Knowledge and Practice of Personal Hygiene among Rural Women in Northern Bangladesh

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Authors’ contributions

The research was conducted in collaboration among all authors. Authors MFU, SH and DC conceptualized the study. Authors EHMSR and MMH helped in instrument preparation. Authors MFU and MEU analyzed data and wrote the first draft of the manuscript. Author MEU wrote abstract, prepared skeleton of results section and conclude the findings. Authors EHMSR and MMH improved the first draft. Authors SH and DC supervised the implementation of overall research. All authors read and accepted the final manuscript.

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ABSTRACT

Background: Sanitation and hygiene have huge impact on human health particularly on death and morbidity of children which are influenced by mother knowledge and practice on the issues.

Aim: The study aimed to assess the present situation of knowledge and practices of basic health hygiene and sanitation of the rural farm families in Northern Bangladesh with a view to find the ground for development initiative towards a better health and sanitation systems. The study also aimed to identify the regional variations in health and sanitation systems in Northern Bangladesh with a view to offer policy support and development.

Methodology: The study was conducted in six sub-districts of three poverty-prone districts – Gaibandha, Rangpur and Kurigram. The multi-stage cluster sampling process yielded a sample size

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of 386 household (HH) covering 24 different villages. Data was collected by trained assistants following a face-to-face interview using structured interview schedule. Descriptive statistics were used to organize the table with results. Chi-square test was used to assess the regional variations in knowledge and practice of hygiene and sanitation.

**Results:** About 70% families use unsafe latrines where a significant portion of them are open pit types (33%) having no latrines floor (32%) and wall (75%). More than half of the child-bearing mothers have poor knowledge therefore they directly through the feces outside and did not wash hand properly after cleaning the defecated children and toilets/potty. Many of them do not know that they should wash hand before breast feeding (50%), prior to food preparation (77%), after cleaning of animals (79%) and after any activity (97%). Women of Gaibandha district was the better user of flush toilet and good habit of washing hand after toilet use. Better disposal of domestic waste was observed among the women of Kurigram District. In all respect women of Rangpur was mediocre in hygiene practice. Except disposal of children feces and hand washing before eating significant regional variations were found in type of toilet used, disposal of domestic waste, hand washing before food preparation, hand washing before feeding their child, after toilet use, after cleaning toilet of child and after cleaning the animal.

**Conclusion:** More awareness program and subsidy policy should be taken for improving sanitation and hygiene with keeping in mind the regional variations in hygiene practice.

**Keywords:** Rural women; hygiene practice; education; Northern Bangladesh.

1. **INTRODUCTION**

Bangladesh gained independence in 1971 through the Liberation War with a cost of huge death toll and oppression. The post-war Bangladesh passes many challenges including people health, nutrition. Day-by-day Bangladesh has achieved good progress in reducing child and maternal mortality and has achieved remarkable progress in overall health outcomes as per Sustainable Development Goals (SDGs) but not as much in nutrition and hygiene practice.

The knowledge of key hygiene messages is high in Bangladesh, but the practice of the most effective hygiene behavior is very low. According to UNICEF survey 2013 [1] about 59 percent people practices hand washing with water and soap at critical times. Hygiene is a series of practices performed to preserve good health. According to the World Health Organization (WHO), “hygiene refers to conditions and practices that help to maintain health and prevent the spread of disease.” Personal hygiene refers to maintaining the body’s cleanliness.

On the other side Bangladesh has been working towards eliminating open defecation since before its independence in 1971. The Department of Public Health Engineering (DPHE) began some of its first sanitation and latrine projects in the mid-1960, a time when latrine coverage was estimated to be less than 1% [2]. Since then, Bangladesh has made substantial progress in improving sanitation coverage across the country. According to the WHO/UNICEF Joint Monitoring Programme (JMP), in 2000, approximately 18% of the population was practicing open defecation [3]. As of 2018, the country had nearly ended open defecation but still lag sanitary latrine use in Bangladesh [4].

It is assumed that there is an obvious association among knowledge, economic condition, personal hygiene and health [5,6]. Knowledge helps to change habit and economic condition facilitate technology adoption for a better life. On the other hand ignorance, poverty and rurality portray an unpleasant picture in Bangladesh. Geographically Northern Bangladesh particularly Kurigram, Rangpur and Gaibandha are vulnerable area in perspective of poverty, education and in health outcomes. Due to geographic disadvantage people of this area frequently faces flood, river bank erosion, norwester, lack of income diversification and a bad consequences of these vicious cycle [7,8].

Despite birth place of many leaders and famous personality Northern Bangladesh still remains out of national focus in development. Agriculture is the main livelihood here that offers two lean seasons in a year which is popularly known as Monga. Although monga is on decline due to migration as factory worker in Dhaka, the far-reaching impact of deprivation is still rooted there. Therefore, this area deserve development program of almost all kinds including immediate response to health. Health is such an issue which is a function of body capacity, food intake
and healthy habits. Healthy habit implies many things where hygiene and sanitation are important. Therefore, almost all programs will see a fallacy without prior looking into the existing the status of safe drinking water, sanitation and hygiene. However, very few studies have so far been taken in this area based on which development program can be designed.

