

Effect of behaviour change communication on qualified medical care-seeking for sick neonates among urban poor in Lucknow, northern India: a before and after intervention study

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Summary

OBJECTIVE To assess the impact of a behaviour change communication (BCC) intervention on qualified medical care-seeking for sick newborns in urban Lucknow, northern India.

METHODS Before and after intervention study conducted at two urban public hospitals at Lucknow. Neonates who did not have any morbidity or congenital malformation and were residents of Lucknow were enrolled within 48 h of birth and followed once between 6 and 8 weeks at the outpatients' clinic or home to assess the primary outcome measure which was qualified medical care-seeking for any neonatal illness. Mothers in the after-intervention phase received BCC intervention at enrolment, targeted at identification of danger signs of neonatal illnesses and promotion of qualified medical care-seeking. Analysis was by intention to treat.

RESULTS In the before-intervention phase, 510 neonates were enrolled (from March 2007 to August 2007) and 481 (94.3%) were followed up. In the after-intervention phase, 510 neonates were enrolled (September 2007–April 2008) and 490 (96.1%) were followed up. Neonatal morbidity was 50.3% (242/481) and 44.3% (217/490) in before and after intervention phases, respectively. Qualified medical care-seeking for neonatal illnesses was significantly higher among mothers after-intervention (OR = 2.12; 95% CI = 1.42–3.16; $P = 0.0001$).

CONCLUSION Since the behaviour change intervention package led to significant improvement in qualified medical care-seeking for sick newborns, this may be tested for effectiveness in other settings and considered for scaling up here, with rising proportion of institutional deliveries.

keywords neonatal illness, danger signs, care-seeking, behaviour change, IMNCI

Introduction

India in general and the state of Uttar Pradesh in particular have very high neonatal mortality rates of 39 per 1000 live births and 47.6 per 1000 live births, respectively (National Family Health Survey-3, 2005–06). Neonatal mortality accounts for more than two-thirds of infant mortality and more than half of the under-five mortality in India as well as in Uttar Pradesh. Eight percent of the global neonatal deaths occur in Uttar Pradesh alone. Neonatal mortality rates among urban poor and rural populations in Uttar Pradesh are similar at 50 per 1000 live births and 49.4 per 1000 live births, respectively. Thus, in order to achieve the Millennium Development Goal-4 of reducing under-5 deaths by two-thirds till the year 2015, a significant reduction in neonatal mortality is required.

Care-seeking for newborns in developing countries is a priority research area acknowledged by WHO (WHO 1999; Neonatal mortality formative research working group 2008) and other groups, such as the authors of the *Lancet* neonatal survival series (Martines *et al.* 2005). Although regional and sub-regional estimates vary, it has been estimated that more than half (52%) of the neonatal deaths in India occur due to infections (State of World's Newborns 2001). Inappropriate domiciliary newborn care practices and sub-optimal care-seeking have been cited as major causes of neonatal deaths among home deliveries (Bang *et al.* 1999; Darmstadt *et al.* 2005; Kumar *et al.* 2008). However, even among the hospital deliveries in urban Lucknow almost half the neonates developed morbidity and medical care was not sought for one-quarter of them (Srivastava *et al.* 2008). Also, more than one-quarter of the neonates presented with clinical signs suggestive of

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sepsis and one-third of those neonates for which qualified medical care was not sought, died (Awasthi *et al.* 2008). Behaviourally modifiable factors such as poor recognition of neonatal danger signs, local illness beliefs, use of traditional/home remedies and inability of mothers to identify appropriate health providers prevented or delayed the care-seeking for sick newborns in Lucknow (Awasthi *et al.* 2006, 2008).

We hypothesized that one-to-one counselling (along with pictorial 'Neonatal Well-Being Card') of urban poor mothers within 48 h of institutional delivery could improve qualified medical care-seeking for sick neonates in urban Lucknow, northern India.

The primary objective of our study was to assess the impact of a behaviour change communication (BCC) intervention on qualified medical care-seeking for sick newborns in urban Lucknow. The secondary objectives were to assess the impact of BCC intervention on (i) qualified medical care-seeking for newborns presenting with illnesses listed in Integrated Management of Neonatal and Childhood Illnesses (IMNCI) program, (ii) care-seeking from public hospitals and (c) the proportion of mothers who return to outpatients' clinic on pre-specified dates for follow-up and routine immunization. The first two secondary objectives relate to qualified medical care-seeking behaviour whereas the third relates to general program evaluation.

