Across-country comparisons of selected infant and young child feeding indicators and associated factors in four South Asian countries

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Abstract

Background. *Information on infant and young child feeding is widely available in Demographic and Health Surveys and National Family Health Surveys for countries in South Asia; however, infant and young child feeding indicators from these surveys have not been compared between countries in the region.*

Objective. *To compare the key indicators of breastfeeding and complementary feeding and their determinants in children under 24 months of age between four South Asian countries.*

Methods. *We selected data sets from the Bangladesh Demographic and Health Survey 2004, the India National Family Health Survey (NFHS-03) 2005–06, the Nepal Demographic and Health Survey 2006, and the Sri Lanka 2000 Demographic and Health Survey. Infant feeding indicators were estimated according to the key World Health Organization indicators.*

Results. *Exclusive breastfeeding rates were 42.5% in Bangladesh, 46.4% in India, and 53.1% in Nepal. The rate of full breastfeeding ranged between 60.6% and 73.9%. There were no factors consistently associated with the rate of no exclusive breastfeeding across countries. Utilization of health services (more antenatal clinic visits) was associated with higher rates of exclusive breastfeeding in India but lower rates in Nepal. Delivery at a health facility was a negative determinant of exclusive breastfeeding in India. Postnatal contacts by Public Health Midwives were a positive factor in Sri Lanka. A considerable proportion of infants under 6 months of age had been given plain water, juices, or other nonmilk liquids. The rate of timely first suckling ranged from 23.5% in India to 56.3% in Sri Lanka. Delivery by cesarean section was found to be a consistent negative factor that delayed initiation of breastfeeding. Nepal reported the lowest bottle-feeding rate of 3.5%. Socioeconomically privileged mothers were found to have higher bottle-feeding rates in most countries.*

Conclusions. *Infant and young child feeding practices in the South Asia region have not reached the expected levels that are required to achieve a substantial reduction in child mortality. The countries with lower rates of exclusive breastfeeding have a great potential to improve the rates by preventing infants from receiving water and water-based or other nonmilk liquids during the first 6 months of life.*

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Key words: Across-country comparison; breastfeeding; infant and young child feeding; South Asia

Introduction

South Asia has remained over the past few decades a global hub for the burden of infant and child malnutrition and mortality. According to a recent series in the

Lancet, child undernutrition is the underlying cause of 3.5 million deaths, 35% of the disease burden in children under 5 years of age, and 11% of total global disability-adjusted life years (DALYs) lost [1]. Furthermore, this review found that suboptimal breastfeeding in the first 6 months of life results in 1.4 million deaths and 10% of the disease burden in children under five [1].

Improving infant and young child feeding practices will be of great importance in helping countries in South Asia to achieve their Millennium Development Goals of reducing child mortality by two-thirds between 1990 and 2015 [2]. It has been estimated that 10% to 15% of under-five deaths in resource-poor countries could be prevented through achievement of 90% coverage with exclusive breastfeeding alone [3]. Two cohort studies—one in Ghana and the other in Nepal—showed that 22% and 19% of neonatal deaths, respectively, could be avoided with the universal initiation of breastfeeding within the first hour of life [4, 5].

The current World Health Organization (WHO) recommendation for infant and young child feeding includes initiation of breastfeeding within the first hour after birth, exclusive breastfeeding from birth to 6 months of age, and giving nutritionally adequate and safe complementary foods thereafter while continuing breastfeeding up to 2 years of age or beyond [6]. Infants and young children should not be given any forms of prelacteal foods or breastmilk substitutes, labeled commonly as "formula feeds," and should not use feeding bottles, soothers, or pacifiers at any time. The change in the duration of exclusive breastfeeding from the previous WHO recommendation of 4 months to 6 months was based on an adequate review of evidence, including a meta-analysis [7–9]. There is epidemiological evidence to suggest that early initiation of breastfeeding would have additional benefits in reducing mortality even in exclusively breastfed infants, reaffirming recommendations to begin breastfeeding immediately after delivery [5].