Following that, this study particularly aims to determine (i) what is the present status of the knowledge and practice of hygiene among the child bearing mother and (ii) how this practice varies over the areas and three districts of Northern Bangladesh? The findings of the study would help to take national program and policy for improving health and nutritional status of women of child-bearing age, adolescent girls, and children under five (U5).

2. REVIEW OF LITERATURE

Neglect of hygiene can be considered as a source of various diseases threatening to personal and environmental health [9]. Research reflects that education is associated with maintaining personal hygiene [10]. Among all hygiene practices, the basic and first step is hand washing and it is central in preventing spread of infectious diseases in home and everyday life settings [11]. Literature recommends developing the habit of good personal hygiene such as washing of hands before taking food and after defecation [12]. The national hygiene survey 2014 of Bangladesh found that less than half of household latrines had soap and water available for hand washing [6]. It was also found that more than half of the women do not wash their hand before feeding their child [13]. However, it is difficult to generalize that men maintain better hygiene than women. A contrast result published in Lancet reports that overall, 54% of world’s population maintains good personal hygiene, which is higher among women (59.5%) than men (44.5%) [14].

Evidence showed that hand washing can reduce the occurrence of diarrheal diseases by 14- 40% [15]. Diarrheal disease has been considered as a serious global problem [16] and leading cause of child mortality around the world [17]. According to World Health Organization, 1.8 million people die every year from diarrhoeal diseases including cholera; 90% are children under 5 years of ages, mostly in developing countries. Of diarrhoeal diseases, 88% is attributed to unsafe water supply, inadequate sanitation and hygiene [18]. An average of 65% of death caused by diarrheal diseases could be reduced if good hygiene practice accompanies the provision of water and sanitation [19,20].

Maintaining hygiene and sanitation is assumed to be associated with many factors. Akter & Ali [21] identified that factors such as poverty, lack of consciousness, lack of willingness, water sources and availability are barrier to proper hygiene behavior. They stressed that adoption of hygiene practice influences by income and access to available safe of water. Rizwan et al. [22] conducted a research on adolescent girls of several schools in Dhaka city of Bangladesh and found that about 80% girls used sanitary napkin whereas about 95% of the non-users used piece of cloths. They further mentioned that use of sanitary napkin depends on the parent’s income, occupation and water sources but there is not association with mother’s education level. In contrast a study conducted on three slums of Dhaka city found that 59% of the slum dwellers used sanitary latrine and 59.2% of them washed their hands with soap after using the toilet. Among the respondents 67% of slum dwellers wash their hands before taking their food. Further exploration found a positive association of education and knowledge of personal hygiene with the practice of personal hygiene [23].

Study conducted at various location of Bangladesh shows various results on hygiene status. A study conducted on fishermen in Southern Bangladesh shows that all of the participants washed their hands before taking food and after using toilets. But it is sorry to share that 80% of the fisherman used water only for washing hand. Sometimes it is found that people are over concern on washing hand before eating regular meals but remain halfhearted to wash hand before eating any dry foods [24]. Similarly Sinha et al. [25] found that 95% of the women washed their hands after using toilet but only 35% of them washed their hand before and after their meal.

Hossain et al. [26] conducted a study at Sadullapur Upazilla of Gaibandha district revealing that 87% of the participants utilized latrine, whereas 13 percent defecated outside. According to the results of the survey, 36.8% of respondents have U5 children but only 6.4% found to use soap for hand washing after defecation. A study conducted in Kustia found that significant number (32%) of people use pit latrine and still go for open defecation (3.4%) in the field [27].
3. METHODOLOGY

3.1 Locate of the Study

The study was conducted in six Upazillas under three districts, namely Gaibandha Sadar and Fulchari Upazilla under Gaibandha district, Kurigram Sadar and Rajarhat under Kurigram district and Kaunia and Pirgachha under Rangpur district in Bangladesh where Development and Delivery of Biofortified (DDBIO) Crops at Scale Program is implemented by International Potato Center (CIP). The area selected purposively to determine the knowledge status of women of child bearing age on hygiene and sanitation to set program target and give the training on knowledge gap by preparing training module that contribute to improve health and nutrition status.

3.2 Population and Sampling

At the first stage of the multi-stage cluster sampling process for intervention household selection, two unions were selected randomly from each of the six program Upazillas and 12 unions were selected accordingly. The second stage involved selection of two villages representing smaller clusters from each of the 12 unions selected at the first stage randomly where 24 villages were selected. At the next stage a sample size of 386 households from 24 villages were estimated using the Probability Proportional to Size sampling procedure and household selected following lot quality assurance sampling procedure. Thus, total 380 eligible mothers from six program Upazillas were selected as sample for interview.