Subjects and methods

Study setting

Lucknow is the capital of the state of Uttar Pradesh, Northern India and has a native population of 2.2 million. United Nations Centre for Human Settlements (UNCHS) estimates that currently more than half of Lucknow's urban population lives in slums (Basic Services for the Urban Poor 2007). The literacy rate in Lucknow is 67.5% and the sex ratio is 893 females per 1000 males. Institutional delivery rate (59.5%) and antenatal care coverage (54.9%) are much higher than the average in Uttar Pradesh (Baseline facts: Uttar Pradesh 2007). However, neonatal mortality rate in Lucknow is similar to the average in Uttar Pradesh.

This study was conducted in two public hospitals, an urban Reproductive and Child Health (RCH) centre and a district hospital, after obtaining institutional ethical clearance and permission from relevant district authorities. This study is registered at clinicaltrials.gov with identifier NCT 00832143.

The RCH centre was a 12-bedded hospital, with free outpatients' clinic and free normal vaginal delivery care facilities round the clock which caters to mainly slum and low income group population from the adjoining areas.

The district hospital was a large 150-bedded hospital well equipped to deal with complicated obstetric cases referred from Lucknow and adjoining areas. While the district hospital had paid as well as free inpatient facilities, for this study we recruited mothers from free facility only, which catered to mainly lower income group.

Study design

This was a before and after-intervention study. This design was chosen primarily because the nature of the intervention was visible and it was difficult to randomize mothers to individual groups. We also considered it to be unethical to withhold counselling about newborn danger signs and benefits of qualified care-seeking from the control mothers recruited along with the intervention mothers.

Intervention

Based on the findings of our formative research (Awasthi *et al.* 2008), standard Integrated Management of Neonatal and Childhood Illnesses (IMNCI) guidelines (WHO 2003) and World Health Organisation (WHO) recommendations on care-seeking (WHO 1999), an intervention was developed which comprised a Neonatal Well-Being Card [Navjat Shishu Raksha Card (NSRC)] which was provided to mothers at the time of enrolment (in the after-intervention phase) and each component of the card was explained to the mothers through one-to-one counselling by the project staff. The card contained pictorial representation of neonatal danger signs, and messages regarding the importance of qualified medical care-seeking and names and addresses of public hospitals where care could be sought if required. The names of two public facilities nearest to the place of residence of the mother were marked in the NSRC and their addresses were explained. The mothers carried the card back to their homes after discharge from the hospital.

Doctors and nursing staff of the participating hospitals were also trained in the concept and delivery of the study intervention. Thus, counselling by the hospital nursing staff was envisaged as a reinforcement of the messages delivered by the project staff. Figure 1 shows the content and messages depicted in the NSRC. It took on an average 10 minutes to counsel and explain all the messages of the NSRC to the mothers.

Recruitment and data collection

Before-intervention phase

Neonates born in the participating hospitals within last 48 h were screened on all working days (excluding Sundays

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CONTENT	MESSAGES AND FORMAT	
A: Pictures of danger signs shown, read and explained to mothers in local terminology:	Textual	Picture
Watery liquid motions: 3 or more or >9 motions of normal consistency in 24 hours or blood in stool	√	
Reduced skin turgor	√	√
Sunken eyes	√	√
Fever	√	√
Hypothermia	√	
Nasal flaring	√	√
Elevated Respiratory rate (>60/minute)	√	
Chest in-drawing	√	√
Ear discharge	√	√
Eye discharge	√	√
Lethargy	√	√
Vomiting	√	√
Refusal to feed	√	√
Irritability	√	
Continuous cry	√	√
Cyanosis	√	√
Skin, Palms and soles yellow	√	√
Umbilical redness, discharge, pus, inflammation	√	√
More than 10 pustules or one/more skin ulcers	√	√
Bulging fontanel	√	√
Seizures	√	
B. Neonatal information entered in the Card	Mother's name, Father's name, hospital of delivery, date and time of birth, gender, birth weight, gestational age and address.	
C. List of public health facilities and their addresses explained	The addresses of two public health facilities nearest to her residence were encircled in the card and explained to her and she was advised to show her neonate at those facilities if the need arose.	
D. Simple messages on qualified medical care-seeking	Mothers were counseled that only those doctors who write formal prescription notes, explain the drug dosages and have a government registration number are appropriate for care-seeking for newborns. Such doctors are available at district hospitals, Community health centers, Reproductive and Child Health (RCH) centers and private clinics/hospitals. If a neonate exhibits any of the signs explained above, it should always be shown to a qualified provider as explained.	

