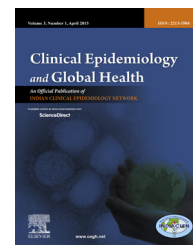


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Original Article

Breastfeeding pattern and the risk of neonatal illnesses among urban poor in Lucknow, Northern India: A prospective follow-up study

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ABSTRACT

Background: Exclusive breastfeeding has been shown to be protective against infants' illnesses. Evidence is sparse about the association of different breastfeeding patterns on neonatal illnesses.

Methods: The study was 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 up once at 6 weeks of age, at the outpatients clinic or home to assess neonatal illnesses and established (voluntary) breastfeeding pattern (exclusive, predominant, partial, never breastfed). Association of established breastfeeding patterns with neonatal illnesses was studied using multivariate logistic regression, adjusting for potential confounders.

Results: A total of 1020 neonates were enrolled. Follow-up information on occurrence of neonatal illnesses (if any) as well as established breastfeeding pattern was available for 937 (91.8%) enrolled neonates. Among these, 46% (431/937) presented with any illness, with 20.2% (189/937) reported with at least one danger sign of severe illnesses as mentioned in Integrated Management of Neonatal and Childhood Illnesses (IMNCI).

Partially breastfed neonates were significantly more likely to develop any illness (Adj. OR = 6.6; 95% CI: 4.0–10.8, $p < 0.001$) as well as IMNCI illnesses (Adj. OR = 5.8; 95% CI: 2.9–11.8, $p < 0.001$) as compared to exclusively breastfed neonates. Similarly, predominantly breastfed neonates were also significantly more likely to develop any illness (Adj. OR = 3.4; 95% CI: 2.0–5.8, $p < 0.001$) as well as IMNCI illnesses (Adj. OR = 2.9; 95% CI: 1.3–6.4, $p < 0.01$) as compared to exclusively breastfed neonates. The strength and consistency of these associations remained similar on refitting the model with term, singleton, and normal birth weight neonates.

Conclusions: Exclusive breastfeeding during the neonatal period was significantly protective against the occurrence of any illness as well as illnesses mentioned in the IMNCI program, as compared to predominant or partial breastfeeding.

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1. Background

In 2015, an estimated 5.9 million childhood deaths occurred, among which 2.7 million (46%) occurred in the neonatal period.¹ India contributed to around 26%¹ of all neonatal deaths in the world. In low-resource settings in India, infections contribute to around half of the neonatal deaths.²

Throughout the world, evidence suggests that due to several biological reasons exclusive breastfeeding is protective against infectious diseases among infants and children. Immune complexes in breastmilk help to initiate and stimulate an infant's immune system.³ Oligosaccharides, Immunoglobulins (IgA, IgM, IgG), lactoferrin, B lymphocytes, T lymphocytes, eosinophils, and neutrophils provided from the mother's milk have been shown to have a protective effect against infections.^{3–5} Having breastmilk as the single source for feeding, further, protects infants from contracting infections from the external environment such as contaminated top milk, water or bottle feeding.⁶

Neonatal period is a time in which the newborn could be at highest risk of infection than within any time period during infancy and childhood.⁷ The risk of contracting infections through external sources of nutrition gradually decreases with age, and though there is a body of evidence demonstrating significant protective effect of breastfeeding (particularly exclusive breastfeeding) against infant/childhood morbidity and mortality,^{7–9} there is sparse literature on the strength of this protection within the neonatal period.¹⁰ A recent systematic review found only 6 studies (all observational) that had studied the effect of breastfeeding on neonatal morbidity; among which only two studies presented an adjusted analysis for potential confounding.¹¹ The present study assesses the association between the established neonatal breastfeeding pattern (exclusive, predominant, partial, never breastfed) with neonatal illnesses among urban poor in Lucknow, northern India.

2. Methods

2.1. Study design

This was a prospective follow-up study of neonates delivered at two public hospitals in urban Lucknow.

2.2. Setting

Lucknow is the capital city of Uttar Pradesh, a state in Northern India and has a native population of 4.5 million.¹² United Nations Centre for Human Settlements (UNCHS) estimates that more than half of Lucknow urban population live in slums.¹³ Total literacy rate in Lucknow is 79%, and sex ratio is 900 females per thousand males.¹² Institutional delivery rate is 76.3% and antenatal care coverage is 64.6%.¹⁴

The study was conducted in two public hospitals, an urban Reproductive and Child Health (RCH) center and the district hospital, after obtaining institutional ethical clearance from King George's Medical University and permission from relevant district authorities. The RCH center is 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. District hospital is a 150-bedded hospital, which is well-equipped in dealing with complicated obstetric cases referred from Lucknow and adjoining areas. While the district hospital has both paid as well as free inpatient facilities, for this study we have recruited mothers from the free facility only, which caters to mainly lower income group so that economic status of subjects could be similar to those recruited from the RCH center.

2.3. Study population

2.3.1. Inclusion and exclusion criteria

Mothers of neonates born at the study sites and who gave written informed consent were enrolled.

Excluded were the mothers of neonates who required any resuscitation at birth and/or presented with any clinically detectable serious congenital malformation.

Mothers who were not residents of Lucknow or who were likely to move out of the city in next 1 month were also excluded.

2.3.2. Enrollment

Mothers in this study were enrolled from March 2007 to April 2008. At enrollment, a pre-tested questionnaire was used to elicit data on identification (unique identifier, name and address) and baseline variables as shown in [Table 1](#).

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.

Mothers were requested to keep prescriptions, receipts, wrappers, investigation reports, bottles of medicines etc. in case their newborn suffered any illness and were informed that this information would be collected at follow-up.

2.3.3. Follow-up

If the mother along with the baby did not turn up in the outpatients' department at the pre-specified dates for routine immunization at 6 weeks, home follow-up was done by a trained research person within next 2 days to obtain the same information.

At the time of follow-up mothers/caregivers were asked if their baby faced any health problem in the neonatal period and if answered in affirmation, symptoms of morbidity were recorded as narrated by them. A structured and pre-tested questionnaire was used to elaborate the details of illnesses and established (voluntary) neonatal breastfeeding pattern (exclusive, predominant, partial, never breastfed) as told by the mother. A comprehensive list of illnesses and symptoms was prepared in local terminology to avoid any translation problem. Information about the health care providers consulted was also obtained from the study participants. Medical prescriptions, investigation records, medicine bottles, chemist's receipts, etc., one or more of which were available in all cases, were also taken into account to support the information provided by the caregivers. Diagnosis and prescriptions by qualified health care providers, if available, were taken into

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