Total population coverage was farmer households. The sampled households were among those have met the five selection criteria set by the program that include: Women aged 19-49 years; at least one under 5 child; at least 5 decimals of land suitable for crop cultivation; Interest to cultivate Orange Flesh Sweet potato (OFSP); and Permanent residency in the DDBIO implementation area.

3.3 Collection of Data

Data were collected from household by three trained team where 18 research assistant recoded data using Smart phone Tablet based online/offline apps. It was programmed in the online data collection software, ODK, in all target languages for automated translation during data processing. The Data Quality Control Administrator and the survey coordinator monitored data consistency remotely throughout the ongoing data collection process. Feedback was provided regularly to the field teams through WhatsApp, email and telephone to support real-time data quality control. The collection teams were instructed to explain the purpose of this study to each mother. A soft structured questionnaire was used to record data during 18 February 2020 to 30 March 2020. Hygiene and sanitation practice and knowledge were assessed based on the type of latrine they used, the system of disposal of feces and domestic waste they followed and the habit they kept in washing their hand after and before the critical works of the day. Mostly yes/no type of questions were used to assess their opinion.

3.4 Data Management and Statistical Analysis

Household survey data was submitted to an online server (www.ona.io). Number identified out of range and improbable values reported. Data was cleaned and analyzed by using SPSS software (Version 23) through replicable *.do files. The original data files are preserved in an unaltered state and the cleaned and prepared data stored separately. The quantitative data were analyzed using SPSS. Descriptive statistics were used to organize the table with results. Chi-square test was used to assess the regional variations in knowledge and practice of hygiene and sanitation.

4. RESULTS AND DISCUSSION

4.1 Family Size and Age Distribution of the HHs

A family is known as the smallest fundamental unit of society. In this study, a family is defined as the total number of persons living together and having meals from the same kitchen under the administration of the single household’s head. Family members mainly include the owner him/herself, spouse, sons, unmarried daughters, and old parents. The findings on the family size of different age groups by the study HHs in six sub-districts are presented in Table 1. The family size varied in six Upazilla under three districts in the study HHs with the overall mean family size of 4.68 persons in the study HHs.
As per Household Income and Expenditure Survey, 2016 (HIES) of BBS (2019), the average family size in rural areas of Bangladesh was reported as 4.11 [28]. Findings on the family size of this study are slightly higher than average family size in rural Bangladesh. The overall mean number of U5 children in the study HHs is 1.13, with very slight difference among six study area. The overall mean numbers of 10 to <19 adolescent group in the study HHs are 0.56 and the 19-49 years older women in the study HHs are 1.10 with a very slight difference among the six study areas. The mean proportion of male and female members of the study HHs was 2.30:2.38, which slightly varies from one area to another study area.

4.2 Level of Education of the HH Heads and HH Members

It is said that education is the backbone of a nation. Education helps a person to have day-to-day information about modern technology and technological changes in various agricultural production processes. It makes a person more capable of managing and coordinating scarce resources more judiciously and hence, to earn maximum profit. Findings presented in Table 1; overall mean indicate that 3.6% members of the study HHs are illiterate while the majority members of the study (38.3%) HHs can sign. This implies that majority members of study area (58.1%) HHs is educated (Table 1). It is noted that there is a slight variation among the six Upazillas in respect of the level of education of the HH members.

4.3 HH Sources of Drinking Water

The oral-fecal route spreads about 70% of diseases. Those diseases are diarrhea, dysentery, typhoid, paratyphoid, poliomyelitis, helminthiasis, and jaundice [29]. There is a proverb, ‘Prevention is better than cure.’ To reduce all these sufferings, people should have a safe drinking water supply. The findings on the sources of drinking water by study HHs in six Upazillas of the study area provided in Table 1. Hand tube-well is the primary source of drinking water of the study area (99.0%) HHs, similar findings from the MICS 2011 survey and only 1% HHs use deep tube-well as a source of their drinking water which indicate that study HHs have access to safe drinking [30].

