.2)		
Place of delivery					
Home delivery	167	117 (70.1)	50 (29.9)	1.78 (1.25-2.52)	1.78 (1.22-2.59)
Institutional delivery	1131	643 (56.9)	488 (43.1)		
Mode of delivery					
Cesarean delivery	122	83 (68.0)	39 (32.0)	1.57 (1.05-2.33)	1.67 (1.12-2.53)
Vaginal delivery	1171	674 (57.6)	497 (42.4)		
ASHA visits					
Not visited	193	134 (69.4)	59 (30.6)	1.738 (1.25-2.41)	1.64 (1.17-2.29)
Visited at least once	1105	626 (56.7)	479 (43.3)		

*Figures in round brackets indicate row-wise percentages. Figures in square brackets indicate 95% CI of OR. CI: Confidence interval, KP: Knowledge and practice, ASHA: Accredited Social Health Activists, OR: Odds ratio

modifying high-risk newborn care practices could prove beneficial.

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Conflicts of interest

There are no conflicts of interest.

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