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Mothers' Hygiene Behaviour and Beliefs about Diarrhoea: A Case Study of a District in Eastern India

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Abstract

The present study explores different dimensions of mothers' hygiene behaviour such as hand washing practices, water hygiene, food hygiene, domestic hygiene and stool disposal practices and beliefs about diarrhoea in a diarrhoea-prone district of rural Odisha. Using mixed methods, information on various aspects of hygiene behaviour of mothers with under-five children was obtained. Three hygiene outcome variables namely mothers' hand washing practices, treatment of water and domestic hygiene were analysed to understand the determinants of mothers' hygiene behaviour. It is found that time spent on fetching water is significantly related to hand washing practices i.e., mothers who spend more than 30 minutes to fetch water have poor hygiene behaviour. Mothers' education also plays an important role in hygiene behaviour. More than one-third of the mothers believe that diarrhoea is caused by taking wrong food, spoiled food and bad water. Providing personal and community hygiene education to improve the knowledge about causes for diarrhoea and easy access to water for the community could improve mothers' hand washing practices and overall hygiene in the household.

Key words: Diarrhoea, Mothers, Hygiene Behaviour, Children

I. Background

Diarrhoea continues to be a major cause of morbidity and mortality in children below five years of age in developing countries and it also leads to considerable economic burden worldwide. Globally, there are about 2.5 billion cases of diarrhoeal disease every year which contributes to around 20 per cent of all deaths of children globally (Kosek, Bern & Guerrant, 2003; UNICEF and WHO, 2009; Wheeler et al., 1999; WHO, 2009). Among the developing countries, India accounts for the highest number of children dying of diarrhoea with 3,86,600 deaths annually (WHO, 2009). Diarrhoea continues to take a heavy burden on the Indian health sector. Studies show that children under five years of age experience on an average of two or three episodes of diarrhoea each year (Nath, 2003). However, diarrhoea is an easily treatable disease and can be prevented by simple hygienic measures. Hand washing with soap at six important moments namely after defecation, after cleaning child's bottom (after his/her defecation), after stool disposal or any contact with human faeces, before eating, feeding child, and handling food are such simple hygiene behaviours that can reduce diarrhoea drastically. Further, safe storage and handling of food and water, treating water to make it safe for drinking, maintaining domestic hygiene and following safe stool disposal practices are some of the other important ways to prevent diarrhoea (Esrey et al., 1991; Gorter et al., 1998; Park, 2009; UNICEF, 1995).

Hand washing practices, water hygiene, food hygiene, domestic hygiene and stool disposal practices are different components of hygiene behaviour which play a crucial role in reducing diarrhoea cases. Several studies have been carried out to understand the important factors related to different components of hygiene behaviour. Studies in Kenya, Philippines and Peru reveal that mother's hand washing practices is strongly associated with educational status of mother (Schmidt et al., 2009), age of the youngest child, affordability of soap (Sakisaka, Wakai & Wongkhomthong, 2002) and environmental factors like accessibility and availability of sufficient water for household

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use (Gilman et al., 1993). Low standard of domestic hygiene is associated with lack of access to adequate quantities of potable water. Housing and facility for waste disposal are some of the other socio-environmental factors influencing domestic hygiene practices. Poor standard of domestic and personal cleanliness was found in those households with inadequate housing and lack of facilities for waste disposal (Nath, 2003). However, no relationship was found between mother's hand washing practices and education, health knowledge and household wealth in Ghana (Scott, Lawson and Curtis, 2007). Domestic electricity supply and age of the youngest child are related to consumption of boiled drinking water. Mothers with child less than two years were found to use boiled water for drinking (Sakisaka, Wakai & Wongkhomthong, 2002).

In Sri Lanka, latrine ownership is an important determinant of safe stool disposal practices (Satterthwaite, 2003). Mothers with access to tap water in their dwelling units reported safe stool disposal practices three to five times more often than mothers whose source of water was outside their compound wall. Psycho-social factors like individual beliefs regarding cause of diarrhoea may also affect hygiene practices (Curtis et al., 1995). Myths and misconceptions about diarrhoea and how to treat it are many in most cultures in developing countries including India. Studies found that various myths and beliefs regarding the cause of diarrhoea may extend from the most traditional beliefs to modern biomedical causation of the disease. In Botswana, sunken fontanel, child being bewitched, improper food, teething and cold weather are some of the beliefs that cause diarrhoea (Kaltenthaler & Drasar, 1996). Too much food, too little food, hot and cold food, hot and cold environment, contaminated food, contaminated water and bad breast milk, insects or flies, dirtiness, soil eating and teething are some of the beliefs regarding causation of diarrhoea in Pakistan (Nielsen et al., 2001).

