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### **Original Research Article**

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## Personal and domiciliary hygiene practices and its association with incidence of infectious diseases among children aged 6-59 months

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#### **ABSTRACT**

Background: Over 200 million under-five-children born in low-income countries are at risk of not reaching their development potential and infectious diseases are the leading cause of development deficits in these regions.

Methods: A cross-sectional study was conducted to investigate personal and household hygiene practices among 154 mothers and their association with the incidence of infectious diseases among 167 children aged 6 months to 59 months in Patuakhali district, Bangladesh.

Results: Only 13.6% of the mothers had proper hand washing knowledge. Besides, 14% and 53.9% of the mothers washed their hands with soap and only with water respectively before feeding their child. About 68.2% of mothers prepared food on the ground and half (49.5%) of the toilet did not have a hand washing location beside it. The risk of childhood infectious disease was significantly associated with hand washing of mothers before feeding a child (OR: 2.3, 95% CI: 1.5-4.1, p<0.05) and hand washing of child before eating (OR: 3.4, 95% CI: 1.8-5.7, p<0.05).

Conclusions: Hand washing agents were inadequate and compliance to hand washing was poor. Therefore, the continuous focus is needed on the mother's awareness construction to increase the compliance to hand washing practice among mothers as well as their child with soap, especially during child feeding.

Keywords: Personal hygiene, Domiciliary hygiene, Infectious diseases, Under-5 children

#### **INTRODUCTION**

Infectious diseases are one of the leading causes of the global burden of diseases and it is estimated that 499 thousands of under-five children die due to diarrhea globally.<sup>1,2</sup> Diarrhea and other enteric infections remain an unmet global child health problem.<sup>3</sup> Besides diarrheal disease is reported as the second leading cause of death in children under five children and most is due to hygiene and sanitation conditions within households.<sup>4</sup> World health organization reported that 90%

of all deaths from diarrhea in children happen due to inadequate access to clean water, basic sanitation, and poor hygiene practices.<sup>5</sup> Food hygiene was also considered as a potential vehicle of diarrheal diseases and up to 70% of diarrhea episodes in developing countries are regarded as food-borne.<sup>6,7</sup> There is also a considerable burden of other infectious diseases due to insufficient water, sanitation, and hygiene facilities and practices, particularly in low-income countries.8 Over 200 million children born in low-income countries are at risk of not reaching their development potential and poor sanitation

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and hygiene practices were reported as one of the potential causes of that developmental deficit. 9-12. Every year about 2.4 million deaths (4.2% of all deaths) could be prevented globally if appropriate hygiene was practiced and everyone had reliable sanitation and drinking water. 13 The importance of household safe water, sanitation, and hygiene (WASH) improvement to reduce infectious diseases among children is well documented. 14-17 Besides, there are also numerous interventions focused on improving hygiene practices and drinking water treatment for reducing child diarrhea and acute respiratory infections. 16,18-22 In addition to that, there are other studies targeting water storage and sanitation interventions in household settings reported the reduction of diarrhea among members. 16,23,24

Extensive morbidity from infectious diseases was reported to be imposing adverse effects on the growth and development of the children in Bangladesh. 25 Households in rural areas usually lacked hand washing location and compliance to hand washing practice was also poor among both children and their caregiver in Bangladesh.<sup>26</sup> According to the Bangladesh National hygiene baseline survey around two-third of the toilet and four-fifths of the drinking, water points were unclean.26 Evidence indicating that numerous infectious diseases are related to the home environment such as airborne microorganisms, mites, and insects and beetles may be the cause of respiratory diseases such as asthma.<sup>27</sup> However, to our knowledge, no study has been conducted in Bangladesh regarding household hygiene practices and their association with the occurrence of infectious diseases. We aimed to describe the frequencies of personal hygiene practices, household hygiene practices, and their association with the incidence of infectious diseases.