Despite the numerous recognized advantages [10] and benefits of appropriate feeding practices during early childhood, the rates of exclusive breastfeeding and early initiation of breastfeeding in most countries are typically low and have only slowly improved. The available recent Demographic and Health Surveys in the South Asia region indicate that most member countries have exclusive breastfeeding rates among infants under 6 months between 43% and 75% [11–14]. Identification of the modifiable factors that influence feeding practices is essential for building effective nutrition interventions by targeting individuals, families, and communities at heightened risk for suboptimal feeding behaviors. In addition, identification of modifiable risk factors will help public health nutrition program managers and policy makers develop strategies to improve these contributory factors.

Across-country comparison of health indicators has

the advantage of describing variation of health status and their determinants across countries in a region. It is important to recognize the factors that are common to South Asia, since the member countries share many common socioeconomic and cultural attributes. Across-country comparisons may also be useful to understand the characteristics that are unique to each country and develop locally acceptable interventions to improve practices. Across-country comparisons may also be beneficial to regional managers of funding organizations for the purpose of resource allocation and program evaluation.

Information on infant and young child feeding practices is widely available in the Demographic and Health Surveys of many developing countries; however, there have been few comparisons of such indicators between countries, except for the Infant and Young Child Feeding Update that compiled the key indicators from the Demographic and Health Survey reports around the world [15]. However, this global comparison of indicators does not include any across-country comparisons of factors associated with indicators of infant and young child feeding practices.

The present study aimed to compare the key indicators of breastfeeding and complementary feeding in children under 24 months of age between four South Asian countries—Bangladesh, India, Nepal, and Sri Lanka—by using recent Demographic and Health Survey data. It also aimed to identify the sociodemographic characteristics and other factors associated with poor infant feeding practices across these countries.

Methodology

Data sources

We selected the Bangladesh Demographic and Health Survey 2004, the India National Family Health Survey (NFHS-3) 2005–06, the Nepal Demographic and Health Survey 2006, and the Sri Lanka Demographic and Health Survey 2000 data sets in this study [11–13, 16]. The data sets for the Sri Lanka Demographic and Health Survey 2006–07 [14] and the Pakistan Demographic and Health Survey 2007 were not available at the time of this study. The details of survey methodology, sampling procedure, and questionnaires are available in the respective Demographic and Health Survey reports and are also described in the individual country papers in this series [17–20].

Survey methodology

The estimated midyear populations in the survey years were 144 million in Bangladesh, 1,100 million in India, 27 million in Nepal, and 20 million in Sri Lanka. The Bangladesh Demographic and Health Survey

2004 used a stratified, multistage cluster sample and covered all six administrative regions in the country. The sample, which was stratified by urban and rural sectors, aimed to interview approximately 10,000 ever-married women aged 10 to 49 years from 10,500 households. The NFHS-3 2005–06 in India covered 29 states using a two-stage sample design in most rural areas and a three-stage sample design in most urban areas. In this survey 109,041 sample households were visited and 124,385 ever-married women aged 15 to 49 years were interviewed. The sample for the Nepal Demographic and Health Survey 2006 was based on a two-stage, stratified sample of households from the five regions in the country. The survey was designed to obtain completed interviews of 8,600 women aged 15 to 49 years from a total of 9,036 households nationwide. The Sri Lanka Demographic and Health Survey 2000 used a multistage cluster sample, stratified by urban, rural, and tea estate sectors of the country. The survey was confined to seven of the nine zones of the country because of the unsettled conditions prevailing in two zones—the Northern and Eastern provinces. In the selected households, 6,385 ever-married women in the age group from 15 to 49 years were interviewed.

The present analysis was confined to last-born children aged 0 to 23 months living with the respondent; it included 2,482 children in Bangladesh, 20,108 in India, 1,906 in Nepal, and 1,127 in Sri Lanka, for a total of 25,623 children. All the surveys reported very high response rates for the interviews with women of reproductive age, the main source of information for the analyses reported. The response rates were highest in Bangladesh (98.6%) and Nepal (98.4%) and were lower in Sri Lanka (96.6%) and India (94.5%).

