

**Mass media exposure and childhood diarrhea:
a secondary analysis of the 2011
Bangladesh Demographic and Health Survey**

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ABSTRACT

In order to reduce child mortality, recommendations for diarrhea management practices have been widely promoted by various methods, including mass media. This study examined whether mother's exposure to mass media was associated with child's diarrhea, and with the diarrhea management practiced by their mothers. Data on 7,068 women, whose youngest child was under five years old, were extracted from the Bangladesh Demographic and Health Survey, 2011, together with information on the child. The outcome variables were an episode of diarrhea in the two weeks prior to the survey and diarrhea management practices; exposure to mass media was used as the major explanatory variable. They were descriptively summarized, and logistic regression analyses were performed. Television was found to be the most common form of media. Among 346 children who had experienced an episode of diarrhea in the previous 2 weeks, less than 42.5% were given zinc and only 26.3% of the mothers provided sufficient fluids. No significant associations between mother's mass media exposure and child's diarrhea were observed. Women who read newspapers/magazines were more likely to provide sufficient fluids and food, and those exposed to the radio were more likely to provide zinc supplementation. Since mother's exposure to newspaper/magazines and radio showed associations with some recommended practices for the treatment of childhood diarrhea, mass media clearly has the potential to improve diarrhea management practices. More effective use of mass media is anticipated; in particular, promotion of zinc supplementation and increasing fluid intake during diarrhea, neither of which were currently well practiced.

Keywords: mass media, diarrhea, oral rehydration therapy, zinc, child, Bangladesh, Demographic and Health Survey

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INTRODUCTION

Globally, mortality rates for children under the age of five have fallen from 93 deaths per 1000 live births in 1990 to 41 in 2016.¹ Despite the overall decline in mortality over the last two decades, diarrheal disease still kills around 525,000 children every year and is the second

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leading cause of death in children under five years old.² In Bangladesh, the under-five-year mortality rate has drastically declined from 144 deaths per 1000 live births in 1990 to 34 in 2016.³ The under 5-year mortality rate due to diarrhea has also decreased; however, it was 2.3 per 1000 live births in 2016. This figure is lower than India and Pakistan, but higher than other South Asian countries and majority of Southeast Asian countries.⁴

The immediate cause of death after diarrhea is dehydration. Dehydration can be prevented through increased intake of fluids and continued feeding, while rehydration therapy using oral rehydration salts (ORS) has been demonstrated to reduce diarrheal mortality by up to 93%.⁵ Most diarrhea cases are treatable at home by administration of ORS. Recommended homemade solutions (RHS), such as sugar-salt and water, or cereal-based drinks can also be used. More recently, zinc supplementation has been included in the treatment recommendations, as it reduces the duration and severity of the diarrheal episode, stool volume, and the need for advanced medical care.⁶

It has been suggested that the provision of information through electronic mass media is effective in increasing awareness of the value of oral rehydration therapy (ORT) and that it can also encourage people to administer zinc to their children to treat diarrhea.⁷⁻¹⁰ Mass media has been used to disseminate several public messages regarding various social and medical issues,¹¹⁻¹⁴ and studies have been conducted to determine whether there is an association between mass media exposure and people's knowledge, practice and health outcomes.¹⁵⁻¹⁷ In Bangladesh, mass media has been utilized for health promotion, too. For example, since the 1990s, the Bangladeshi government, in collaboration with the United Nations Children's Fund (UNICEF) Bangladesh, has used a cartoon called 'Meena' to deliver messages related to health.¹⁸ It is believed that a large proportion of the population has been educated regarding essential health information in this way.¹⁹⁻²¹

However, to date, no study has investigated whether mass media exposure is related to diarrhea management practices for children under five years old in Bangladesh. Therefore, in this study, we aimed to describe mother's exposure to mass media and diarrhea management practices, using a nationally representative Bangladeshi dataset. Associations between mothers' exposure to mass media and a diarrheal episode among children under 5 years old and the diarrhea management practiced by the mothers of these children were then examined.

MATERIALS AND METHODS

Dataset and extracted samples

Nationally representative data from the Bangladesh Demographic and Health Survey (BDHS) 2011 were used for this study. The original dataset was obtained from ICF International at the authors' request. The BDHS 2011 was conducted by the National Institute of Population Research and Training, part of the Ministry of Health and Family Welfare, Bangladesh from July to December 2011. The complete BDHS study sample consists of 17,842 ever-married women aged 12–49 years, and 3,997 men aged 15–54 years, from 17,141 households. Detailed information about the study design and data collection of BDHS 2011, including ethical considerations, can be found elsewhere.²²

For this study, data on women aged 15–49 whose youngest child was under five years and lived with her were extracted along with this child's data. A total of 7,068 women and their youngest child were included in this study.