Signs indicated in bold are IMNCI danger signs

Figure 1 Contents of the neonatal well-being card shown, read and explained to the mothers in local language.

and holidays) and were enrolled after taking written parental informed consent. Excluded were neonates who required any resuscitation at birth or presented with any clinically detectable serious congenital malformation or were hospitalized for any morbidity immediately after birth. Mothers who were not the residents of Lucknow or were likely to move out of the city in the next month were also excluded.

At enrolment, mothers were requested to come back to the outpatients' clinic of the respective hospital on a specified date after 6 weeks, for follow-up and routine immunization. Dates (along with days) of follow-up were written on the copy of the informed consent form given to mothers. If the mother along with the baby did not turn up in the outpatients' clinic, home follow-up was done by a trained medical social worker to collect the same information within next two weeks.

At follow-up, mothers/caregivers were asked whether their baby suffered any health related problem in the neonatal period. If the answer was affirmative then

symptoms of morbidity were recorded as narrated by them. A structured and pre-tested format was used to obtain the details of illnesses as told by the mother and/or caregivers. We used simple clinical definitions of neonatal illnesses as recommended by the Integrated Management of Neonatal and Childhood Illnesses (IMNCI) (WHO 2003) and National Neonatology Forum of India (Singh *et al.* 1989). IMNCI definitions were used for classifying patients as having diarrhoea with dehydration, persistent diarrhoea, pneumonia, meningitis, ear discharge, fever, more than 10 pustules, jaundice and sepsis (WHO 2003). IMNCI danger signs were the signs presented in a neonate likely to be suffering from serious bacterial infection, severe jaundice, diarrhoea with dehydration or severe persistent diarrhoea. Non-IMNCI illnesses were defined and classified as per the guidelines of National Neonatology Forum of India. Non-IMNCI illnesses were upper respiratory tract infection (URI), diarrhoea, conjunctivitis, dermatitis, physiological jaundice and others. A comprehensive list of illnesses and symptoms

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was prepared in local terminology to avoid any translation problem.

Mothers were also asked about the health care provider/providers consulted. Diagnosis and prescriptions by qualified providers, if available (in cases of qualified medical care-seeking) were also taken into account by the study paediatrician while categorizing symptoms of neonatal illnesses into a diagnosis. Thereafter responses were coded and classified into IMNCI and non-IMNCI illnesses.

We classified medical providers from whom care was sought for sick neonates in three categories (Awasthi & Pande 1998):

- Government Providers (GPs): Those employed by the government and working through government hospitals. To obtain their services, mothers had to pay nominal hospital registration fees. Mostly, medicines were provided free of charge. All the GPs were qualified medical practitioners.
- Non-Governmental Consultants (NGCs): These health care providers worked through privately owned clinics/hospitals and gave formal prescription notes to their patients. Almost all of them had recognized medical qualifications. They charged for consultation and investigations, and prescribed medicines were purchased from a pharmacy.
- Non-Governmental Dispensers (NGDs): These were also self-employed health care providers. The basic difference between these and the NGC was that the former dispensed medicines without prescription. Therefore, there was no record of medicines taken by their patients. Mostly, their service charge was inclusive of the cost of medicine. Unlike the NGCs, the NGDs were a heterogeneous group, some with a degree in modern medicine, others with qualifications in indigenous systems of medicine like Ayurveda, Unani and Homeopathy, who may also prescribe modern medicines. Yet there were many others who had no recognized qualifications.

Definition of qualified medical care-seeking as used in this study

Care-seeking was classified as qualified medical care-seeking, if at follow-up, a mother responded that she sought care for her sick newborn either (i) from a government hospital or (ii) said that she received a formal prescription note by the doctor on which names of the prescribed medicines were written and the doctor explained their dosages (either produced or could not

produce documentary evidence). Thus care-seeking from GPs and NGCs has been considered as qualified medical care-seeking in this study.

After-intervention phase

Variables and definitions for data collection in this phase were similar to those used in the before-intervention phase. The only difference was that in this phase the study intervention was provided to mothers immediately after the enrolment.

Statistical analysis

The size of the sample was designed to provide an 80% power at 5% alpha to detect a 50% increase in qualified medical care-seeking behaviour with intervention (one-to-one counselling [along with NSRC] of mothers). A 10% loss-to-follow-up has been taken into consideration.