#### **METHODS**

#### Study site and participants

The study was carried out in the Jelepara, Guccha Gram, and Jamla area in Dumki Upazilla of Patuakhali district, Bangladesh. Verbal autopsy was taken from all mothers with children aged 6 months to 59 months and an observational study was carried out in their household. Children younger than six months were excluded as most of them were breastfed and had less exposure to drinking water and contaminated food. Participants were selected by the snowball sampling method. The study was conducted among 154 mothers. Among all the mothers, 141 had 1 child and 13 had 2 children each aged between 6 months to 59 months. Therefore, total of 167 children participated in the study.

#### Data collection

Data were collected as part of a baseline survey in research for preventing diarrheal disease through personal hygiene and kitchen sanitation in Dumki Upazila. A structured questionnaire that included a total of 45

questions was used to collect data and the questionnaire consisted of five sections; general information, personal hygiene, kitchen sanitation, environmental information, and observation. Several food-hygiene practices of mothers were measured including proper hand washing, hand-washing before food preparation, washing-method of utensils; such as cups, bowls, and spoons, separation of utensils; such as cutting boards or knives for raw or cooked food, and the location where food was prepared for cooking. Proper hand washing practice was measured according to world health organization (WHO) guideline.<sup>28</sup> We collected data regarding infectious diseases like diarrheal diseases and respiratory infections during the last 3 months by the recall method. We also observed the hygiene practices and status of kitchen sanitation through direct observation. In this study, we considered possession of a refrigerator as a reflection of the economic status of the household; therefore, we also included this variable in the model.

#### Statistical analysis

All statistical analyses were performed using the SPSS statistical software package for Windows (version 22.0; IBM SPSS Inc.). Descriptive statistics were used to describe the different variables of hygiene practices and kitchen sanitation status. To explore the association between dependent and independent variables, we conducted binominal logistic regression analysis.

#### **RESULTS**

#### Sociodemographic status

The mean age of 167 children was 2.78 years; standard deviation (SD)=1.44 years. Besides, 66.2% were aged between 6 months to 36 months, and all of them were taken care of by their mother. All children had started receiving some additional solid and semi-solid food other than breastmilk before the survey period. The mean age of the mothers was 27.0 (SD=4.71) years. Regarding the education of mothers, 80 (52.0%) attended at least primary school, 40 (26.0%) attended secondary school and most of them (153; 99.35%) were homemakers. About 39% of the family possessed a refrigerator which was considered as the reflection of family income. Monthly income of fathers was  $\leq 10,000$  (62.3%), ≤20,000 (30.4%) and above 20,000 (7. 3%). Most of the 147 (95.5%) lived in a nuclear family and the rest 7 (4.5%) lived in a joint family (Table 1).

#### Status of personal hygiene practices

Knowledge about proper hand washing practice was very poor (N=21; 13.6%) among mothers. Almost all mothers reported that they washed their hands before preparation of foods and before feeding children, among them only 48 (31.2%) mothers reported that they washed their hands with soap, 83 (53.9%) with only water, and 23 (14.9%)

sometimes used soap to wash their hands before feeding their child.

Table 1: Socio demographic status.

Characteristic	N	%
No. of children below 5 years age		
1	141	91.6
2	13	8.4
Age of last children (years)		
1	39	25.3
2	35	22.7
3	28	18.2
4	25	16.2
5	27	17.5
Mothers education		
Primary level	80	51.9
High School level	40	26.0
College	25	16.2
University	8	5.8
Mothers occupation		
Homemaker	153	99.35
Employee	1	0.65
Family income (monthly)		
≤10,000	96	62.3
≤20,000	47	30.4
Above 20,000	11	7.3
Possession of refrigerator		
Yes	60	39
No	94	61

Besides, all mothers reported that they wash their hands with soap after the toilet. Analysis of the hand-washing practice of children revealed that 61 (39.6%) and 108 (70.2%) children were washed hands with soap before eating by their mother and eating by themselves respectively. Besides, the study found all children always washed their hands with soap after the toilet (Table 2).