Feeding indicators

Infant feeding indicators were estimated using the WHO indicator definitions [21]. These indicators include the timely first suckling rate (the proportion of infants less than 12 months of age who first suckled within 1 hour after birth), the ever-breastfed rate (the proportion of infants less than 12 months of age who were ever breastfed), the current breastfeeding rate (the proportion of children less than 24 months of age who are currently breastfed), the continued breast-feeding rate (1 year) (the proportion of children 12 to 15 months of age who are breastfed), the continued breastfeeding rate (2 years) (the proportion of children 20 to 23 months of age who are breastfed), the exclusive breastfeeding rate (the proportion of infants less than 6 months of age who are exclusively breastfed), the pre-dominant breastfeeding rate (the proportion of infants less than 6 months of age who are fed predominantly breastmilk with no additional food-based fluids other than fruit juice and sugar water), the full breastfeeding rate (the proportion of infants less than 6 months of age

who are either exclusively or predominantly breastfed), the bottle-feeding rate (the proportion of infants less than 12 months of age who received any food or drink from a bottle in the previous 24 hours), the timely complementary feeding rate (the proportion of infants 6 to 9 months of age who received complementary foods in addition to breastmilk in the previous 24 hours), the median duration of any breastfeeding (the age [in months] when 50% of children are no longer breastfed), and the median duration of exclusive breastfeeding (the age [in months] when 50% of children are no longer exclusively breastfed). The timely first suckling rate was based on the mother's response to the question of how soon after birth the child was given breastmilk, and the ever-breastfed rate on whether the child was given breastmilk at least once at any time since birth. All other indicators were based on a 24-hour recall of the infant's dietary intake by the mother. Selected feeding indicators were examined against a set of independent variables in order to explain how each indicator varied across individual-, household-, and community-level characteristics.

Statistical analyses

Analyses were performed using Stata version 9.0 with Svy commands to allow for adjustments for the cluster sampling design used in the surveys when estimating confidence intervals around prevalence estimates. Multiple logistic regression was used to identify the factors associated with four infant feeding indicators: timely initiation of breastfeeding, exclusive breastfeeding, bottle-feeding, and timely complementary feeding. These models were constructed by stepwise backwards regression to estimate the odds ratios adjusted for independent variables and with Svy commands to adjust for the cluster sampling design. Variables with $p < .05$ were retained in the final model. Details of the modeling strategy and the variables considered have been reported in each of the country-specific articles in this Special Section.

Results

Infant and young child feeding indicators

Feeding indicators for the four countries are tabulated in **tables 1** and **2**, and the patterns for five selected feeding indicators—the rates of timely initiation of breastfeeding (timely first suckling), exclusive breastfeeding, full breastfeeding, bottle-feeding, and timely complementary feeding—are presented in **figures 1** to **5**.

The lowest rates of timely initiation of breastfeeding were found in India (23.5%) and Bangladesh (27.5%), with higher rates in Nepal (35.4%) and Sri Lanka (56.3%). The exclusive breastfeeding rates were similar

TABLE 1. Across-country comparison of selected feeding indicators in South Asian countries, 2000–06

Country	Year	Timely first suck-ling rate		Exclusive breast-feeding rate		Bottle-feeding rate		Continued breast-feeding at 1 yr		Timely comple-mentary feeding rate	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Bangladesh	2004	27.5	24.5, 30.6	42.5	38.3, 46.8	22.4	19.6, 25.4	96.4	93.9, 97.9	62.3	56.6, 67.7
India	2005–06	23.5	22.3, 24.8	46.4	44.4, 48.5	14.8	13.8, 15.9	89.4	87.9, 90.7	56.7	54.4, 59.0
Nepal	2006	35.4	31.0, 40.0	53.1	46.8, 59.3	3.5	2.4, 5.1	97.5	94.5, 98.9	74.7	68.5, 80.0
Sri Lanka	2000	56.3	51.6, 60.9			27.2	23.2, 31.5	85.7	79.4, 90.3	93.4	88.1, 96.4