Although a large body of literature is available on determinants of diarrhoea in India, studies to understand the hygiene behaviour related to diarrhoea are scanty. This is surprising given the fact that hygiene behaviour is one of the important factors that could prevent diarrhoea. Further, the available literature on hygiene behaviour is largely from African countries, Philippines and Peru (Schmidt et al., 2009; Sakisaka, Wakai & Wongkhomthong, 2002; Scott, Lawson and Curtis, 2007; Curtis et al., 1995; Kaltenthaler & Drasar, 1996). The socio-cultural context of villages in India may vary from the socio-cultural context in African or South American countries. Hygiene practices of people largely depend on the cultural context of the community which calls for context specific studies. Moreover, individual beliefs related to diarrhoea which are also likely to be influenced by local culture and traditions. Further, previous studies on hygiene behaviour in India focussed on either one or a few important components of hygiene behaviour. No study to our knowledge explored all important components of hygiene behaviour. Also, the relationship between mothers' education, household wealth, environmental factors like water supply and mothers' hygiene behaviour are not consistent across the existing studies.

Keeping these research gaps in mind, the present study tried to understand all the important components of hygiene behaviour such as mothers' hand washing practices, water hygiene, food hygiene, domestic hygiene and stool disposal practices together in the rural Indian context. These hygiene behaviours along with their determinants were studied using mixed methodology (using structured interview schedule and observation method) in a diarrhoea-prone district of Odisha, an eastern state in India.

II. Data and methods

Setting

The study was carried out in rural Odisha, a state which continues to have high infant mortality rate (IMR) and under five mortality rate (U5MR). Among the Indian states, Odisha's IMR continues to be high with 87 per one thousand in 2001-03 to 51 per one thousand in 2012 (SRS 2013) and a similar situation with U5MR of 68 in 2011 (SRS 2012). Cause-specific death reveals that diarrhoeal death among the new born is found to be one of the leading causes for infant

and child mortality which accounts for 28 per cents of the total death (Government of Odisha, 2004)[1].

Further, Odisha reported 91 deaths due to diarrhoea and occupies fourth position in the country in terms of number of diarrhoea cases reported in the year 2009 alone (Registrar General of India, 2011). Moreover, among the different caste groups, higher percentage of children from Scheduled Castes and Scheduled Tribes had diarrhoea as compared with Other Backward Castes and 'Others' (Singha & Mohanty, 2009). Hence, the present study was carried out in Rayagada, a diarrhoea-prone district of Odisha. It is predominantly a tribal district where 56 per cent of the population belongs to primitive tribal groups, especially the Kondh tribe. Total population of the district is 967,911 with 471,960 male and 495,951 female (Registrar General of India, 2011). It consists of eleven administrative blocks of which four blocks reported death cases due to diarrhoea in 2010. One block that reported death cases due to diarrhoea was selected randomly and three villages (called A, B, and C) from the chosen block were selected randomly for the study. The data were collected during April-May, 2012.

Characteristics of sample villages

The sample villages are small villages located as isolated hamlets. They are surrounded by small mountains in three directions and connected to outside areas by a small narrow road. Most of the families belong to Schedule Tribes and Schedule Castes and mostly work as agricultural labourers, wood cutters, daily wage labourers and farmers. Education level of the people is low with many of them are illiterates. Although the villages are not far from the district headquarters, there is a lack of transportation facilities with no direct road communication to village A. People cross a river to get access to other places. They have to walk through two feet of water in the river during summer season and in the rainy season, they have to swim to cross the river. Hence, women, children and old people do not generally move out of the village A during the monsoon. People who work outside the village have to remain away from their home due to such poor road connectivity to the village during monsoon. Road communication to villages B and C is not in good condition with narrow, rough and uneven *kutcha* roads. Shared auto and mini-bus facilities are limited. Each village has one primary school. Pharmacy shop and any facility for primary health care were not available in any village at the time of the data collection. Most people have to cover at least 10 to 15 kilometres to seek services from healthcare providers.