#### Kitchen Sanitation practices

Table-3 shows that about 105 (68.2%) mothers prepared food on the ground and 49 (31.8%) prepared on impervious layer or table. All mothers used separate utensils for keeping cooked and raw food. Only 4 (2.6%) mothers washed vegetables before cutting and the rest 180 (97.4%) washed after cutting. To keep cooked food, 93 (60.4%) mothers used Almira, 49 (31.8%) on the table with cover, and 12 (7.8%) on the floor. To wash utensils, 111 (72.1%) mothers used tube well water, 42 (27.3%) used pond water, and all of them used detergent to wash utensils. For cooking purposes 109 (70.8%) mothers used tube well water and 45 (29.2%) used pond water, and none of them boiled pond water before cooking. Most of the mothers did not know how to keep raw food and processed food in a freeze. However, they heated food when reused freezing food and most of them used leftover food with reprocessing or heating again. About 75 (48.7%) mothers cut animal products inside of the kitchen and 73 (47.4%) cut outside of the kitchen.

Table 2: Status of personal hygiene practices of mother and child.

Characteristics	N	%	
(onsite condition) Proper handwashing system			
Know	21	13.6	
Did not know	133	86.4	
Wash hand before cooking	133	80.4	
Yes	154	100	
No	0	0	
Hand washing before feeding			
hand)	a Cilliu (illot	iner s	
Yes	154	100	
No	0	0	
Sometimes	0	0	
Handwashing with soap befor			
(mother's hand)	c recuiring a	ciliu	
Yes	48	31.2	
No	83	53.9	
Sometimes	23	14.9	
Ensure handwashing when the	e child was	eaten by	
mother (child's hand)			
Yes	61	39.6	
No	88	57.1	
Sometimes	5	3.2	
Ensure handwashing with soa	p when chil	dren were	
eating them-self (child's hand)	)		
Yes	108	70.2	
No	45	29.2	
Sometimes	1	.65	
Handwashing with soap after	toilet (child	's hand)	
Yes	154	100	
No	0	0	
Handwashing with soap after toilet (mothers' hand)			
Yes	154	100	
No	0	0	

#### Status of environmental hygiene or sanitation

In terms of sanitation, table-4 shows all households had a private toilet, and of these, 99 (64.3%) had concrete cemented (paka) toilet, 54 (35.1%) did not have concrete cemented toilet (kacha) toilet, and 78 (50.5%) toilets had proper hand washing facility beside the toilet. As for water management, the households in the Dumki Upazila use several water sources, such as tube well, ponds, and sometimes river water. All families used tube well water for drinking. 21 (13.6%) families had a water storage tank and 133 (86.4%) had no storage tank and 66.7 % of families (those had storage tanks) cleaned their storage tank at least once every month. The waste disposal areas were open, never cleaned, and 2 to 10 meters away from the kitchen area. About 116 (75.3%) families claimed about insects and rodents attack in the kitchen and from

the observation, we found 81 (52.6%) number of kitchens didn't have a proper drainage system.

Table 3: Status of kitchen sanitation.

Characteristics (onsite condition)	N	%
Place of preparing food		
On ground	105	68.2
On table/ impervious layer	49	31.8
Separating raw and cooked food		
Yes	154	100
No	0	0
Kept cooked food		
In almira	93	60.4
On table	49	31.8
On floor	12	7.8
Used water for cooking		
Tube well	109	70.8
Pond	45	29.2
River	0	0
Used water for washing utensil		
Tube well	111	72.1
Pond	42	27.3
River	0	0
Other	1	0.6
Boiling water when used pond water		
Yes	0	0
No	154	100
Used detergent for washing utensil		
Yes	154	100
No	0	0
Water pot		
Covered	131	85.1
Uncovered	23	14.9
Cut animal products		
Inside of kitchen	75	48.7
Outside of kitchen	73	47.4
Other	6	3.9
Washing vegetables		
Before cutting	4	2.6
After cutting	150	97.4

#### Prevalence of childhood infectious disease

The study found a total of 76 (49.4%) children were suffering from fever, 23 (14.9%) children were suffering from diarrheal disease, 7 (4.6%) children were suffering from the common cold, and 48 (31.1%) were suffering from other diseases last 3 months. Other diseases were including vomiting, pox, polio, headache, stomach ache, anemia, allergy, etc.