Independent variables

Exposure to mass media: reading newspapers and/or magazines, listening to the radio, and watching television were used as independent variables in this study. The frequency of each activity was coded into three categories: (1) not at all, (2) less than once a week, and (3) at least once a week. Based on these three categories, subjects were defined as 'not exposed' for those who answered 'not at all' or 'exposed' otherwise.

Other demographic and socio-economic factors of mother and household characteristics were also considered as possible confounding variables. These included place of residence, mother's age, education, working status, religion and household's wealth index. The wealth index is a composite measure of a household's cumulative living standard, which is calculated based on the household's ownership of selected assets, indicating its relative economic level.²²

Dependent variables

The dependent variables were the occurrence of a diarrheal episode and diarrhea-related practices. In BDHS, mothers were asked whether their child had experienced diarrhea during the 2-week period prior to the survey and this was used as the variable for a diarrheal episode. The variables regarding diarrhea management practices were as follows: (1) whether the child received ORS and/or RHS; (2) whether the child received zinc syrup or tablets; (3) the amount of fluid the child was given, including breast milk (nothing / much less / somewhat less / about the same / more than usual); (4) the amount of food a child was given (never gave / stopped / much less / somewhat less / about the same / more than usual). According to guidelines issued by UNICEF and the World Health Organization (WHO), increased fluid and continued feeding during the diarrheal episode are recommended.⁶ Therefore, we defined a 'more than usual' amount of fluid during a diarrheal episode as a sufficient amount and all other options were considered insufficient. Regarding food, the options 'about the same' or 'more than usual' were defined as sufficient.

Statistical analysis

First, characteristics of the mothers and the households were described by the occurrence of childhood diarrhea in the 2-week period prior to the survey. Chi-squared tests were used to examine differences in characteristics between two groups (with or without a diarrheal episode in the 2-week period prior to the survey). Second, exposure to mass media and diarrhea management practices were compared by place of residence (urban or rural), and chi-squared tests were performed to examine associations. Third, logistic regression analyses were performed to test the associations between exposure to mass media and a diarrheal episode, as well as each of the four diarrhea management practices. Crude and adjusted odds ratios (ORs) after adjusting for demographic and socio-economic factors (place of residence, mother's age, education, working status, religion and household's wealth index) were estimated, as well as 95% confident intervals (CIs). A two-tailed P -value <0.05 was considered statistically significant. Stata® version 12 and SPSS® version 20 were used for the analyses.

RESULTS

Demographic and socio-economic characteristics of mothers and households are shown in Table 1. None of the examined characteristics were statistically associated with child's diarrheal episode.

Table 2 shows that the majority of women, in both urban and rural areas, did not read newspapers and/or magazines at all (71.2% and 87.6%, respectively). The main form of media

Table 1 Socio-demographic characteristics of mothers, and diarrheal episodes in their children (n=7,068)

Characteristics	Total		Diarrheal episode				P-value
	n	%	Yes		No		
			n	%	n	%	
Place of residence							
Urban	2,231	31.6	95	27.5	2,135	31.8	0.09
Rural	4,837	68.4	251	72.5	4,585	68.2	
Mother's age							
≤19 years	986	14.0	50	14.5	936	13.9	0.72
20-29 years	4,380	62.0	219	63.3	4,160	61.9	
≥30 years	1,702	24.1	77	22.3	1,624	24.2	
Mother's education							
No education	1,268	17.9	68	19.7	1,199	17.9	0.41
Incomplete primary	1,218	17.2	67	19.4	1,151	17.1	
Primary	3,558	50.3	168	48.6	3,389	50.4	
Secondary or higher	1,024	14.5	43	12.4	981	14.6	
Mother's working status							
Non-working	6,359	90.0	309	89.3	6,049	90.0	0.67
Working	709	10.0	37	10.7	671	10.0	
Religion							
Islam	6,364	90.0	317	91.6	6045	90.0	0.31
Other	704	10.0	29	8.4	675	10.0	
Source of drinking water							
Non-improved	809	11.5	46	13.3	761	11.3	0.26
Improved	6,259	88.6	300	86.7	5,959	88.7	
Type of toilet facility							
Non-improved	3,663	51.8	192	55.5	3,469	51.6	0.16
Improved	3,045	48.2	154	44.5	3,251	48.4	
Wealth index							
Poorest	1,470	20.8	76	22.0	1,394	20.7	0.64
Poorer	1,346	19.0	67	19.4	1,279	19.0	
Middle	1,358	19.2	71	20.5	1,286	19.1	
Richer	1,415	20.0	71	20.5	1,343	20.0	
Richest	1,479	20.9	61	17.6	1,418	21.1	

that they were exposed to was television. All types of media were statistically associated with place of residence. The proportion of exposure to newspapers and/or magazines and television was higher in urban areas than in rural areas. The proportion of exposure to radio was relatively low compared with other media and was higher in rural areas than in urban areas.