Houses in the villages are arranged in rows. Most of them are *kutcha* or *semi-pucca* with thatched roofs and a few of them have tile or concrete roofs. *Pucca* houses are very few with one or two rooms and a separate kitchen area. The main source of drinking water is boring tube-wells. Not a single household has a latrine facility and people go to open space for defecation. Waste disposal facilities of the villages are not good with each village having one or two public dumping places which is used by the households to dump the household garbage and waste materials.

Data collection methods

With the help of Anganwadi workers, the first author visited all the three sample villages. House listing was carried out to identify households that have mothers of under-five children. There were a total of 220 such households in all the three sample villages. Interview schedule was pilot tested in twenty five households and they were excluded from the initial household list. Remaining 195 households were recruited for the study. Using complete coverage, a total of 172 mothers with children below five years of age were finally interviewed. The remaining mothers either refused to participate or were found to be absent in home at the time of interview. A cross sectional study with structured interview schedule using face to face interview was carried out. Mothers were taken as respondents as they are the primary care-takers of children. Information on

[1]http://www.odisha.gov.in/pc/humandevelopment/summary/prelim.pdf accessed on 20th October, 2014

mothers' hand washing practices at six important moments namely: after defecation; after cleaning child's bottom (after his/her defecation); after stool disposal or any contact with human faeces before eating; before feeding the child; and before cooking, serving or handling food were collected. Information on mothers' water hygiene, food hygiene, domestic hygiene and stool disposal practices was also obtained. In addition to mothers' socio-economic and demographic characteristics, environmental factors such as water source, distance to water source, availability of latrine and access to dumping yard were also collected. Further, mothers' beliefs regarding causation, prevention and treatment of diarrhoea were obtained.

In addition to the quantitative survey, around 25 per cent of households from the total sample population were revisited by the first author for observation of the actual hygiene practices of mothers. The first author spent around six hours; morning 8-11 and afternoon 3-6 in the selected households to observe mothers' hand washing practices, water hygiene, food hygiene and domestic hygiene behaviour.

Data analysis

Using the information on six important hygiene behaviours, three outcome/ dependent variables such as "hand washing", "treatment of water" and "domestic hygiene" were created. Hand washing was coded as yes (= 1) if the mother washed hand with soap after three occasions, namely, defection, cleaning child's bottom after his/her defecation and stool disposal or any contact with human stool or else, no (=0). Water treatment was coded as yes (= 1), if the mother did any kind of water treatment or else, no (= 0). Similarly, domestic hygiene was coded as yes (= 1), if the floors of living room and kitchen in the mother's household were observed to be clean, or else, no (= 0). Chi-square (χ^2) test was carried out to see the association between these three outcome variables and important demographic, socio-economic and environmental factors. Logistic regression analysis (see Table 4 for the list of variables used) was carried out to find out the determinants of the three hygiene outcome variables after controlling other factors. Further, kappa (κ) test was carried out to understand the consistency between the respondents' answer to various hygiene questions during the interview and the direct observation findings of their actual hygiene behaviour.

III. Results

Socio-economic and demographic profile of mothers

Table 1 provides information on socio-economic, demographic and environmental characteristics of mothers. Mean age of mothers was 26.4 years and the average family size was 5.5. About 70 per cent of mothers did not have any formal education. The mean annual household income of mothers was Rs. 62,055 rupees. About 90 per cent of mothers were not working and the remaining were working as agricultural coolies, and labourers at construction sites. Though, 20 per cent households possess television, only 8 per cent households have subscription to newspaper. Household source of water for 84 per cent of mothers was tube-well or bore-well. Over 90 per cent of the mothers fetched water from outside the house. No respondent's household has access to latrine facility.