Table 1. Salient features of households in the study areas

| General Features of Household | Gaibandha | Rangpur | Kurigram | Total |
|------------------------------|-----------|---------|----------|-------|
|                              | Fu        | Ga      | Pi       | Ka    | Ku    | Ra    |
| Family size (No.)            | 4.88      | 4.58    | 4.68     | 4.27  | 5.07  | 4.62  | 4.68  |
| Age in Years (No.):          |           |         |          |       |       |       |       |
| Under 5 children             | 1.16      | 1.14    | 1.08     | 1.09  | 1.20  | 1.15  | 1.13  |
| 05.00 to 09.00 children      | 0.53      | 0.52    | 0.37     | 0.42  | 0.50  | 0.33  | 0.45  |
| 10.00 to <19.00 age group    | 0.62      | 0.42    | 0.65     | 0.52  | 0.64  | 0.53  | 0.56  |
| 19.00 to 49.00               | 2.11      | 2.07    | 2.18     | 1.97  | 2.13  | 2.15  | 2.10  |
| Above 49.00                  | 0.45      | 0.42    | 0.40     | 0.27  | 0.61  | 0.47  | 0.43  |
| Gender (No.):                |           |         |          |       |       |       |       |
| Male                         | 2.36      | 2.32    | 2.32     | 2.25  | 2.43  | 2.09  | 2.30  |
| Female                       | 2.52      | 2.26    | 2.35     | 2.02  | 2.64  | 2.53  | 2.38  |
| Level of Education (%):      |           |         |          |       |       |       |       |
| Illiterate                   | 4.9       | 4.9     | 3.4      | 2.4   | 3.1   | 2.0   | 3.6   |
| Can sign only                | 36.3      | 36.9    | 49.7     | 34.7  | 42.9  | 31.1  | 38.3  |
| Primary                      | 11.2      | 13.3    | 21.1     | 24.0  | 19.0  | 20.9  | 17.6  |
| Secondary                    | 30.9      | 33.0    | 21.8     | 25.7  | 21.5  | 29.7  | 27.6  |
| SSC                          | 9.0       | 4.9     | 3.4      | 10.2  | 8.6   | 10.8  | 7.8   |
| HSC                          | 4.5       | 3.0     | 0.0      | 2.4   | 2.5   | 2.7   | 2.7   |
| Bachelor’s degree & above    | 3.1       | 3.9     | 0.7      | 0.6   | 2.5   | 2.7   | 2.4   |
| Source of Drinking Water (%) |           |         |          |       |       |       |       |
| Hand tube-well               | 100.0     | 100.0   | 100.0    | 98.5  | 98.2  | 96.4  | 99.0  |
| Deep tube well               | 0.0       | 0.0     | 0.0      | 1.5   | 1.8   | 3.6   | 1.0   |

Note: Fu=Fulchhari; Ga=Gaibandha Sadar; Pi=Pirgachha; Ka=Kaunia; Ku=Kurigram Sadar; Ra=Rajarhat
4.4 HH Sanitation

Safe disposal of human excreta is again essential for the prevention of waterborne, soil-borne as well as food borne diseases. The HH members in the study area can minimize their suffering from many diseases through safe disposal of human excreta using sanitary latrine, thereby reducing the chances of many waterborne, soil-borne as well as food borne diseases have improved their overall physical strength and sound health. The findings on types of latrines used by these HHs in the 6 sub-districts are presented in Table 2.

There are variations in respect of the use of different types of latrines for safe disposal of excreta by the HHs and among 6 sub-districts as well. The overall proportions indicate that the highest percentage of the HHs 35.5% uses without water sealed latrine, followed by 28.5% of HHs using water sealed latrine and 32.6% of HH using pit latrine. It is interesting to note that still 3.4% of HHs are using a bush/open field for defecation.

The highest percentage of the HHs (42.9%) of Kurigram sadar uses without water sealed latrine, followed by 23.2% of HHs using water sealed latrine, 33.9% of HHs using pit latrine. The lowest percentage (32.8%) of HHs of Pirigacha using without water sealed latrine, followed by 18.8% of HHs using water sealed latrine, 46.9% of HH using pit latrine respectively.

4.5 Ownership of Latrines of the HHs

Findings on ownership of latrines of the HHs in the different areas of the program are presented in Table 2. The ownership of latrine by the HHs varied from area to area with the mean of 68.1% private latrine by the HHs and on the other hand, 31.9% of HHs still have to share the latrine with other HHs in these areas. In Kaunia the highest percentage of the HHs 82.8% uses private latrine and 17.2% uses shared latrine. For Pirigacha area the lowest percentage of the HHs (55.6%) uses private latrine and 44.4% uses shared latrine respectively.

4.6 Sanitation Conditions in Respect of Latrines Floor, Wall, the Immediate Surroundings

Findings on the latrines’ sanitation conditions in respect of hygiene of its floor, wall, floor, and the immediate surroundings are provided in Table 2. The sanitation conditions of the latrines regarding the visibility of feces on the floor, wall, and immediate surroundings of HHs varied from area to area of sub-districts and appeared to be poor (Table 2). Findings indicate that 68.1% HHs had faces on latrine floor, 24.6% had on latrine wall and 30.8% HHs had feces in immediate surroundings of the latrine where Fulchhari sub-district had height visibility of feces in the latrine floor that is 42.5% and Gaibandha Sadar had the lowest (57.5%). Visibility of feces in the latrine wall in Kaunia was the highest (47.7%) and lowest (8.2%) reported in Gaibandha Sadar. Visibility of feces in the immediate surroundings was the highest in Kaunia (52.3%) and the lowest (17.8%) was in Gaibandha Sadar.

However, for hygienic conditions of the HHs the sanitation conditions of the latrine in respect of the above points should be improved otherwise the poor sanitation conditions of the latrine could be the sources of deadly disease like typhoid, diarrhea diseases could be transmitted by water, air and other agents like house flies [31].