TABLE 2. Across-country comparison of selected feeding indicators in South Asian countries, 2000−06

| Country	Year	Current breastfeeding		Continued breast-feeding at 2 yr		Predominant breastfeeding rate		Full breastfeeding rate		Ever-breastfed rate	
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Bangladesh	2004	97.3	96.4, 97.9	93.9	90.4, 96.3	27.7	24.0, 31.8	70.2	66.3, 73.9	99.9	99.9, 100
India	2005−06	89.8	89.2, 90.4	73.1	70.9, 75.3	27.4	25.6, 29.3	73.9	72.1, 75.5	99.2	99.0, 99.4
Nepal	2006	98.1	97.2, 98.7	95.0	91.2, 97.2	20.7	16.1, 26.3	73.9	68.0, 78.9	99.5	98.6, 99.8
Sri Lanka	2000	85.0	82.5, 87.2	65.7	57.3, 73.2			60.6	54.1, 66.8	99.7	98.0, 100
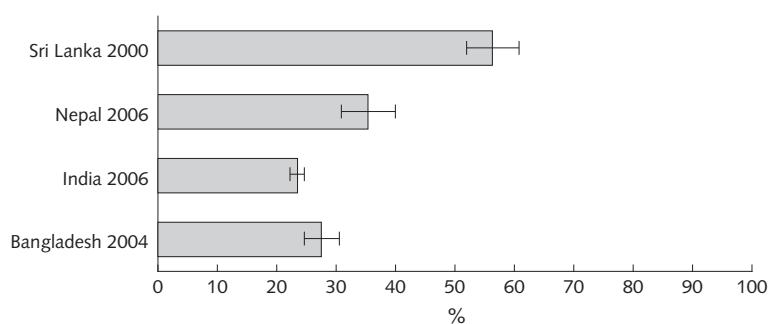
FIG. 1. Across-country comparison of timely initiation of breastfeeding rates in four South Asian countries, 2000–06. Bars indicate the percentage of women initiating breastfeeding within one hour of birth.
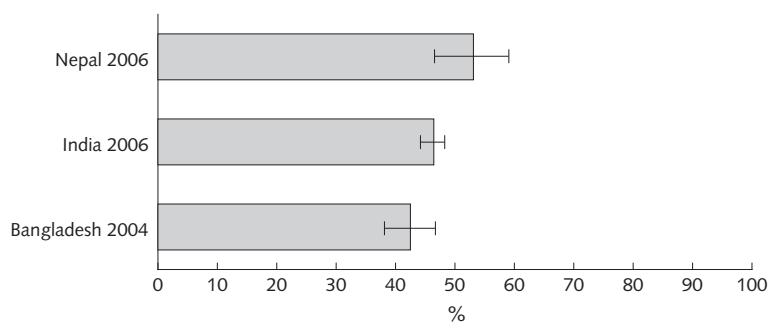

FIG. 2. Across-country comparison of exclusive breastfeeding rates in three South Asian countries, 2000−06. Bars indicate the percentage of children less than 6 months of age who were fed breastmilk only.

in Bangladesh (42.5%) and India (46.4%) and highest in Nepal (53.1%). Information about exclusive breast-feeding was not available for Sri Lanka. The rates of predominant breastfeeding were high for Bangladesh

(27.7%), India (27.4%), and Nepal (20.7%), resulting in less variation in the full breastfeeding feeding rates for these three countries. Sri Lanka had the lowest full breastfeeding rate (60.6%) and no information on
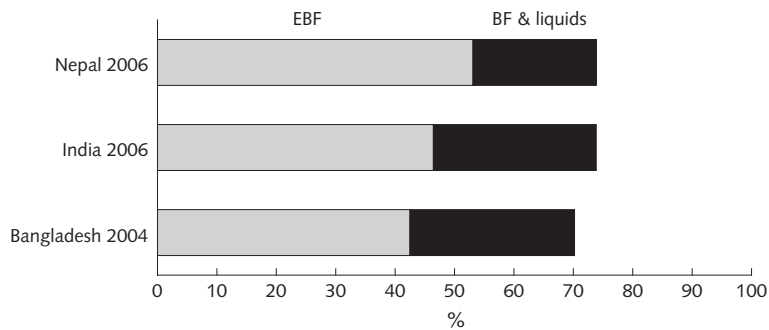
EBF   BF & liquids

Nepal 2006

India 2006

Bangladesh 2004

0   10   20   30   40   50   60   70   80   90 100
%

FIG. 3. Across-country comparison of full breastfeeding rates (exclusive breastfeed-
ing plus predominant breastfeeding) in three South Asian countries. EBF is exclusive
breastfeeding and BF & liquids is predominant breastfeeding.