Hygiene behaviour of mothers and beliefs about diarrhoea

Hand washing practices, water hygiene, food hygiene and domestic hygiene behaviours of mothers are provided in Table 2. The proportion of mothers washing hand with soap after defecation, after washing child's bottom and after stool disposal was 58 per cent, 51 per cent and 46 per cent respectively. Ninety four per cent of mothers reported to store cooked food in covered containers and equal percentage washed vegetables before eating them raw. Eighty one per cent of mothers added untreated water to cooked food. Mothers' domestic hygiene behaviour was also assessed through observation of floor of living room, floor of kitchen, presence of animal faeces,

and garbage inside house. Floor of the kitchen was found to be not clean in 65 per cent of the households. Animal faeces were found in about 13 per cent of the households. Half of mothers reported that there was no specific site for defecation for children who are below five years of age. All mothers reported that adult members of the family use open space for defecation as there was no latrine facility available in the household.

Table 1: Socio-economic, demographic and environmental characteristics of mothers, rural Odisha

Background characteristics	Number	Per cent
Socio-economic characteristics		
Scheduled tribe	145	84.3
Illiterate	118	68.6
Mean income of the household (in Rupees)	62,055	--
Have *pucca* house	29	16.9
Households own agricultural land	75	43.6
Households have access to electricity	82	47.7
Households possess radio	5	2.9
Households possess television	34	19.8
Households subscribe to newspapers	13	7.6
Demographic characteristics		
Mean age of mother (in completed years)	26.4	-
Mean family size	5.5	-
Mean number of children	2.4	-
Mothers with children below two years of age	60	34.9
Environmental factors		
Tube-well or bore-well is the source of water for household use	144	83.7
Tube well or bore well is the source of drinking water	142	82.6
Water source located elsewhere*	156	90.7
Time required to fetch water is more than 30 minutes	25	14.5
No specific dumping yard for household waste disposal	41	23.8
No latrine in the household	172	100.0
Number	**172**	**100.0**

*: Not in the premises of mother's own house or in the dwelling unit shared by few households including mother's household.

Using the above details, three important hygiene (dependent) variables were created. Less than half (45 per cent) of the mothers reported washing hand with soaps in all three important occasions such as after defecation, washing child's bottom after her/his defecation and stool disposal or any contact with human excreta. Little over 50 per cent of mothers reported treating water to make it safe for drinking. Floor of the living room was found to be clean in 28 per cent of the households and floor of kitchen was found to be clean in less than one-third of the mothers' household.

Information on mothers' beliefs regarding diarrhoea and prevention of diarrhoea was also obtained as it shapes how to deal with diarrhoea. Information regarding all such beliefs are presented in Table 3. About 33 per cent of mothers believe that diarrhoea is caused by consumption of irregular food, fatty food, fried food, wild berry, roots and tubers which are difficult to digest. Only 44 per cent of mothers reported that diarrhoea can be treated by modern medicine. About 26 per cent of mothers believe that diarrhoea cannot be prevented.

Table 2: Mothers' hygiene behaviours, rural Odisha

Hygiene behaviour	Number	Per cent
Hand washing practices		
Washed hand with soap:		
After defecation	100	58.1
After cleaning child's bottom after his/her defecation	88	51.2
After stool disposal or any contact with human faeces	80	46.5
Before eating	20	11.6
Before feeding the child	32	18.6
Before serving or handling food	7	4.1
Water hygiene behaviour		
Uses handled dipper to drink water	5	2.9
Treats water to make it safe for drinking	90	52.3
Boils water to make it safe for drinking	56	32.6
Food hygiene behaviour		
Stores cooked food in covered container	162	94.2
Uses clean utensil to serve food	145	84.3
Washes vegetables before eating raw	161	93.6
Adds untreated water to cooked food	139	80.8
Domestic hygiene behaviour*		
Floor of living room found clean	78	45.3
Floor of kitchen found clean	61	35.5
Animal faeces not found inside house	149	86.6
Garbage not found inside house	131	76.2
Dependant variables		
Hand washing		
Mothers washed hand with soap after defecation, washing child's bottom after her/his defecation and stool disposal or any contact with human excreta	78	45.3
Treatment of water		
Mothers' treated water to make it safe for drinking	90	52.3
Domestic hygiene		
Floor of living room and kitchen were clean during observation	48	27.9
Number	**172**	**100.0**

* : Domestic hygiene behaviour was observed by the first author for all 172 mothers.