All analyses were performed on an intention-to-treat basis and *P* values were two-sided. The effect of intervention on the primary as well as secondary outcomes was assessed using multiple logistic regression to adjust for variables with unequal distribution at baseline (mother's education, father's education and religion) among the two arms. Subgroup analyses were performed for the primary outcome (qualified medical care-seeking) as well as for the secondary outcome relating to program evaluation (visiting outpatients' clinic on pre-specified dates). Although the size of the study shall not provide adequate power to assess efficacy of intervention against the outcomes within subgroups, this was undertaken to investigate the consistency of the study conclusions among different subpopulations defined by each of multiple baseline characteristics of the subjects.

Results

In the before-intervention phase, 510 neonates were enrolled (from March 2007 to August 2007) and 481 (94.3%) were followed up between 6 and 8 weeks of age at the outpatients' clinic of the respective hospital or at home. Twenty-nine (5.6%) were lost to follow-up primarily because of migration of families or incomplete addresses. Similarly, in the after-intervention phase, 510 neonates were enrolled (from September 2007 to April 2008) and 490 (96.1%) were followed up. Twenty (3.9%) cases were lost to follow-up. Baseline variables among the before-intervention and after-intervention families are given in Table 1.

S. Awasthi *et al.* **Effect of behaviour change communication****Table 1** Baseline characteristics among before-intervention and after-intervention families*

Variables	Before-intervention (<i>n</i> = 510)	After-intervention (<i>n</i> = 510)
Mother's education		
No schooling	161 (31.6)	226 (44.3)
≤5 years education	43 (8.4)	48 (9.4)
Secondary/higher	306 (60.0)	236 (46.3)
Father's education		
No schooling	163 (32.0)	235 (46.1)
≤5 years education	160 (31.4)	106 (20.8)
Secondary/higher	187 (36.6)	169 (33.1)
Mother's occupation		
Unemployed	488 (95.6)	488 (95.6)
any vocation	22 (4.4)	22 (4.4)
Father's occupation		
Daily wages	63 (12.4)	66 (12.9)
Salaried/professionals	123 (20.6)	99 (17.5)
Self-employed	305 (59.8)	330 (64.7)
Others	19 (3.7)	15 (2.9)
Religion		
Hindus	263 (51.1)	204 (40.0)
Muslims	244 (47.8)	306 (60.0)
Others	03 (0.6)	00 (0.0)
Residence		
Slum	164 (32.2)	154 (30.2)
Non-slum	346 (67.8)	356 (69.8)
Joint family	385 (75.4)	368 (72.2)
Mother's age	24.8 ± 3.9	24.9 ± 4.1
Father's age	29.3 ± 5.0	29.8 ± 5.0
Family income	2804.5 ± 1565.1	2785.2 ± 1396.7
Other maternal variables		
Any Antenatal care (ANC)	484 (94.9)	482 (94.5)
prior to this delivery		
ANC at Public hospital	459 (90.0)	463 (90.8)
≥3 ANC visits	394 (77.3)	364 (71.4)
Tetanus Toxoid (≥2 doses)	453 (88.8)	455 (89.2)
Maternal morbidity		
Fever in prenatal period	55 (10.8)	37 (7.3)
Leaking/bleeding per vaginum	29 (5.7)	38 (7.4)
in prenatal period		
Any chronic disease	15 (2.9)	19 (3.7)
Newborn variables		
Males	265 (52.0)	274 (53.7)
Singletons	500 (98.0)	498 (97.6)
Birth weight (<2500 g)	148 (29.0)	167 (32.7)
Gestational age (<37 weeks)	44/335 (13.1)	32/329 (9.7)
[on the basis of LMP]		
Birth order = 1	185 (36.3)	165 (32.4)

*Numbers (percentages) have been reported. Plus-minus values are means ± SD. Family Income has been reported in Indian rupees (INR) [1 US\$ = 50 INR]. All variables among the two groups were similar except that in the after-intervention group the mothers and fathers were significantly lesser educated, proportion of Muslims was significantly higher; mothers with ≥3 ANC visits were significantly lower.

P-values <0.05 have been taken as statistically significant. Chi-square test has been used for comparison of categorical variables and Student's *t*-test has been used for comparison of continuous variables.