Sri Lanka 2000

Nepal 2006

India 2006

Bangladesh 2004

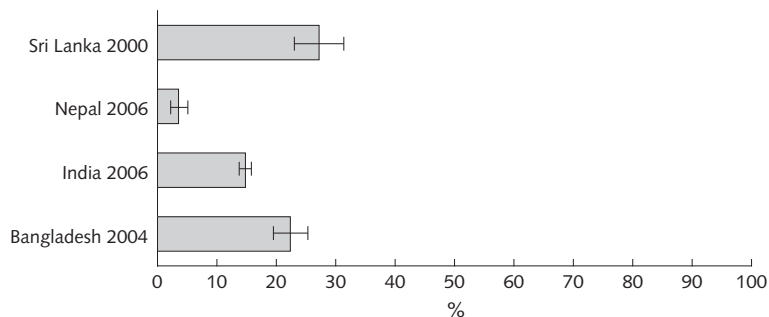0   10   20   30   40   50   60   70   80   90 100
%

FIG. 4. Across-country comparison of bottle-feeding rates in four South Asian coun-
tries, 2000–06. Bars indicate the percentage of infants less than 12 months of age who
received any food or drink from a bottle in the previous 24 hours.

Sri Lanka 2000

Nepal 2006

India 2006

Bangladesh 2004

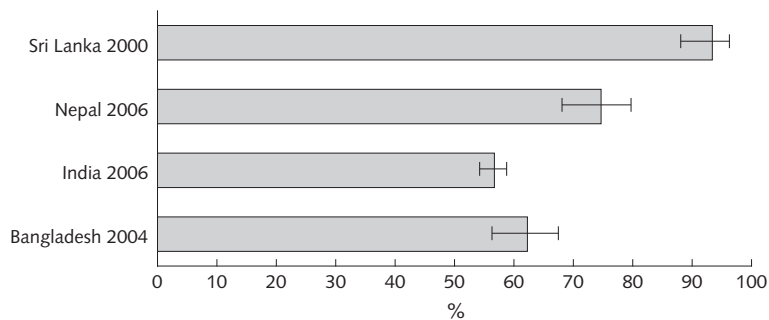0   10   20   30   40   50   60   70   80   90 100
%

FIG. 5. Across-country comparison of timely complementary feeding rates in four
South Asian countries, 2000–06. Bars indicate the percentage of infants 6 to 9 months
of age who received complementary foods in addition to breastmilk in the previous
24 hours.

predominant breastfeeding.

Nepal reported the lowest bottle-feeding rate (3.5%); the highest rates were in Sri Lanka (27.2%) and Bangladesh (22.4%). The timely complementary feeding rates were lowest in India (56.7%) and Bangladesh (62.3%) and highest in Nepal (74.7%) and Sri Lanka (93.4%).

Almost all of the infants in the four countries had been breastfed at least once ("ever breastfed"), and the proportion of infants who were currently being breastfed (during the previous 24 hours) was also very high. It is interesting to note that breastfeeding was continued to the end of the first year by a majority (86% to 98%) of the mothers in these countries. By the end of the second year, the rates dropped by about 16% in India and 10% in Sri Lanka. However, there were only marginal declines in Nepal and Bangladesh, where the rates were sustained above 90% to the end of the second year.

Across-country comparison of selected factors associated with feeding indicators

Multivariate analyses revealed associations between feeding indicators and individual, household, and community characteristics in individual countries. **Tables 3 to 6** summarize the significant factors that were associated with higher or lower rates according to the country; these factors are briefly discussed below.

Factors associated with absence of timely initiation of breastfeeding

This indicator showed regional differences within each country. Delivery by cesarean section was found to be a consistent negative factor that delayed initiation of breastfeeding in Nepal, India, and Sri Lanka (**table 3**). The rate of timely initiation of breastfeeding was higher among those delivered at health facilities in India. The following factors were associated with significantly higher rates of timely initiation of breastfeeding: access to media (India), and more antenatal contacts with health care providers (Bangladesh, India and Sri Lanka).