The prevalence of diseases was significantly higher among children aged less than 3 years than among children aged 4 to 5 years (Table 5).

**Table 4: Status of environmental sanitation.** 

Characteristics	N	%	
(onsite condition)	11	70	
Private toilet			
Yes	154	100	
No	0	0	
Concrete cemented toilet			
Yes (paka)	99	64.3	
No (kacha)	54	35.1	
Others	1	0.6	
Source of water for drinking water			
Tube well	154	100	
Pond	0	0	
others	0	0	
Had water storage tank			
Yes	21	13.6	
No	133	86.4	
Waste disposal system			
Open	154	100	
Closed	0	0	
The proper drainage system at the k	itchen		
Yes	72	47.4	
No	81	52.6	
Had insect attack			
Yes	116	75.3	
No	38	24.7	
Proper hand washing facilities near the toilet			
Yes	78	50.6	
No	76	49.4	

Table 5: Children suffered from infectious disease in last 3 months.

Name of the disease	N	%
Fever	76	49.4
Diarrhea	23	14.9
Cold	7	4.6
Others	48	31.1

# Association between infectious diseases and hygienic practices

Two variables, which showed significant associations with the prevalence of diarrhea and maternal hygienic practices, were: mother's hand washing with soap before feeding child and child's hand washing when the child is eaten by mother in bivariate analysis. Binominal logistic regression revealed that children whose mothers washed hands with soap before feeding the child were less 2.3 (95% confidence interval (CI): 1.5-4.1, p<0.05) times less likely to be infected with infectious diseases. Besides, children who washed their hands before eating were 3.4 times (95% CI: 1.8-5.7, p<0.05) less likely to be infected with infectious diseases.

#### **DISCUSSION**

It is evident that proper hand washing significantly reduces the spread of infectious diseases and promotes wellness in child care.29 Paediatrics and child health of Oxford University suggests that washing both mother's and their kids' hands are the best things to stop the spread of germs.<sup>30</sup> While all the mothers in our study reported that they wash their hands before feeding their child, the number of children ensured wash their hands with soap when they fed by their mother is poor (39.6%). Our research observed that hand hygiene practices of both mother and child have a significant effect on the incidence of infectious diseases among children, among them fever and diarrhea were most common. However, our study found some potential reasons for such poor hand hygiene practices among mothers and children. First of all our study found over half of the mothers wash hands with just water and they have a lack of knowledge about proper hand washing practices (Table 2).

A large portion (68.2%) of the mothers cook on the ground which is considered an important route of transmission of diarrheal pathogens.31 The practice of preparing foods on the ground is a traditional custom in Bangladesh, especially in rural areas. However, this custom may increase the possibility of food contamination and could cause intestinal infectious diseases among children. Moreover, almost all the mothers (97.4%) wash the vegetables after cutting it while it is recommended to wash the vegetables before cutting them down. 32,33 Besides, most of the mothers were found with good practice of keeping cooked foods and washing the utensils (Table 3). However, the results of this study suggest that food hygiene practices among mothers were inadequate which might have an important impact on the prevalence of diarrhea among children. Hand washing practice among both mothers and children after the toilet is satisfactory. Almost all the participants self-reported their hand washing compliance after the toilet. However, half of the households in our study area did not have a hand washing facility near the toilet, which is considered a barrier to hand washing compliance.<sup>34</sup>

#### Limitations

This study has certain limitations. First, hygiene practices were graded based on self-reported behaviors of the mothers which might be subjected to inaccuracy. Therefore further investigation using the observational method is required. Second, this study only reached the mother considering them as the regular caretaker of the baby, while other family members also take care of the baby in the same household. Third, the duration and temperature of boiling water were not clearly defined.