S. Awasthi *et al.* Effect of behaviour change communication**Table 2** Distribution of neonatal illnesses in the before-intervention and after-intervention phases

Neonatal Illnesses	Before-intervention (<i>n</i> * = 242) <i>m</i> † (<i>m/n</i> %)	After-intervention (<i>n</i> * = 217) <i>m</i> † (<i>m/n</i> %)
IMNCI		
Diarrhoea with dehydration	04 (1.7)	01 (0.5)
Dysentery	00 (0.0)	01 (0.5)
Persistent diarrhoea	07 (2.9)	03 (1.4)
Isolated Fever	14 (5.8)	16 (7.4)
Hypothermia	00 (0.0)	01 (0.5)
Pneumonia	25 (10.3)	27 (12.4)
Ear discharge	04 (1.7)	03 (1.4)
Pathological jaundice	05 (2.1)	01 (0.5)
Septicemia	28 (11.6)	16 (7.4)
Necrotizing enterocolitis	02 (0.8)	01 (0.5)
Meningitis	02 (0.8)	01 (0.5)
Multiple pustules	11 (4.5)	13 (6.0)
Umbilical sepsis	05 (2.1)	02 (0.9)
Total	107 (44.2)	86 (39.6)
Non-IMNCI		
Diarrhoea	34 (14.0)	38 (17.5)
Upper respiratory infection	46 (19.0)	65 (29.9)
<i>Conjunctivitis</i>	08 (3.3)	07 (3.2)
Jaundice	16 (6.6)	02 (0.9)
Dermatitis	11 (4.5)	15 (6.9)
Others‡	20 (8.3)	04 (1.8)
Total	135 (55.8)	131 (60.4)

*Total number of morbid neonates in before and after-intervention phases.

†Total number of neonates having particular morbidity.

‡This includes: In Before-Intervention: vomiting = 9, oral thrush = 4, evening colic = 2, umbilical granuloma = 2, injury = 2, brachial palsy = 1. In After-Intervention: injury (neonatal death) = 1; shoulder dislocation = 2; cause unknown (neonatal death) = 1.

The Mean number of morbidities per neonate was 1.11(±0.35) and 1.08(±0.28) in the before and after-intervention phases, respectively. We have considered only primary disease conditions in neonatal morbidity classification (Table 2). Neonatal morbidity among the followed up neonates was similar in before and after-intervention phases being 50.3% (242/481; 95% CI = 45.7–54.8) and 44.3% (217/490; 95% CI = 39.8–48.8), respectively.

There were six neonatal deaths in the before-intervention phase due to diarrhoea with dehydration (*n* = 1), necrotizing enterocolitis (*n* = 2), probable septicaemia (*n* = 2) and probable aspiration (*n* = 1). There were 12 neonatal deaths in the after-intervention period due to probable septicaemia (*n* = 4), pneumonia (*n* = 2), necrotizing enterocolitis (*n* = 1), meningitis (*n* = 1), hypothermia (*n* = 1), probable jaundice (*n* = 1), road accident (*n* = 1) and due to unknown cause (*n* = 1).

Care-seeking behaviour

Care was sought from any type of medical provider (GPs, NGCs or NGDs) at least once for 80.1% (196/242) sick neonates in before-intervention and 88.5% (192/217) sick neonates in after-intervention phase, respectively (OR = 1.80; 95% CI = 1.03–3.16; *P* = 0.02). Care-seeking from at least one qualified provider (i.e. GPs or NGCs) increased from 50.8% (123/242) before intervention to 68.7% (149/217) after intervention (OR = 2.12, 95% CI = 1.42–3.16, *P* = 0.0001). However, care-seeking from only NGDs decreased from 30.2% (73/242) before intervention to 19.8% (43/217) after intervention (OR = 0.57, 95% CI = 0.36–0.90, *P* = 0.01). The numbers indicating any type of care-seeking represent only those for whom care was sought and which were managed and received treatment. Mean number of medical providers consulted

Table 3 Qualified medical care-seeking for sick newborns before and after-intervention

Variable	Before-intervention <i>m/n</i> (%)	After-intervention <i>m/n</i> (%)	OR (95% CI) <i>P</i> value	Adjusted* OR (95% CI) <i>P</i> value
Qualified medical care-seeking for all illnesses	123/242 (50.8)	149/217 (68.7)	2.12 (1.42–3.16) 0.0001	2.42 (1.63–3.60) <0.0001
Qualified medical care for IMNCI illnesses	58/107 (54.2)	63/86 (73.3)	2.31 (1.20–4.47) 0.006	2.66 (1.40–5.07) 0.003
Care-seeking from Government providers (GPs)	86/242 (35.5)	96/217 (44.2)	1.44 (0.97–2.13) 0.057	1.57 (1.07–2.30) 0.022

m, Those who sought care from at least one qualified medical provider.

n, Total neonates who had any morbidity.