Factors associated with absence of exclusive breastfeeding

Increased maternal age was associated with lower rates of exclusive breastfeeding in Bangladesh and of full breastfeeding in Sri Lanka (**table 4**). Mothers from wealthier households had low rates of exclusive breastfeeding in both Bangladesh and India. This indicator shows regional differences, usually with lower rates in urban regions. There was no consistent association across countries between rates of exclusive breastfeeding and utilization of health services; a higher number of antenatal clinic visits was associated with a higher rate of exclusive breastfeeding in India but a lower rate in Nepal. Delivery at a health care facility was a negative determinant of exclusive breastfeeding in India, and postnatal contact with a Public Health Midwife was a positive factor in Sri Lanka. In Bangladesh, the rate of exclusive breastfeeding was higher for girls than for boys.

Factors associated with bottle-feeding

Infants living in urban areas in all four countries were more likely to be bottle-fed (**table 5**). Higher bottle-feeding rates were also associated with wealthier households in both Bangladesh and India. Mothers who did not work were less likely to bottle-feed their children in Bangladesh and Sri Lanka. Mothers with a higher level of education reported higher bottle-feeding rates in India but lower bottle-feeding rates in Sri Lanka. Female infants in Bangladesh were less likely to be bottle-fed than male infants.

Factors associated with absence of timely complementary feeding

A higher number of antenatal clinic visits was predictive of higher timely complementary feeding rates in Bangladesh and India (**table 6**). Region of residence was a determinant of this indicator in India, Nepal, and Sri Lanka. The following factors were associated with increased rates of timely complementary feeding in some of the countries: higher maternal age (Nepal), higher maternal education (Nepal), and increased access to television (India).

TABLE 3. Factors associated with timely initiation of breastfeeding in four South Asian countries, 2000–06

| Country | Factors associated with timely initiation of breastfeeding | |
	Higher rates	Lower rates
Bangladesh 2004	More antenatal visits Wealthier household Living in Sylhet, Khulna, or Raishahi region	Living in urban area
India 2005–06	Delivered at health facility More antenatal visits Mother listens to radio Living in Northeastern, Southern. or Western region Increasing age of infant	Delivered by cesarean section Living in Central region
Nepal 2006	Mother involved in household decisions Living in terai	Delivered by cesarean section
Sri Lanka 2000		Delivered by cesarean section Mother not seen by Public Health Midwife at home during pregnancy

Discussion

Overall in these four countries in South Asia, the rate of initiation of breastfeeding within the first hour after birth was poor, and only approximately half or less of

the mothers exclusively breastfed their infants for the first 6 months of life. Our results indicated that infant and young child feeding practices in the South Asia region have not reached the expected levels that are required to achieve a substantial reduction in child

TABLE 4. Factors associated with exclusive breastfeeding in four South Asian countries, 2000−06

Country	Factors associated with exclusive breastfeeding[a]	
	Higher rates	Lower rates
Bangladesh 2004	Higher parity (2−4 or ≥ 5)	Maternal education—primary
	Female infant	Maternal age ≥ 35 yr
		Longer birth interval (14−24 or ≥ 25 mo)
		Birth attended by friends and relatives
		Mother from richest household quintile
		Living in Dhaka region
India 2005−06	More antenatal visits	Delivered at health facility
	Living in Central, Southern, Northeastern, Western, or Eastern region	Mother from richest household quintile
	Mother formerly married	Living in urban area
Nepal 2006	Living in Midwestern region	1−2 or ≥ 7 antenatal visits
	Living in hills or terai	
Sri Lanka 2000[b]	Mother seen by Public Health Midwife at home during postnatal period	Maternal age 25−29 yr

a. The adjusted odds ratios for these factors from the multiple logistic regression models can be found in **table 5** in the papers in this Special Section from Bangladesh [17], India [18], and Nepal [19] and in **table 4** in the paper from Sri Lanka [20].
b. In Sri Lanka, the rate of full breastfeeding rather than exclusive breastfeeding was recorded.