Factors associated with mothers' hygiene behaviour

Results of Chi-square test

To find out the factors associated with the mothers' hygiene behaviour, Chi- square test was carried out for each of the three hygiene outcome variables and socio-economic, demographic and environmental factors (see Table 4). Education of respondent, household access to electricity and total time to fetch water were found to have a significant association with hand washing. Treating water showed statistically significant association with the age of respondents, having at least one child below two years of age, education of respondents, household access to electricity and total time to fetch water. Annual household income and location of water source did not show statistically significant association with treatment of water. The Chi- square test showed statistically significant association between domestic hygiene and caste or tribe of respondents, education of respondents, household's access to electricity and household waste disposal facility.

Results of logistic regression analysis

In order to understand the important determinants of hygiene outcome variables after controlling for other factors, logistic regression analysis was carried out (see Table 5 for list of variables). Table 6 provides the results of logit regression analysis for the three hygiene outcome variables. Total time to fetch water and education of mother were found to be important determinants of hand washing. Age of mother, having at least one child with age of less than two years, education of mother and household ownership of land were found as statistically significant determinants of water hygiene behaviour. The likelihood of treating water and domestic hygiene was found to be increasing with increase in education of mothers. Total time to fetch water was found to be statistically significant determinant for treatment of water as well. Overall, total time spent to fetch water seems to be an important factor for hand washing and treatment of water. Education of the mother seems to an important variable for all the three hygiene variables.

Table 3: Mothers' beliefs about diarrhoea, rural Odisha

Beliefs about cause and treatment of diarrhoea*	**Number**	**Per cent**
Causes of diarrhoea		
Diarrhoea happens to children during teething	19	11.0
Wrong[#] food taken	56	32.6
Change of weather	2	1.2
Witchcraft or bad eye	8	4.7
Attack of fever	16	9.3
Presence of worms in stomach	9	5.2
Consuming spoiled food and bad water	40	23.3
Do not know	25	14.5
Treatment of diarrhoea		
No treatment required	2	1.2
Mantra chikischa or *zhadaphunk***	6	3.5
Restriction of foods like chapatti or eggs or pulses or fruits	22	12.8
Indigenous homemade herbal remedies only	26	15.1
Adequate fluid and ORS[2] solution only	12	7.0
Modern medicine only	77	44.8
Modern medicine and ORS solution	47	27.3
Prevention of diarrhoea		
Cannot be prevented	45	26.2
Wearing amulets	3	1.7
Drinking boiled water	22	12.8
Following all Hygiene practices	41	23.8
Any other	16	9.3
Do not know	45	26.2
Number	**172**	**100**

Note: #. Wrong food includes irregular food, fried food and some kind of foods difficult to digest like wild berries, wild roots and tubers; 2. ORS: Oral Rehydration Solution

* Total number and per cent is not adding up to 172 and 100 respectively as multiple responses were allowed.

** *Mantra chikischa* or *zhadaphunk:* Treatment of disease by sacred words or syllable by a traditional healer

Kappa test: Consistency between the response from interview schedule and observation method about hygiene behaviour.

Kappa values are provided in Table 7 which presents the consistency between the responses from interview schedule and observation method to hygiene questions. Fair degree of consistency was found between the two methods for hand washing after defecation, cleaning child's bottom and faecal disposal (κ value lies between 0.21 and 0.40). During the observation, no respondent washed the hand with soap before handling food, eating and feeding the child. There is

a slight degree of agreement between two methods for hand washing before handling food and feeding child. Mother's hand washing practice before eating was observed in 34 households. All 34 mothers said at the time of interview that they washed their hands before eating food. However, only 26 respondents (76.5 per cent) actually washed their hands before eating during observation. Fair degree of consistency was found between two methods for use of covered container to store water and water treatment. Food hygiene practices like storing cooked food in covered container and washing vegetables before eating raw also show fair agreement between two methods response. However, use of clean utensils showed significantly moderate degree of agreement.