*Adjusted for mother's education, father's education and religion.

Table 4 Subgroup analysis of qualified medical care-seeking for sick neonates before and after-intervention

Variables	Number of morbid neonates		Number of those who sought qualified medical care		OR (95% CI)	P-value
	Before (<i>n</i> = 242) <i>n</i>	After (<i>n</i> = 217) <i>n</i>	Before (<i>n</i> = 123) <i>m</i> (<i>m/n</i> %)	After (<i>n</i> = 149) <i>m</i> (<i>m/n</i> %)		
Study Site						
RCH centre	78	101	24 (31)	64 (63.4)	3.89 (1.98–7.68)	0.00001
District hospital	164	116	99 (60.4)	85 (73.6)	1.80 (1.04–3.12)	0.02
Mother's education						
No Schooling	79	93	32 (41)	60 (65)	2.67 (1.38–5.31)	0.001
Any Schooling	163	124	91 (56)	89 (72)	2.01 (1.19–3.42)	0.005
Father's education						
No Schooling	90	103	37 (41)	68 (66)	2.78 (1.49–5.22)	0.0005
Any Schooling	152	114	86 (57)	81 (71)	1.88 (1.09–3.27)	0.02
Father's occupation						
Daily wages	31	24	11 (36)	22 (92)	20.0 (3.46–151.2)	0.00002
Salaried/professional	52	38	31 (60)	30 (79)	2.54 (0.89–7.41)	0.05
Self-employed	148	147	74 (50)	94 (64)	1.77 (1.08–2.91)	0.02
Others	11	8	07 (64)	03 (38)	0.34 (0.03–3.18)	0.25
Residence						
Slum	84	62	40 (48)	45 (73)	2.91 (1.36–6.27)	0.002
Non-slum	158	155	83 (53)	104 (67)	1.84 (1.14–2.99)	0.008
Religion						
Hindus	118	78	66 (56)	59 (76)	2.45 (1.24–4.84)	0.004
Muslims	123	139	57 (46)	90 (65)	2.13 (1.26–3.61)	0.003
Maternal age						
≤20 years	26	34	17 (65)	26 (77)	1.72 (0.48–6.20)	0.34
>20 years	216	183	106 (49)	123 (67)	2.13 (1.39–3.27)	0.0002
Parity						
<4	205	181	112 (55)	127 (70)	1.95 (1.26–3.04)	0.001
≥4	37	36	11 (30)	22 (61)	3.71 (1.27–11.12)	0.007
Family structure						
Joint	189	160	97 (51)	110 (69)	2.09 (1.31–3.32)	0.0009
Nuclear	53	57	26 (49)	39 (68)	2.25 (0.97–5.28)	0.04
Prior ANC visits						
<3 visits	60	62	20 (33)	40 (65)	3.64 (1.62–8.26)	0.0005
≥3 visits	182	155	103 (57)	109 (70)	1.82 (1.13–2.93)	0.009
Birth weight of the neonate						
<2500 g (LBW)	77	73	37 (48)	54 (74)	3.07 (1.46–6.50)	0.001
≥2500 g	165	144	86 (52)	95 (66)	1.78 (1.10–2.90)	0.01
Gender of the neonate						
Males	148	110	75 (51)	81 (74)	2.72 (1.54–4.80)	0.0001
Females	94	107	48 (51)	68 (64)	1.67 (0.91–3.06)	0.07
Birth Order						
1	86	63	49 (57)	42 (67)	1.51 (0.73–3.14)	0.23
>1	156	154	74 (47)	107 (70)	2.52 (1.54–4.13)	0.00008

was 1.1(±0.30) (*n* = 196) and 1.03(± 0.17) (*n* = 192) in the before and after-intervention phases, respectively.