TABLE 5. Factors associated with bottle-feeding in four South Asian countries, 2000−06

Country	Factors associated with bottle-feeding[a]	
	Lower rates	Higher rates
Bangladesh 2004	Mother did not work in the past 12 mo	Father has secondary or higher education
	Longer birth interval	Maternal age 20−34 or ≥ 35 yr
	Female infant	Wealthier household (middle, richer, and richest quintiles)
		Living in Dhaka or Rajshahi
India 2005−06	Average or large birth size	Birth attended by health professional
	Living in rural area	Wealthier household
	Living in Northeastern or Western region	Higher maternal education
		Delivered by cesarean section
		No postnatal checkup
		Mother worked in the past 12 mo
		Mother watches television
		Living in urban area
		Living in the Central region
		Increasing age of infant
Nepal 2006	Birth attended by friends and relatives	Living in urban area
Sri Lanka 2000	Mother has secondary or higher education	Ever-employed mother
		Formerly married mother
		Increasing age of infant
		Living in metropolitan area or South-Central Hills country

a. The adjusted odds ratios for these factors from the multiple logistic regression models can be found in **table 5** in the papers in this Special Section from Bangladesh [17], India [18], Nepal [19], and Sri Lanka [20].

mortality—a 90% coverage with exclusive breastfeeding required for a reduction of 10% in the rate of under-five deaths [3]. Sri Lanka had the highest rates of early initiation of breastfeeding and timely complementary feeding, whereas Nepal had the highest rate of exclusive breastfeeding. The bottle-feeding rate was lowest in Nepal and highest in Sri Lanka. India and Bangladesh had alarmingly low rates of early initiation of breastfeeding, exclusive breastfeeding, and timely complementary feeding, indicating an urgent need for improvement in these rates in these countries because of their large populations.

Promotion of early initiation of breastfeeding has the potential to make a major contribution to the achievement of the child survival Millennium Development Goal [4, 5], and evidence shows that such rates can be improved on a large scale by effective community interventions [22]. Antenatal contact with health professionals has been recognized as a major factor that helps to give confidence to women to establish early breastfeeding. In support of this argument, our study found higher rates of timely initiation of breastfeeding among mothers who had made more antenatal care visits or who were seen by a health care provider at home during pregnancy. Our results showed that cesarean deliveries, although representing a small percentage of births, have contributed significantly to reduced rates of timely initiation of breastfeeding, even though evidence shows that breastfeeding can be initiated immediately even after a cesarean delivery [23]. Ideally, all health institutions should have a uniform policy regarding early initiation of breastfeeding after cesarean delivery and a mechanism to support mothers to initiate breastfeeding as soon as possible after cesarean delivery. The results also showed that exposure to radio was positively associated with early initiation of breastfeeding in India, suggesting that the mass media have a strong influence on early initiation of breastfeeding. This factor was not

significant in other countries, but this may be related to variations in penetration of the mass media in different countries and to the smaller sample sizes in the surveys conducted in the other countries.

Across the countries examined, analyses of feeding status by 24-hour recall showed that a considerable proportion of infants under 6 months of age had been given plain water, juices, or other nonmilk liquids, resulting in low rates of exclusive breastfeeding. These countries with lower exclusive breastfeeding rates have the potential to improve their rates by preventing the feeding of water and water-based or other nonmilk liquids during the first 6 months of life. Antenatal and postnatal care were associated with better exclusive breastfeeding rates in India and Sri Lanka, but in Nepal, in contrast, antenatal care visits were found to be a negative influence. These findings suggest a variable success rate across countries in South Asia in having providers of antenatal and postnatal care deliver appropriate messages about exclusive breastfeeding to their clients. Despite these variations, all countries need further improvement in the practice of exclusive breastfeeding, especially from 3 to 6 months of life, when rates decline rapidly.