Of the total 7,068 respondents, 346 women (4.9%) had a child who had experienced an episode of diarrhea in the two weeks prior to the survey. Approximately 80% of these women had given their child ORS and/or RHS but less than half of children had been given zinc syrup or tablets in either the urban or the rural areas. Only 26.3% of respondents reported that they

Table 2 Mass media exposure by place of residence

Mass media exposure	Total		Place of residence				P-value
			Urban		Rural		
	n	%	n	%	n	%	
Newspaper or magazine (n=7,061)							
Not exposed	5,820	82.4	1,586	71.2	4,234	87.6	<0.01
Exposed	1,241	17.6	641	28.8	600	12.4	
Radio (n=7,065)							
Not exposed	6,412	90.8	2,077	93.2	4,335	89.6	<0.01
Exposed	653	9.2	152	6.8	501	10.4	
Television (n=7,067)							
Not exposed	2,750	38.9	388	17.4	2,362	48.8	<0.01
Exposed	4,317	61.1	1,843	82.6	2,474	51.2	

Table 3 Management practices during diarrhea by place of residence

Management practice	Total		Place of residence				P-value
			Urban		Rural		
	n	%	n	%	n	%	
Oral rehydration salt and/or recommended homemade solution (n=339)							
Yes	270	79.7	74	80.4	196	79.4	0.83
No	69	20.4	18	19.6	51	20.7	
Zinc syrup and/or zinc tablets (n=341)							
Yes	145	42.5	42	45.2	103	41.5	0.55
No	196	57.5	51	54.8	145	58.5	
Amount offered to drink (n=346)							
Sufficient	91	26.3	23	24.2	68	27.1	0.59
Insufficient	255	73.7	72	75.8	183	72.9	
Amount offered to eat (n=346)							
Sufficient	228	65.9	71	74.7	157	62.6	0.03
Insufficient	118	34.1	24	25.3	94	37.5	

provided sufficient fluids, whereas 65.9% provided sufficient food. Giving sufficient food was statistically associated with place of residence (Table 3).

After adjusting for demographic and socio-economic factors, no significant association was observed between any type of mass media exposure and a childhood diarrheal episode (Table 4). Exposure to newspapers and/or magazines was significantly associated with the provision of

Table 4 Logistic regression estimates for odds of diarrheal episodes according to mass media exposure

Mass media exposure	Crude		Adjusted	
	OR (95% CI)	P-value	OR ¹ (95% CI)	P-value
Newspaper or magazine (n=7,061)				
Not exposed	1		1	
Exposed	1.07 (0.81–1.42)	0.63	1.14 (0.85–1.51)	0.38
Radio (n=7,065)				
Not exposed	1		1	
Exposed	1.15 (0.81–1.64)	0.45	1.12 (0.78–1.59)	0.55
Television (n=7,067)				
Not exposed	1		1	
Exposed	0.93 (0.75–1.16)	0.55	0.98 (0.78–1.24)	0.88

¹Adjusted for place of residence, mother's age, education, working status, religion and household's wealth index

Reference was the 'not exposed to media' group (for all three media and combined media).

Abbreviations: CI, confidence interval; OR, odds ratio

sufficient fluids and food (adjusted OR 2.11, 95% CI 1.14–3.91 and adjusted OR 3.17, 95% CI 1.51–6.65, respectively) and mothers who listened to the radio were more likely to provide zinc syrup or tablets (adjusted OR 2.50, 95% CI 1.19–5.23) during a diarrheal episode than women who did not (Table 5).

DISCUSSION

Regarding recommended diarrhea management, giving ORS and/or RHS and continuing food were well practiced by mothers, whereas providing zinc syrup or tablets and increasing fluid intake were not. Using nationally-representative data in Bangladesh, we found no significant associations between mother's exposure to media and occurrence of child's diarrheal episode. However, significant associations were found between exposure to newspapers and/or magazines and the provision of sufficient fluids and food, as well as between exposure to radio and treatment with zinc after adjusting for confounding factors. Television was not associated with diarrhea management practice although it was the most commonly accessed mass media, even in rural areas.