Table 4: Results of Chi-square analysis

Socio-economic and environmental factors	Hygiene outcome variables χ^2 (p)		
	Hand washing	**Treatment of water**	**Domestic hygiene**
Age of mother (in completed years)			
Less than 25	0.249	6.489	2.072
25 and more than 25	(0.618)	(0.011)**	(0.150)
Family type			
Nuclear	0.051	0.014	1.507
Joint	(0.822)	(0.907)	(0.220)
Total family members			
1-4	0.026	0.815	1.152
5 and more	(0.872)	(0.367)	(0.283)
Mothers with at least one child below two years of age			
No	0.804	9.465	0.647
Yes	(0.370)	(0.002)***	(0.421)
Caste of mother			
Scheduled tribe	1.346	2.641	6.522
Other caste	(0.246)	(0.104)	(0.011)**
Education of mother(in completed years of schooling)			
Illiterate	19.884	10.274	8.438
Literate	(0.000)***	(0.001)***	(0.004)***
Household's ownership of land			
No	1.517	2.606	0.001
Yes	(0.218)	(0.106)	(0.981)
Household's access to electricity			
No	9.057	6.119	5.866
Yes	(0.003)***	(0.013)**	(0.015)**
Total annual household income (in rupees)			
40,000 and less	2.194	2.989	0.154
More than 40,000	(0.139)	(0.084)*	(0.695)
Location of water source			
Elsewhere	0.018	0.520	0.098
In premises of own house or dwelling unit	(0.893)	(0.471)	(0.754)
Total time to fetch water			
Up to 30 minutes	7.584	4.539	0.244
More than 30 minutes	(0.006)***	(0.033) **	(0.622)
Household waste disposal facility			
Have access to some kind of dumping yard	2.726	2.546	F-test
No specific dumping yard	(0.099)*	(0.111)	(0.001)***
Total	**172**		

Level of significance: * p< 0.10, ** p< 0.05, *** p< 0.01.

Table 5: Variables used in the logistic regression analysis

Variables	Description	Mean of the variable
Independent variables		
Age of mothers	In completed years	26.4
Family type	Nuclear = 0 Joint =1	1.47
Total family members	Actual Number	5.53
Mothers with at least one child below two years of age	No = 0 Yes = 1	0.348
Caste of mothers	Scheduled tribe = 0 Other caste = 1	0.157
Education of mothers	In completed years of schooling	1.66
Household ownership of land	No = 0 Yes =1	0.44
Household access to electricity	No = 0 Yes = 1	0.48
Annual household income	Log value in rupees	10.891
Total time to fetch water	Up to 30 minutes = 0 More than 30 minutes = 1	0.145
Household waste disposal facility	No specific dumping yard 0 Have access to some kind of dumping yard= 1	0.238
Dependant variables		
Hand washing	No = 0 Yes = 1	0.453
Treatment of water	No = 0 Yes = 1	0.523
Domestic hygiene behaviour	No = 0 Yes = 1	0.279

IV. Discussion and conclusion

Importance of hygiene behaviour is gaining momentum in India with introduction of *Swachha Bharat Mission* (Clean India Mission), a national campaign which was launched by the Prime Minister of India on 2nd October, 2014. Simple hygiene behaviours can significantly improve the health of individual and save many million lives, especially children under five years of age globally. A cross-sectional study was carried out to understand mothers' hygiene behaviour and its determinants using mixed methods in a diarrhoea-prone district of rural Odisha. The study revealed that considerable proportions of mothers were not washing hands with soap after defecation, cleaning children's bottom and faecal disposal or any contact with human faeces which

is a serious public health concern. Mothers were washing hands with soil or only water. Most of the mothers were using only water to wash hands before cooking or handling food, eating and feeding their children. They do not wash their hands before feeding and preparing or handling food. Water hygiene practice was not good as only around 50 per cent mothers were doing some kind of water treatment to make it safe for drinking. Most commonly used method of water treatment was boiling water among the mothers who treat water. Though a majority of mothers used covered containers to store water, a very few mothers used handled dipper to take water from the container. Food hygiene of the mothers was relatively good. Almost all of them reported storing cooked food in covered containers. Washing vegetables before eating raw was a common practice. However, most of the mothers reported that they add untreated water to cooked food which may cause health problems. This can create substantial risk of transmission of diarrhoea causing pathogens as the untreated water could act as a vehicle to carry such pathogens. The domestic hygiene behaviour was relatively good for all mothers.