Primary and secondary outcomes

Unadjusted analyses showed that qualified medical care-seeking for all neonatal illnesses and for IMNCI illnesses

improved significantly in the after-intervention phase (Table 3). We adjusted for unequal distribution of maternal education, paternal education and religion in the two phases but there was no effect on primary outcome measure. The distribution of children within families (before and after-intervention) was similar at baseline as well as among those families which had sick newborns at

Table 5 Subgroup analysis of those who returned to outpatients' clinic on pre-specified dates for follow-up and immunization before and after-intervention

Variables	Total enrolled		Those who returned		OR (95% CI)	P-value
	Before (<i>n</i> = 510) <i>n</i>	After (<i>n</i> = 510) <i>n</i>	Before (<i>n</i> = 154) <i>m</i> (<i>m/n</i> %)	After (<i>n</i> = 221) <i>m</i> (<i>m/n</i> %)		
Study site						
RCH Centre	154	243	41 (27)	112 (46)	2.36 (1.49–3.74)	0.0001
District Hospital	356	267	113 (32)	109 (41)	1.48 (1.05 to2.09)	0.02
Mother's education						
No schooling	161	226	43 (27)	81 (36)	1.53 (0.96–2.45)	0.057
Any Schooling	349	284	111 (32)	140 (49)	2.08 (1.49–2.92)	<0.0001
Father's education						
No schooling	163	235	44 (27)	90 (38)	1.68 (1.06–2.65)	0.02
Any schooling	347	275	110 (32)	131 (48)	1.94 (1.38–2.73)	<0.0001
Father's occupation						
Daily wages	63	66	15 (24)	24 (36)	1.83 (0.80–4.23)	0.12
Self employed	305	330	91 (30)	134 (41)	1.61 (1.14–2.27)	0.004
Salaried/professionals	123	99	40 (33)	55 (56)	2.59 (1.45–4.66)	0.0005
Others	19	15	8 (42)	8 (53)	1.57 (0.33–7.72)	0.5
Residence						
Slum	164	154	47 (29)	59 (38)	1.55 (0.94–2.54)	0.06
Non-slum	346	356	107 (31)	162 (46)	1.85 (1.34–2.55)	<0.0001
Religion						
Hindus	263	204	88 (34)	91 (45)	1.60 (1.08–2.38)	0.01
Muslims	244	306	66 (27)	130 (43)	1.99 (1.37–2.91)	0.0001
Family structure						
Joint	385	368	113 (29)	168 (46)	2.02 (1.48–2.76)	<0.0001
Nuclear	125	142	41 (33)	53 (37)	1.22 (0.71–2.09)	0.43
Prior ANC visits						
<3 visits	115	146	25 (22)	56 (38)	2.24 (1.24–4.06)	0.003
≥3 visits	395	364	129 (33)	165 (45)	1.71 (1.26–2.32)	0.0004
Maternal age						
≤ 20 years	63	74	18 (29)	30 (41)	1.70 (0.78–3.72)	0.14
>20 years	447	436	136 (30)	191 (44)	1.78 (1.34–2.37)	<0.0001
Parity						
<4	438	440	137 (31)	186 (42)	1.61 (1.21–2.14)	0.0007
≥4	72	70	17 (24)	35 (50)	3.24 (1.49–7.09)	0.001
Birth weight						
LBW	148	167	46 (31)	72 (43)	1.68 (1.03–2.75)	0.03
Non-LBW	362	343	108 (30)	149 (43)	1.81 (1.31–2.49)	0.0001
Gender						
Males	265	274	72 (27)	122 (45)	2.15 (1.48–3.14)	<0.0001
Females	245	236	82 (34)	99 (42)	1.44 (0.97–2.12)	0.057
Birth order						
1	185	165	58 (32)	79 (48)	2.01 (1.27–3.19)	0.001
>1	325	345	96 (30)	142(41)	1.67 (1.20–2.33)	0.001

follow-up. Care-seeking from public providers (GPs), which were also the designated providers in our study intervention also improved significantly.

Subgroup analysis of qualified medical care-seeking behaviour among before and after-intervention families is given in Table 4. We observed that following the intervention qualified medical care-seeking increased in all subgroups, but it did not achieve statistical significance for

female neonates, first birth order and among mothers ≤20 years of age.

There was an increase in the number of mothers returning to outpatients' clinic for follow-up and routine immunization of their baby on pre-specified dates in the after-intervention phase (43.3%) as compared to the before-intervention phase (30.2%) (OR = 1.77; 95% CI = 1.35–2.31; *P* < 0.0001).

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Subgroup analysis of those who returned to outpatients' clinic on pre-specified dates before and after-intervention is shown in Table 5. After intervention, there was an increase in the mothers returning to outpatients' clinic in all subgroups but did not achieve statistical significance among uneducated mothers, fathers who worked on daily wages, slum dwellers, nuclear families, mothers with age ≤ 20 years, and female neonates.