4.7 Hygiene Practices Followed by the Mothers/Caregivers of U5 Children

Findings on places of disposal of the feces of U5 children by the mothers and caregivers are presented in Table 3. Places of disposal of the feces of U5 children by the mothers and caregivers varied among different HHs of the study areas. The highest percentages of the mothers and caregivers of the U5 children of study HHs (82.8%) from Pirigacha area throw the feces outside and it was the lowest in Kurigram Sadar (57.1%). The highest percentage (40.0%) of study HHs from Rajarhat put the feces of U5 children in the latrine and the practice was the lowest (15.6%) at Pirigacha. The overall results indicate that majority of the study (64.5%) HHs dispose the feces of U5 children by just throwing it outside the house which is an awful practice from a health point of view as the feces carry different types of harmful microbes which could spread in the environment, i.e., soil, water and air can subsequently be the causes of deadly diseases later. About 33% HHs put feces in the latrine and 2.1% HHs buried the feces under the earth and only 0.5% HHs covered feces with dirt/ash.

Findings on places of disposal of the domestic animal waste by the pregnant/lactating women and caregiver of U5 children in different study
areas have been presented in Table 3. It is noted that the highest percentages of pregnant/lactating women and caregivers of U5 children of study HHs (90.9%) disposed the domestic animal waste in separate uncovered pit in Rajarhat area. In comparison, the minimum percentage (5.4%) in this respect was recorded from the Kurigram Sadar area. Use of the desired place of disposal of animal waste i.e., separate covered pit is almost absent in study In Gaibandha majority of the HHs (56.2%) throws the domestic animal waste outside the HHs, followed by Rangpur (43.4%) and Kurigram (5.4%). The results indicate that that majority of the study (61.7%) HHs use separate uncovered pit for disposal of domestic animal waste followed by throw outside. In comparison, minimal percentages of study (0.3%) HHs follows the standard practice of separate covered pit for disposal of domestic animal waste. Proper disposal of household waste is very important. In Bangladesh, soil organic matter and nutrients are depleting very fast because of the continuous cultivation of crops on the same land. Properly disposed of domestic waste could be important source of organic matter and plant nutrients as manure. On the other hand, if domestic waste is not disposed of correctly, it could be a potential source of environmental pollution as well as different water and airborne zoonotic diseases [12]. Therefore, awareness should be created among the HHs for adopting standard practices, i.e., disposal of domestic waste in a covered pit, to harvest its benefit as manure, and to avoid environmental pollution and health hazards [32].

| Table 2. HH Sanitation for disposal human excreta |
|-----------------------------------------------|
| Type of Latrine used for disposal of human excreta (%) | Gaibandha | Rangpur | Kurigram | Total |
|------------------------------------------------------|-----------|---------|----------|-------|
| Water sealed                                         | Fu        | Ga      | Pi       | Ku    | Ra    | Total |
|                                                      | 27.4      | 39.7    | 18.8     | 24.6  | 23.2  | 36.4  | 28.5  |
| Without water seal                                   | 32.9      | 32.9    | 32.8     | 33.8  | 42.9  | 40.0  | 35.5  |
| Pit                                                  | 34.2      | 17.8    | 46.9     | 40.0  | 33.9  | 23.6  | 32.6  |
| Bush/open field                                      | 5.5       | 9.6     | 1.6      | 1.5   | 0.0   | 0.0   | 3.4   |
| Ownership of latrine HHs (%)                         |           |         |          |       |       |       |       |
| Private                                              | 63.8      | 63.6    | 55.6     | 82.8  | 73.2  | 70.9  | 68.1  |
| Shared                                               | 36.2      | 36.4    | 44.4     | 17.2  | 26.8  | 29.1  | 31.9  |
| Sanitation conditions of the latrines (%)            |           |         |          |       |       |       |       |
| Latrine floor (Yes)                                  | 75.3      | 57.5    | 73.4     | 73.8  | 67.9  | 60.0  | 68.1  |
| Latrine floor (No)                                   | 24.7      | 42.5    | 26.6     | 26.2  | 32.1  | 40.0  | 31.9  |
| Latrine wall (yes)                                   | 16.4      | 8.2     | 21.9     | 47.7  | 32.1  | 25.5  | 24.6  |
| Latrine wall (No)                                    | 83.6      | 91.8    | 78.1     | 52.3  | 67.9  | 74.5  | 75.4  |
| Immediate surroundings of the latrine (Yes)          | 28.8      | 17.8    | 23.4     | 52.3  | 44.6  | 20.0  | 30.8  |
| Immediate surroundings of the latrine (No)           | 71.2      | 82.2    | 76.6     | 47.7  | 55.4  | 80.0  | 69.2  |