Table 6: Logistic regression results for hygiene practices of mothers, rural Odisha

Independent Variables	Hygiene Practices								
	Hand washing			Treatment of water			Domestic hygiene behaviour		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	P
Education of mothers (in completed years of schooling)									
	1.402	1.189-1.654	***	1.230	1.055- 1.434	***	1.155	1.020-1.308	**
Household's ownership of land									
No ®	1.000			1.000			1.000	0.593	
Yes	1.039	0.716- 1.508	NS	0.625	0.424- 0.922	**	0.897	0.593- 1.358	NS
Annual household income (log)									
	1.610	0.715- 3.625	NS	1.833	0.791- 4.245	NS	2.094	0.873- 5.021	*
Age of mothers (in completed years)									
	0.955	0.875- 1.042	NS	0.913	0.839- 0.994	**	0.984	0.900- 1.075	NS
Mothers with at least one child below two years of age									
No ®	1.000			1.000			1.000		
Yes	1.030	0.703- 1.511	NS	1.762	1.186- 2.618	***	1.059	0.713- 1.573	NS
Total time to fetch water									
Up to 30 minutes ®	1.000			1.000			1.000		
More than 30 minutes	0.345	0.171-0.696	***	0.701	0.990- 2.921	*	1.068	0.640- 1.780	NS

Level of significance: NS: Non-significant, * p< 0.10, ** p< 0.05, *** p< 0.01. ®: Reference category

What determines hygiene behaviour?

Hygiene behaviour could be influenced by various socio-economic factors and environmental factors. Socio-economic factors like education and wealth can directly affect hygiene behaviour. Environmental factors like access to latrine and location of water source influence hygiene behaviour. Logit regression analysis points out that education of mothers and the time spent to fetch water play an important role in practising hygiene behaviours after controlling for other factors.

Education of mothers: The most important determinant of hygiene behaviour

All three dependant variables (hand washing, treatment of water and domestic hygiene) showed significantly positive relationship with education of mothers, i.e., hygiene practices were

Table 7: Comparison of structured interview schedule response and observation findings, rural Odisha

Hygiene behaviours				**κ^e value (p)**
Hand washing practices after any contact with human faeces	**Structured interview schedule**	**Observation**		
		Hands not washed with soap	Hands washed with soap	
After defecation	Do not wash with soap	5	1	0.327 (0.095)
	Wash with soap	6	8	
After cleaning child's bottom	Do not wash with soap	9	1	0.302 (0.097)
	Wash with soap	7	5	
After faecal disposal	Do not wash with soap	10	2	0.290 (0.163)
	Wash with soap	5	4	
Hand washing practices before contact with food				
Before preparing, handling or serving food	Do not wash hand	10	0	0.134 (0.118)
	Wash hand	19	5	
Before feeding the child	Do not wash hand	3	0	0.158 (0.087)
	Wash hand	15	16	
Water hygiene behaviour	**Structured interview schedule**	**Observation**		**κ value (p)**
		No	**Yes**	
Used covered container for storing water	No	2	0	0.346 (0.004)
	Yes	6	31	
Treated water to make it safe for drinking	No	16	0	0.387 (0.002)
	Yes	13	10	
Stored cooked food in covered container	No	5	0	0.268 (0.014)
	Yes	14	20	
Food hygiene behaviour				
Washed vegetables before eating raw	No	3	0	0.289 (0.073)
	Yes	7	9	
Used clean utensils to serve food	No	9	0	0.603 (0.000)
	Yes	7	23	

Note: None of the respondents washed hands with soap before handling food and feeding the child. Hence, observation for these two items were coded as 'Hands not washed' and 'Hands washed' only. For structured interview schedule response, the coding was 'Do not wash hands' and 'Wash hands' in two above mentioned occasions. When kappa (κ) value is less than 0 is poor agreement, when it lies between 0-0.2 is slight agreement, between 0.21-0.40 is fair agreement, between 0.41- 0.60 is moderate agreement, between 0.61-0.80 is substantial agreement and when it lies between 0.81-1.00 is almost perfect agreement between structured interview schedule and observed responses.

found to be better among educated mothers. When mothers' education increases, the likelihood of practicing hand washing with soap after defecation, cleaning child's bottom after his/her defecation, stool disposal or any contact with human faeces increases. Educated mothers were also more likely to treat water to make it safe for drinking as compared with illiterate mothers. Domestic environment in terms of cleanliness of floors of living room and kitchen was better in the households where mothers are educated. It is important to note that even as little education as primary education can play an important role in practising hygiene behaviour of an individual as the mothers who went to school (about 70 per cent of mothers in the sample area did not go to school) in the sample area had only education up to the primary level. The finding that education affects health is not new. Education is strongly linked to health and its determinants such as health behaviour, risky contexts and preventative health service use. In poor socio-economic settings, even a few years of schooling has a huge potential to influence people on healthy behaviour as revealed by the present study.