#### **CONCLUSION**

Hand washing of both mother and her child during feeding significantly affects the incidence of infectious diseases among children. Besides mothers lacked hand washing knowledge. Hand washing agents were inadequate and compliance to hand washing was poor. Therefore, this study assumed that washing hands with just water and lack of proper hand washing knowledge were the potential reason for poor hand washing practice among mother and their child. Therefore the continuous focus is needed on the mother's awareness construction to increase the compliance to hand washing practice among mothers as well as their child with soap, especially during child feeding. In addition to that, improving household sanitation practices could be an efficient strategy to prevent infectious diseases among kids.

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Institutional Ethics Committee

#### **REFERENCES**

- 1. The global burden of disease. Available at: https://www.who.int/healthinfo/global\_burden\_diseas e/GBD\_report\_2004update\_full.pdf?ua=1. Accessed on 20 January 2021.
- 2. Troeger C, Forouzanfar M, Rao PC. Estimates of global, regional, and national morbidity, mortality, and aetiologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study 2015. Lancet Infect Dis. 2017;17(9):909-48.
- 3. Mokomane M, Kasvosve I, Melo E de, Pernica JM, Goldfarb DM. The global problem of childhood diarrhoeal diseases: emerging strategies in prevention and management. Ther Adv Infect Dis. 2018;5(1):29-43.
- 4. Diarrhea: Common Illness, Global Killer. Available at: https://www.cdc.gov/healthywater/pdf/global/programs/Globaldiarrhea508c.pdf. Accessed on 20 January 2021.
- 5. Water, Sanitation and hygiene interventions and the prevention of diarrhoea. Available at: https://www.who.int/elena/titles/bbc/wsh\_diarrhoea/en/. Accessed on 20 January 2021.
- Basic Principles for the preparation of safe food for infants and young children. Available at: https://apps. who.int/iris/bitstream/handle/10665/67833/WHO\_FN U\_FOS\_96.6.pdf?sequence=1&isAllowed=y. Accessed on 20 January 2021.
- 7. Motarjemi Y, Kaferstein F, Moy G, Quevedo F. Contaminated weaning food: A major risk factor for diarrhoea and associated malnutrition. Bull World Health Organ. 1993;71(1):79-92.
- 8. Cairncross S, Bartram J, Cumming O, Brocklehurst C. Hygiene, Sanitation, and Water: What Needs to Be Done? PLoS Med. 2010;7(11):e1000365.
- 9. Lu C, Black MM, Richter LM. Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level. Lancet Glob Heal. 2016;4(12):e916-22.