Note: Fu=Fulchhari; Ga=Gaibandha Sadar; Pi=Pirgachha; Ka=Kaunia; Ku=Kurigram Sadar; Ra=Rajarhat

| Table 3. Hygiene practices followed by the mothers/caregivers of U5 children |
|-------------------------------------------------|
| Places of disposal of the feces of U5 children (%) | Gaibandha | Rangpur | Kurigram | Total |
|--------------------------------------------------|-----------|---------|----------|-------|
| Put in latrine                                    | 35.6      | 32.9    | 15.6     | 36.9  | 37.5  | 40.0  | 32.9  |
| Just throw outside                                | 63.0      | 64.4    | 82.8     | 60.0  | 57.1  | 58.2  | 64.5  |
| Burying under the soil                            | 1.4       | 2.7     | 1.6      | 1.5   | 3.6   | 1.8   | 2.1   |
| Covering with dirt/ash                            | 0.0       | 0.0     | 0.0      | 1.5   | 1.8   | 0.0   | 0.5   |
| Places of disposal of the domestic waste           |           |         |          |       |       |       |       |
| Separate covered pit                              | 0.0       | 0.0     | 0.0      | 1.5   | 92.9  | 0.0   | 0.3   |
| Separate uncovered pit                            | 41.1      | 46.6    | 25.0     | 86.2  | 5.4   | 90.9  | 61.7  |
| Just throw outside                                | 58.9      | 53.4    | 75.0     | 12.3  | 1.8   | 9.1   | 37.8  |

Note: Fu=Fulchhari; Ga=Gaibandha Sadar; Pi=Pirgachha; Ka=Kaunia; Ku=Kurigram Sadar; Ra=Rajarhat
4.8 Mothers/Caregivers of U5 Children Knowledge on Using Different Hygiene Practices

Findings of knowledge on the importance of washing hands before or after performing different daily activities such as eating, prayer, breastfeeding, cooking, defecation or when those are dirty by the pregnant/lactating women or caregivers of U5 children HHs in different sub-district presented in Table 4. There is profound difference among different sub-district HHs regarding the importance of washing hands by the pregnant/lactating women or caregivers of U5 children. The positive response (%) provided by pregnant/lactating women or caregivers of U5 children from the study HHs about the knowledge level on the importance of washing hands before or after different daily activities except a few is either low or very low. It needs further attention to improve the knowledge level of pregnant/lactating women or caregivers of U5 children from the study area HHs for the healthy lives of the U5 children and themselves.

4.9 Mothers/Caregivers of U5 Children Practicing Different Hygienic Techniques

Findings on practices of different hygienic techniques by the pregnant/lactating women or caregivers of U5 children in their daily life in the program areas are presented in Table 5. There is little difference among sub-district HHs regarding practicing of washing hands by the pregnant/lactating women or caregivers of U5 children. The positive response (%) of the pregnant/lactating women or caregivers of U5 children from study HHs about the practice of washing hands for many daily hygienic activities such as before food preparation, after cleaning animal/bird’s feces and other activities is deficient and needs further attention to improve the practice of washing hands as a good hygienic practice by the pregnant/lactating women or caregiver of U5 children for the study HHs for their healthy life. Also, practices of washing hands for some of the daily activities such as washing hands before feeding the children, washing hands after baby’s defecation by the pregnant/lactating women or caregivers of U5 children appear to be moderate, and practice levels for those aspects should also be improved [24].

4.10 Regional Variation in Hygiene Practice among the Women

As a measure of variation chi-square test was run. The results of chi-square test in the Table 6 shows that type of latrine used varies significantly ($\chi^2 = 24.58, P<0.001$) among three regions. The tendency of flash-latrine use was high in Gaibandha but tendency of pit-latrine use was very low in Kurigram district. Hossain et al. [26] in their study conducted at Sadullapur Upazilla of Gaibandha district found that 87% of the participants used well sanitized latrine. Consistent result of pit latrine use was also found in a study conducted in Kustia district of Bangladesh where about 32 percent people used pit-latrine [27]. However, no significant variation ($\chi^2 = 6.28, P>0.05$) was found in disposal of U5 child feces among the three districts of Northern Bangladesh. Majority of the women dispose the U5 child feces just throwing it outside. This indicates a poor knowledge of hygiene among the mother of this region. Similar results were also found by Vu Nguyen et al. [5] in their study in rural Vietnam. However, this habit has a serious consequence on environmental health [9]. Highly significant variation ($\chi^2 = 70.72, P<0.001$) was found in disposal of domestic waste among the three selected districts. Relatively better disposal system was found in Kurigram and the worst one was found in Gaibandha.

A significant variation ($\chi^2 = 6.03, P<0.05$) was also found in Northern districts in respect of hand washing habit before food preparation. However, no significant variation ($\chi^2 = 5.22, P>0.05$) found in hand washing habit before eating. Most of the women of Northern Bangladesh know that they need to wash hand before eating food. Similar result was also found in a study conducted at Jessore district of Bangladesh [24]. A significant difference ($\chi^2 = 10.86, P<0.01$) was found among the mother of three district of Northern Bangladesh in the habit of washing hand before feeding child. Hand washing after toilet use of self ($\chi^2 = 11.23, P<0.01$) and babies ($\chi^2 = 8.5, P<0.05$) varied significantly among the three districts. The habit of cleaning hand after cleaning animals also varied significantly ($\chi^2 = 8.8, P<0.05$) among the regions.
### Table 4. Knowledge on importance of washing hands before or after different daily activities