Total time to fetch water

Total time spent to fetch water for drinking and other household use was found to be another important determinant of hygiene behaviour. Our finding shows that mothers who spent more than 30 minutes to fetch water are three times less likely to wash their hands with soap after defecation, cleaning child's bottom after his/her defecation, stool disposal or any contact with human faeces. Time required to fetch water was found to be strongly associated with mother's water treatment practices. This behaviour may be explained in terms of non-availability of sufficient water. Washing hand with soap definitely needs more water than washing hand without soap. Long time to fetch water may act as a barrier to collect sufficient quantity of water for drinking as well as other household use. Those mothers who need more time to fetch water are likely to collect less amount of water than the mothers who spend less time.

Apart from the two major factors, demographic factors like age of mothers and children also showed a strong association with mothers' water treatment behaviour. Domestic hygiene behaviour was strongly influenced by annual household income. The floors of living room and kitchen were often found clean in the households which have more annual income. Overall, time spent on fetching water and education of the mother emerge as important determinants in the study.

Policy recommendations

Based on the above findings, the study suggests three policy recommendations that might help to prevent diarrhoea in the poor socio-economic settings which are prone to be affected with diarrhoea. Education of mothers is a key determinant of hygiene behaviour. Policy intervention is required to raise the overall educational status of the people in general and women in particular. Educated mothers could successfully prevent diarrhoea transmission by following good hygiene practices. This can be achieved only in the long run. Hence, our first suggestion is to provide continuous health education to create hygiene awareness among mothers which can bring a change in health behaviour of people even in short duration. Beliefs regarding the bacterial causation of diarrhoea will also be instrumental in sustaining the hygiene behaviour after such hygiene awareness is created among mothers. Culturally appropriate health education materials illustrating the importance of hygiene behaviour along with the real cause of diarrhoea could be designed and used in such programmes. Second, mothers spending longer time to fetch water could force them to curtail water use for sanitation and other hygiene behaviours. Hence, it is essential to provide easy access to water for the community which could reduce not only diarrhoea in children but also improve overall health of infants and children. Third, providing sanitary toilets and household waste disposal facilities could enable mothers to follow domestic hygiene. Unless easy access to water and sanitary toilets are provided, India's much published campaign of "Swachha Bharat Mission, 2014" may not create personal and community hygiene practices, especially in the poor settings.

Limitations of the study

Although, the researchers had attempted to make this study scientific, the following limitations are acknowledged. Interview schedule method to explore the hygiene practices of respondents may have a few drawbacks. There may be a chance of over reporting of good hygiene practices. Also, hygiene behaviours may vary from time to time for the same person. Single observation of all hygiene practices was carried out in this study. A larger study including repeated observations of hygiene behaviour is recommended to have a more detailed understanding of hygiene behaviour of mothers.

Implications for policymakers

It is essential to provide easy access to water for the community which could reduce not only diarrhoea in children, but also improve overall health of infants and children. Implementation of hygiene awareness programmes for mothers can bring down childhood diarrhoea incidence in a short span. Culturally, appropriate health education (IEC) materials and behaviour change communication (BCC) strategies, illustrating the importance of hygiene behaviour in prevention of diarrhoea could be designed and used in such programmes. Provision of sanitary toilets and household waste disposal facilities could enable mothers to follow domestic hygiene.

Implications for public

The study showed that mothers who spent less time to fetch water follow good hand washing practices and treat drinking water. Uneducated mothers are most likely to follow poor hand washing practices, water hygiene behaviour and stool disposal practices. Correct beliefs about diarrhoea and its transmission routes, among mothers will also help in reducing deaths caused by childhood diarrhoea.

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