In this study, approximately 80% of women used ORS and/or RHS. This high level of use in Bangladesh could be due to the launch date of ORS on the market. In 1969, the International Centre for Diarrheal Disease Research, Bangladesh first used ORS solutions for the treatment of diarrhea. Since then, ORS has become widespread as a result of recommendations by various United Nations agencies and social and commercial marketing strategies.²³ Electronic mass media is one of the major sources of information about ORS; this was the case even in the 1990s, for example in India and in Egypt, with television and radio identified as the main sources of

Table 5 Logistic regression estimates for odds of practices of diarrhea management according to mass media exposure

Mass media exposure	Practices of diarrhea management					
	ORS and/or RHS (n=339)	Zinc syrup and/or tablet (n=341)	Amount of drink (n=346)	Amount of food (n=346)		
	aOR ¹ (95% CI)	P-value	aOR ¹ (95% CI)	P-value	aOR ¹ (95% CI)	P-value
Newspaper or magazine						
Not exposed	1		1		1	
Exposed	2.09 (0.92–4.72)	0.08	1.46 (0.82–2.60)	0.19	2.11 (1.14–3.91)	0.02
Radio						
Not exposed	1		1		1	
Exposed	1.69 (0.61–4.67)	0.31	2.50 (1.19–5.23)	0.02	1.03 (0.46–2.29)	0.95
Television						
Not exposed	1		1		1	
Exposed	1.04 (0.58–1.88)	0.90	1.34 (0.83–2.17)	0.22	1.67 (0.97–2.88)	0.07
					1.27 (0.78–2.07)	0.33

¹Adjusted for place of residence, mother's age, education, working status, religion and household's wealth index

Reference was the 'not exposed to media' group (for all three media)

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; ORS, oral rehydration salt; RHS, recommended home solution

information.^{10,24} A previous meta-analysis of ORS social marketing and mass media strategies indicated that mothers who were exposed to information in the media were twice as likely to use ORS than mothers who were not.⁷ In Bangladesh, awareness and availability of ORS/RHS might have resulted in a high level of ORS/RHS use and no association between mass media exposure and ORS/RHS use.

In addition to ORS treatment, since 2004 zinc supplementation has been recommended by WHO and UNICEF to reduce diarrheal deaths. The effectiveness of zinc treatment was first documented in a community-based trial in Bangladesh in 1998. This knowledge is newer than use of ORS/RHS. Awareness and practice of zinc supplementation during a childhood diarrheal episode vary among countries. In Kenya, more than 80% of women reportedly use zinc to treat diarrhea²⁵ and in Benin, the corresponding number is over 50%.²⁶ In Indonesia, almost three-quarters of caregivers who had heard about zinc for the treatment of diarrhea, had heard about it through mass media (television, radio, and newspapers).²⁷ Findings from Nepal in 2008 showed that more than 95% of respondents had heard messages regarding zinc treatment for diarrhea via the radio or television, and respondents who were exposed to information on correct use of zinc were five times more likely to use it correctly than those not exposed to this information.⁸ A Nepalese project showed a positive association between exposure to information and zinc-related knowledge.²⁸ Although the benefits of zinc supplementation in the management of diarrhea have been established, it is suggested these benefits are still not well appreciated by physicians and healthcare workers.²⁹ Although zinc was first introduced in Bangladesh for the treatment of diarrhea, this current study showed that less than half of women in Bangladesh used zinc to treat diarrhea, regardless of whether they lived in urban or rural areas.

In the present study, exposure to radio was shown to be significantly associated with the use of zinc. In Bangladesh, both television and radio run advertisements regarding zinc syrup or tablets, and a case study suggested television and radio were the quickest media channels in terms of disseminating information on the benefits of zinc nationwide.³⁰ The present study could not identify why only radio, and not television exposure, showed a significant association with zinc use. Although the prevalence of exposure to radio was relatively low in this study, our results suggest that it can still be utilized for health promotion. Our study also showed that women who were exposed to newspapers and/or magazines were more likely to provide sufficient fluids and food. The results imply that adjusting a child's food and fluid intake may require higher health literacy. Findings suggested an important role for print and electronic forms of mass media in promoting diarrhea management practices. However, we did not find a significant association between mother's exposure to television, which was the most popular mass media channel, and diarrhea management practice. Further research is needed to determine why, and exactly how, reading newspapers and/or magazines and listening to the radio are associated with diarrhea management practices.

A major limitation of our study was that only data for children who suffered from diarrhea in the 2-week period prior to the survey were included in our analyses of the associations between exposure to media and diarrhea management practices, which greatly reduced the sample size. As diarrhea is common among children, the sample size could have been increased if the survey asked about mother's practices if the child had ever had a diarrheal episode.

In conclusion, nationally-representative data suggested mother's exposure to mass media was not associated with child's diarrheal episode. Exposure to newspapers and/or magazines was associated with the provision of sufficient fluids and food, and mothers who listened to the radio were more likely to provide zinc syrup or tablets. It is considered that mass media have the potential to improve diarrhea management practices. More effective use of mass media is anticipated, in particular, to promote zinc supplementation and increasing fluid intake during

diarrhea, neither of which are currently well practiced.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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