| Knowledge on importance of washing hands before or after different daily activities (%) | Gaibandha (Fu) | Rangpur (Ga) | Kurigram (Pi) | Total  |
|---|---|---|---|---|
| Before eating | Yes | 95.9 | 97.3 | 98.4 | 98.5 | 98.2 | 96.4 | 97.4 |
| | No | 4.1 | 2.7 | 1.6 | 1.5 | 1.8 | 3.6 | 2.6 |
| After eating | Yes | 98.6 | 90.4 | 95.3 | 81.5 | 64.3 | 87.3 | 87.0 |
| | No | 1.4 | 9.6 | 4.7 | 18.5 | 35.7 | 12.7 | 13.0 |
| Before praying | Yes | 20.5 | 30.1 | 4.7 | 6.2 | 8.9 | 5.5 | 13.5 |
| | No | 79.5 | 69.9 | 95.3 | 93.8 | 91.1 | 94.5 | 86.5 |
| Before breastfeeding or feeding a child | Yes | 43.8 | 54.8 | 26.6 | 52.3 | 58.9 | 65.5 | 49.7 |
| | No | 56.2 | 45.2 | 73.4 | 47.7 | 41.1 | 34.5 | 50.3 |
| Before cooking or preparing food | Yes | 37.0 | 32.9 | 12.5 | 16.9 | 7.1 | 7.3 | 20.2 |
| | No | 63.0 | 67.1 | 87.5 | 83.1 | 92.9 | 92.7 | 79.8 |
| After defecation/urination | Yes | 93.2 | 93.2 | 96.9 | 87.7 | 92.9 | 78.2 | 90.7 |
| | No | 6.8 | 6.8 | 3.1 | 12.3 | 7.1 | 21.8 | 9.3 |
| After cleaning a child that has defecated/changing a child's diaper | Yes | 52.1 | 49.3 | 37.5 | 44.6 | 30.4 | 36.4 | 42.5 |
| | No | 47.9 | 50.7 | 62.5 | 55.4 | 69.6 | 63.6 | 57.5 |
| When my hands are dirty | Yes | 50.7 | 42.5 | 34.4 | 16.9 | 12.5 | 18.2 | 30.6 |
| | No | 49.3 | 57.5 | 65.6 | 83.1 | 87.5 | 81.8 | 69.4 |
| After cleaning the toilet or potty | Yes | 49.3 | 45.2 | 32.8 | 32.3 | 33.9 | 40.0 | 39.4 |
| | No | 50.7 | 54.8 | 67.2 | 67.7 | 66.1 | 60.0 | 60.6 |
| After cleaning animal and bird feces | Yes | 38.4 | 37.0 | 39.1 | 21.5 | 12.5 | 20.0 | 29.0 |
| | No | 61.6 | 63.0 | 60.9 | 78.5 | 87.5 | 80.0 | 71.0 |
| After other daily activities | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | No | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Note: Fu=Fulchhari; Ga=Gaibandha Sadar; Pi=Pirgachha; Ka=Kaunia; Ku=Kurigram Sadar; Ra=Rajarhat

### Table 5. Practice of washing hands before food preparation

| Hand washing habit | Gaibandha (Fu) | Rangpur (Ga) | Kurigram (Pi) | Total  |
|---|---|---|---|---|
| Washing hands before food preparation | Yes | 26.0 | 28.8 | 3.1 | 27.7 | 32.1 | 18.2 | 22.8 |
| | No | 74.0 | 71.2 | 96.9 | 72.3 | 67.9 | 81.8 | 77.2 |
| Washing hands before eating | Yes | 97.3 | 95.9 | 95.3 | 84.6 | 91.1 | 90.9 | 92.7 |
| | No | 2.7 | 4.1 | 4.7 | 15.4 | 8.9 | 9.1 | 7.3 |
| Washing hands before feeding children | Yes | 47.9 | 38.4 | 26.6 | 49.2 | 100.0 | 69.1 | 45.9 |
| | No | 52.1 | 61.6 | 73.4 | 50.8 | 48.2 | 30.9 | 54.1 |
| Washing hands after defecation | Yes | 100.0 | 100.0 | 98.4 | 90.8 | 94.6 | 89.1 | 95.9 |
| | No | 0.0 | 0.0 | 1.6 | 9.2 | 5.4 | 10.9 | 4.1 |
| Washing hands after baby’s defecation | Yes | 60.3 | 57.5 | 50.0 | 43.1 | 35.7 | 47.3 | 49.7 |
| | No | 39.7 | 42.5 | 50.0 | 56.9 | 64.3 | 52.7 | 50.3 |
| Washing hands after cleaning animal/bird’s feces | Yes | 28.8 | 24.7 | 25.0 | 15.4 | 14.3 | 9.1 | 20.2 |
| | No | 71.2 | 75.3 | 75.0 | 84.6 | 85.7 | 90.9 | 79.8 |
| Washing hands after other activities | Yes | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| | No | 100.0 | 98.6 | 100.0 | 100.0 | 100.0 | 0.0 | 99.7 |