- 10.Ngure FM, Reid BM, Humphrey JH, Mbuya MN, Pelto G, Stoltzfus RJ. Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. Ann NY Acad Sci. 2020:45:83-9.
- 11.Stewart CP, Kariger P, Fernald L. Effects of water quality, sanitation, handwashing, and nutritional interventions on child development in rural Kenya (WASH Benefits Kenya): a cluster-randomised controlled trial. Lancet Child Adolesc Heal. 2018; 2(4):269-80.
- 12. Fink G, Günther I, Hill K. The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986-2007. Int J Epidemiol. 2011;40(5):1196-204.
- 13. Prüss-Üstün A, Bos R, Gore F, Bartram J. Safer water, better health; costs, benefits and sustainability of interventions to protect and promote health. Available at: https://apps.who.int/iris/bitstream/handle/10665/43840/9789241596435\_eng.pdf?sequence=1&i sAllowed=y. Accessed on 20 January 2021.
- 14.Bartram J, Cairncross S. Hygiene, sanitation, and water: Forgotten foundations of health. PLoS Med. 2010;7(11):56-9.
- 15.Esrey SA, Habicht J-P. Epidemiologic evidence for health benefits from improved water and sanitation in developing countries. Epidemiol Rev. 1986;8(1):117-28.
- 16.Fewtrell L, Kaufmann RB, Kay D, Enanoria W, Haller L, Colford JM. Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: A systematic review and meta-analysis. Lancet Infect Dis. 2005;5(1):42-52.
- 17.Freeman MC, Ogden S, Jacobson J, et al. Integration of water, sanitation, and hygiene for the prevention and control of neglected tropical diseases: a rationale for inter-sectoral collaboration. PLoS Negl Trop Dis. 2013;7(9):122-9.
- 18.Clasen TF, Roberts IG, Rabie T, Schmidt W-P, Cairncross S. Interventions to improve water quality for preventing diarrhoea. In: Cochrane Database of Systematic Reviews. United States: John Wiley & Sons Ltd; 2006.
- 19. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: A systematic review. Lancet Infect Dis. 2003;3(5):275-81.
- 20. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing diarrhoea. Cochrane Database Syst Rev. 2008;(1):45-9.
- 21.Luby SP, Agboatwalla M, Feikin DR. Effect of handwashing on child health: A randomised controlled trial. Lancet. 2005;366(9481):225-33.
- 22. Rabie T, Curtis V. Handwashing and risk of respiratory infections: A quantitative systematic

- review. Trop Med Int Heal. 2006;11(3):258-67.
- 23. Daniels DL, Cousens SN, Makoae LN, Feachem RG. A case-control study of the impact of improved sanitation on diarrhoea morbidity in Lesotho. Bull World Health Organ. 1990;68(4):455-63.
- 24.Doocy S, Burnham G. Point-of-use water treatment and diarrhoea reduction in the emergency context: An effectiveness trial in Liberia. Trop Med Int Heal. 2006;11(10):1542-52.
- 25.Black RE, Brown KH, Becker S, Yunus M. Longitudinal studies of infectious diseases and physical growth of children in rural Bangladesh. Am J Epidemiol. 1982;115(3):305-14.
- 26.WaterAid Bangladesh, Policy Support Unit. Available at: https://washmatters.wateraid.org/publications/bangladesh-national-hygiene-baseline-survey-preliminary-report-2014. Accessed on 20 January 2021.
- 27.Beumer RR, Kusumaningrum H. Kitchen hygiene in daily life. In: International Biodeterioration and Biodegradation. Netherlands: Elsevier Ltd; 2003:15;299-302.
- 28.Hand Hygiene: why, how & when? why?. Available at: https://www.who.int/gpsc/5may/Hand\_Hygiene\_Why\_How\_and\_When\_Brochure.pdf. Accessed on 20 January 2021.
- 29.Niffenegger JP. Proper handwashing promotes wellness in child care. J Pediatr Health Care. 2005; 11(1):26-31.
- 30.Handwashing for parents and kids. Paediatr Child Health. 2001;6(1):53-6.
- 31.Sanitation and Hygiene promotion: programming guidance. Available at: https://www.who.int/water\_sanitation\_health/hygiene/sanhygpromo.pdf. Accessed on 20 January 2021.
- 32.Raw produce selecting and serving it safely. Available at: https://www.fda.gov/media/77178/download. Accessed on 20 January 2021.
- 33.Lehman S. Why nutrients are lost in cut fruits and vegetables. Available at: https://www.verywellfit.com/fruits-vegetables-cut-nutrients-lost-2506106.
- 34.Zellmer C, Blakney R, Van Hoof S, Safdar N. Impact of sink location on hand hygiene compliance for Clostridium difficile infection. Am J Infect Control. 2015;43(4):387-9.

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