Bottle-feeding has been discouraged over many years because of its adverse effects on feeding, nutrition, morbidity, and mortality of young children. In the three countries for which there is information about exclusive breastfeeding, the rate tends to be lower where the bottle-feeding rate is higher. However, most of the variability in exclusive breastfeeding rates can be accounted for by different rates of predominant breastfeeding, and there is no apparent relationship between bottle-feeding rates and full breastfeeding rates. Bottle-feeding was associated with urban residence, working mothers, higher maternal education, and wealthier households. Programs to prevent bottle-feeding will need to be targeted to these populations. Paradoxically, in Sri Lanka,

TABLE 6. Factors associated with timely complementary feeding in four South Asian countries, 2000–06

| Country | Factors associated with timely complementary feeding[a] | |
	Higher rates	Lower rates
Bangladesh 2004	Increasing age of infant 3–6 antenatal clinic visits	
India 2005–06	Increasing age of infant Mother watches television ≥ 7 antenatal care visits Living in Eastern, Northeastern, Southern, or Central region	Shorter preceding birth interval (9–14 mo)
Nepal 2006	Higher maternal education (secondary or above) Maternal age ≥ 35 yr Increasing age of infant	Living in terai
Sri Lanka 2000		Living in urban or tea estate area

a. The adjusted odds ratios for these factors from the multiple logistic regression models can be found in **table 6** in the papers in this Supplement from Bangladesh [17], India [18], and Nepal [19] and in **table 5** in the paper from Sri Lanka [20].

the bottle-feeding rate was significantly higher among less-educated women and the low-socioeconomic-status tea estate sector populations, so it is important to evaluate the situation in each country before targeting women for different interventions.

All the countries in the region have high rates of timely complementary feeding, but the usefulness of this indicator is limited for two main reasons. First, this indicator includes infants who had started complementary foods before 6 months of age, although this is not a recommended practice. Second, it does not give any information about the adequacy or diversity of the complementary foods. Further analyses of complementary feeding will be needed using the new WHO-proposed indicators of infant and young child feeding practices [24], such as the dietary diversity indicator and the meal frequency indicator, to capture the adequacy of the diet.

The limitations of this analysis include the use of 24-hour recall data in the questionnaires, subtle differences between countries in the questions, and differences between countries in the season and time of year the surveys were conducted. The main strengths of our study were the nationally representative samples, the comprehensive data on standard infant feeding indicators, and the appropriate adjustments for sampling design made in the analysis.

Infant and young child feeding practices in the South Asia region have not reached acceptable levels, and millions of children are thus at risk for food- and water-borne illnesses and childhood malnutrition associated with inappropriate feeding. This across-country analysis provides valuable insight into the risk factors for poor infant and young child feeding practices in each country as well as in the South Asia region as a whole. Our results indicate that Bangladesh, India, and Nepal need to improve early initiation of breastfeeding, as the rates in these countries were very low. This could be achieved through more effective promotion of the importance of early initiation of breastfeeding at antenatal care contacts, support for women delivering at home to initiate early breastfeeding through education of key family members and traditional birth attendants, and improved hospital protocols, especially with cesarean deliveries, to ensure an early start to breastfeeding.

Exclusive breastfeeding also needs to be supported in Bangladesh, India, and Nepal through better promotion of exclusive breastfeeding at antenatal care contacts and at the time of delivery for hospital births. Community-based peer support for exclusive breastfeeding will also be an important intervention across the region to improve the rates of exclusive breastfeeding. These promotion efforts should focus on reducing the rates of predominant breastfeeding, as this is likely to lead to rapid improvement in the level of exclusive breastfeeding. Bottle-feeding rates were high in Bangladesh and Sri Lanka, and in these countries interventions to reduce the use of bottle-feeds should be targeted at working mothers, especially in urban areas, and women from wealthier households. Health professionals will need to be involved in these efforts because of their potential to influence the groups of women at higher risk for bottle-feeding.

The rates of timely complementary feeding were lowest in India and Bangladesh, and education for women and their families about the appropriate timing and type of complementary foods should start during antenatal care contacts and extend to postnatal care contacts. New approaches will be needed to improve complementary feeding. The use of local peer counselors to promote foods already available in the household should be evaluated as a possible sustainable intervention to improve complementary feeding.

An integrated approach is needed in South Asia to improve infant and young child feeding through appropriate sets of messages directed at all the infant and young child feeding indicators. This integrated package of messages should be developed to meet the specific needs of each country, or regions within a country, and delivered across the health care system and directly in the community though local health promoters or peer counselors.

Acknowledgments

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