Note: Fu=Fulchhari; Ga=Gaibandha Sadar; Pi=Pirgachha; Ka=Kaunia; Ku=Kurigram Sadar; Ra=Rajarhat
5. CONCLUSION AND RECOMMENDATIONS

Knowledge and practice of personal hygiene among rural women is still unpleasant. The study clearly shows the problem with sanitation and hygiene is very awful in rural communities that may concern issue of health and environment. Personal hygiene practice of rural women in relation to hand washing before meal was satisfactory but before cooking or preparing food and before breastfeeding or feeding a child the practice of hand washing was very poor. Women were conscious about washing after defecation but still need to improve. Washing hands before food preparation, after baby’s defecation and after cleaning animal/bird’s feces are still concern that needs to improve. Large number of study area HHs using latrine (35.5%) that are without water seal, 3.4% are still doing open defecation in the field and majority of HHS (64.5%) dispose the feces of U5 children just throwing it outside the house which is an awful practice from a health point of view as the feces carry different types of harmful microbes which could spread in the environment.

A significant variations were found among the women in the three district of Northern Bangladesh especially in type of toilet used, disposal of domestic waste, hand washing before food preparation, hand washing before feeding their child, after toilet use, after cleaning toilet of child and after cleaning the animal. However, no variations were found in disposal of U5 child feces and washing hand before eating food. Women of Gaibandha district had better access to sanitation system to create awareness in mass media should through more education and training program should be organized by state department of health and other development partners.

In conclusion it can be sum-up in ways that more research and development initiative is needed to improve the sanitation and hygiene condition in these area for a better health and livelihood as well.

Specific recommendations can be put forwarded in following ways:

- Review of this study shows that education influences improving household sanitation and hygiene. Therefore, more non-formal education and training program should be organized by state department of health and other development partners.
- Mass media should through more programs on household health and sanitation system to create awareness in

Table 6. Regional differences in hygiene practice and sanitation

| Variables          | Categories          | District Name | Total | Chi-square ($\chi^2$) | Statistics |
|--------------------|---------------------|---------------|-------|-----------------------|------------|
|                    |                     | Gai. | Kuri. | Rang. |                         |            |
| Types of latrine   | Flush latrine       | 49   | 33    | 28    | 110                     | $\chi^2 (4df) = 24.58$ |
| used               | No water seal       | 48   | 46    | 43    | 137                     | (P<0.001) |
|                    | Pit Latrine         | 49   | 32    | 58    | 139                     |            |
| Disposal of U5     | Latrine             | 50   | 43    | 34    | 127                     | $\chi^2 (4df) = 6.28$ |
| feces              | Burying under soil  | 3    | 4     | 3     | 10                      | (P>0.05)  |
|                    | Just throw outside  | 93   | 64    | 92    | 249                     |            |
| Disposal of        | Pit with no cover   | 64   | 102   | 73    | 239                     | $\chi^2 (2df) = 70.72$ |
| domestic waste     | Just throw outside  | 82   | 9     | 56    | 147                     | (P<0.001) |
| Hand wash before   | Yes                 | 40   | 28    | 20    | 88                      | $\chi^2 (2df) = 6.03$ |
| food preparation   | No                  | 106  | 83    | 109   | 298                     | (P<0.05) |
| Hand wash before   | Yes                 | 141  | 101   | 116   | 358                     | $\chi^2 (2df) = 5.22$ |
| eating             | No                  | 5    | 10    | 13    | 28                      | (P>0.05)  |
| Hand wash before   | Yes                 | 63   | 65    | 49    | 177                     | $\chi^2 (2df) = 10.86$ |
| feeding child      | No                  | 83   | 46    | 80    | 209                     | (P<0.01)  |
| Hand wash after    | Yes                 | 146  | 102   | 122   | 370                     | $\chi^2 (2df) = 11.23$ |
| toilet             | No                  | 0    | 9     | 7     | 16                      | (P<0.01)  |
| Hand wash after    | Yes                 | 86   | 46    | 60    | 192                     | $\chi^2 (2df) = 8.5$ |
| baby’s toilet      | No                  | 60   | 65    | 69    | 194                     | (P<0.05)  |
| Hand wash after    | Yes                 | 39   | 13    | 26    | 78                      | $\chi^2 (2df) = 8.8$ |
| cleaning animals   | No                  | 107  | 98    | 103   | 308                     | (P<0.05)  |

Note: Gai = Gaibandha, Kuri = Kurigram, Rang = Rangpur
the community, as most of the mothers are unaware of proper disposal of their children’s feces.

- Agriculture Department of Government should organize more training on preparing compost using household waste.
- Government through its Health Engineering Department should provide subsidy token to the poor rural household in purchasing the sanitary items.
- Development project of various organization should offer sanitary materials at free of cost for the poor clients.
- Need-based program should be taken as practice of hygiene varies over regions.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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