Discussion

This before- and after-intervention study was conducted in two public health facilities over a period of 15 months, to assess the impact of a BCC intervention on qualified medical care-seeking for sick neonates in urban Lucknow. We observed that qualified medical care-seeking for neonatal illnesses improved significantly after intervention (OR = 2.12, 95% CI = 1.42–3.16; $P = 0.0001$).

Researchers have noted that the increasing privatization of health care could result in decline in access to quality health care among poorer section, poorer regions and poorer states in India (Dilip & Duggal 2002). The private sector has not been restricted to upper and middle classes alone but is used by even poorer classes. While the rich and educated classes usually opt for private qualified providers, poorer people opt for untrained providers who provide relatively cheaper treatments.

Due to poor coverage of any health insurance program, out-of-pocket expenditure contributes to three-quarter of the total expenditure on health care and is a major cause of debts among poor families (Dilip & Duggal 2002). Hence care-seeking is not prioritized which leads to either no care-seeking at all or care-seeking from relatively cheap and easily accessible untrained providers (Awasthi *et al.* 1998). Care-seeking from qualified providers have also been reported to be sub-optimal everywhere in south Asia (Zoysa *et al.* 1998; Awasthi *et al.* 2006; Syed *et al.* 2008).

We observed that qualified medical care-seeking for neonatal illnesses was significantly more common among mothers who received our BCC intervention. Although number of published trials which target neonatal medical care-seeking is limited (Kelly & Black 2001; Hill *et al.* 2004; Haws *et al.* 2007), there is emerging evidence that behaviour change communication could improve medical care-seeking for children and neonates even in resource poor settings (Mohan *et al.* 2004; Kumar *et al.* 2008). Hence, it is evident that behaviour change communication is a potential tool for increasing qualified medical care-seeking for sick newborns and needs scaling up with rising institutional deliveries, post-launch of *Janani Suraksha Yojana* under National Rural Health Mission (NRHM) (Ministry of Health & Family Welfare 2008), which

provides financial incentives to families opting for institutional deliveries in public hospitals.

In India, females are more likely to die in first 5 years of life (Khanna *et al.* 2003) and gender differences in child care-seeking have been reported other researchers (Willis *et al.* 2009). We have previously reported inadequate care-seeking for female neonates among urban poor in Lucknow (Srivastava *et al.* 2008). In our study, we observed that improvement in qualified medical care-seeking for female neonates did not achieve statistical significance unlike that for male neonates. Further ethnographic research is required to make our BCC intervention gender sensitive with appropriate messages to address this issue.

An increase in follow-up at outpatient's clinic and routine immunization on pre-specified dates was observed among all subgroups in the after-intervention phase, but did not achieve statistical significance among uneducated mothers, fathers working on daily wages, slum dwellers, nuclear families, teenage mothers and female neonates. The reasons for this could be potential loss of wages, poor awareness about benefits of immunization and follow-up, lack of spousal support and potential neglect of the health of the female neonate. However, the reasons underlying these observations need to be studied further.

A major strength of this study was the impressive improvement in qualified medical care-seeking through a relatively simple intervention. Our study findings also exhibit that it is possible to improve care-seeking from government facilities, which if promoted can lead to enhanced equity in neonatal health. The sample size and the time frame of the study were limited and did not allow studying the impact of intervention on neonatal mortality.

One major limitation is the lack of concurrent controls. However, the short time period within which the study was completed may not support the assumptions that the increase in qualified medical care-seeking as observed by us may be an artefact of an underlying upward trend in the care-seeking for sick newborns. Achieving such substantial behaviour changes over a short period of time generally requires intensive promotional work (Curtis *et al.* 2001). Moreover, there was no other significant activity addressing neonatal care-seeking behaviour in the study setting during the study period. Another limitation of this study is that the most of the mothers in our study had sought antenatal care at least once; hence our findings cannot be generalized for mothers who never seek care for themselves or their newborns.

Our findings suggest that it is possible to increase qualified medical care-seeking for sick newborns through socio-culturally contextualized behaviour change intervention in urban Lucknow. It needs to be further investigated whether this behaviour change intervention increases

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medical care-seeking in other settings (such as rural areas, where public health infrastructure and other conditions are different than those among urban populations) and in settings where neonatal mortality is different and the characteristics of the care-providers differ.

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