

*Article*

## **A survey on hygienic practices and immunization coverage among 12-59 months old children in urban slum, Barishal, Bangladesh**

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**Abstract:** Good hygiene and sanitation are essential for the prevention of infectious diseases. Immunization is one of the most important public health interventions to reduce both morbidity and mortality of infectious diseases. Thus, the survey study aimed to determine the status of hygienic practices and assess the immunization coverage among 12-59 months old children in urban slums. A cross-sectional study was conducted among 259 under five children's (12-59 months) in Barisal city, Bangladesh, from June to December 2019 using a structured questionnaire. Data was collected by interviewing the mothers from different slum areas. Chi-squared test and multiple logistic regression models were used to explore the association. Prevalence of good hygiene practices status was 65.3% and fully immunized was 71.4%. Joint family (AOR=0.54; 95% CI: 0.31-0.95;  $P<0.05$ ), monthly family income less than 10,000 BDT (AOR=0.52, 95%CI: 0.32-0.97;  $P<0.05$ ) were less likely to practice good hygiene. Water along or ash/soil with water (AOR=5.32; 95%CI: 2.91-9.73;  $P<0.001$ ), open toilet practices (AOR=81.1, 95%CI: 13.2-505.7;  $P<0.001$ ) and suspended toilet facilities (AOR=2.77, 95%CI: 1.57-13.44;  $P<0.05$ ) showed the likelihood to good hygiene practices. Illiterate mother (AOR=0.06; 95%CI: 0.09-0.79;  $P<0.001$ ), children living with joint family (AOR=0.08; 95%CI: 0.12-0.96;  $P<0.001$ ) associated with lower immunization coverage. Immunization services center <10-minute walking distance from their living place (AOR =1.71; 95%CI: 1.02-2.87;  $P<0.05$ ) associated with more immunization coverage status. The prevalence of hygiene practices status (65.3%) and immunization status (71.4%) in urban slums of Barishal city were reported less compared to the national level (86% immunization coverage). Some modifiable factors (water used within soap/soil, suspended toilet, the distance of immunization center, etc.) were significant with good hygiene practices and immunization coverage which are needed to improve for promoting good hygiene practices and reduce the infant mortality and morbidity rate.

**Keywords:** hygiene practices; immunization coverage; full immunization; urban slum

### **1. Introduction**

According to World Bank, more than 50% of the world's population resides in an urban area. By 2050, 70% of the world's population will be living in towns and cities due to rapid rural-to-urban migration (Nnebue *et al.*, 2014). So, urbanization is a common issue throughout the world (Govindaraj *et al.*, 2017). Bangladesh also has expertise one of the highest urban population growth rates (>6%) in the last three decades where national population growth rate is about 1.5% per year (Farah *et al.*, 2015). The novel urban growth results in the

creation of informal settlements as slum (Ghafoor and Ghafoor, 2016). According to UN-Habitat, more than 50% of the world's population live in cities or urban centers (Nations, 2014). Today, by the most conservative estimates, about 900 million people worldwide dwell in slums (Friesen *et al.*, 2019). However in Bangladesh, over 37% of the city populations reside in slums that occupy only 4% of town land (Das *et al.*, 2010). As the largest number of population living in urban slum, hygiene is a vital issue for them (Acharya *et al.*, 2015).

According to the National Sanitation Foundation of the USA; "Sanitation & Hygiene is a way of life" and good hygiene are the essential components for the war against infectious diseases (Begum *et al.*, 2020). Slum people, in general favor several communicable diseases due to poor personal hygiene practices (Ali *et al.*, 2018). The slum children are more vulnerable to the diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid and polio, worm infestation, respiratory infections etc arising out of poor personal hygiene practices (Pal *et al.*, 2017; Akter *et al.*, 2022). In 2017, 74% of the world's population behaved at least a basic hygiene & sanitation service (WHO, 2022). About 15% of the world's population, currently practice open defecation, and another 1.5 billion do not have entry to a hygienic latrine or toilet, whereas 24 % of urban households (Das *et al.*, 2010), which is estimated to cause 280,000 deaths per year (Raymond *et al.*, 2013). In Bangladesh, 4.9 million (3%) people still do not have safe drinking water near at home, 32.6 million in urban areas uses contaminated water, 29% people still have inadequate toilets and 66% people lack proper hygiene at home (WHO and UNICEF, 2015). Among them, urban slum dwellers face the maximum challenges so that hygiene habits are important for preventing infectious disease (Farah *et al.*, 2015; Curtis *et al.*, 2000).

In addition, immunization is a proven tool for controlling and eliminating life-threatening infectious diseases and it is estimated to avert between 2 and 3 million child deaths each year. Therefore, routine immunization is the most urgent and cost-effective public health intervention for children (Adane *et al.*, 2017; Hosseinpoor *et al.*, 2016). Prevalence of vaccine preventable diseases are more ordinary in urban slums due to high density of population (Uddin *et al.*, 2010). The destination of immunizing children against Tuberculosis, Polio, diphtheria, pertussis, tetanus, Hepatitis B, Measles, Mumps ( Crocker-buque *et al.*, 2017) and diarrhea liable for child mortality and morbidity, is indeed a noble one (Datta *et al.*, 2017). In 2018, worldwide 116 million children were immunized against diphtheria, tetanus and pertussis (DTP) yet millions of children are still not reached by potentially life-saving vaccines (Unicef, 2014). In Bangladesh, 75% of children aged 12–23 months are completely immunized but the coverage in urban slums stands less (Uddin *et al.*, 2010). A current survey in Dhaka city found that the proportion of completely-immunized children in slums aged 12 months was merely 54% (Uddin *et al.*, 2010). Elevated immunization services are momentous for slum populations not only the inhabitants are under protected against vaccine- preventable diseases but also they are overexposed to the danger because of high density and impoverished environmental situations (Ghei *et al.*, 2010). As the hygienic practices and immunization coverage are the burning question, therefore, the survey assessed the hygienic practices and immunization coverage among under five years children in urban slums of Braishal city.

## 2. Materials and Methods

### 2.1. Ethical consideration

This study was conducted in accordance with Bangladesh Medical Association Act (BMA). Moreover, this study was approved by ethical committee at Patuakhali Science and Technology University (approval no.:07/06/2019:06). The purpose of the study was explained in detail to the caregiver of the participant. Privacy, confidentiality and anonymity were fully maintained throughout the research process.

### 2.2. Study area

The survey was carried out in the Barishal city cooperation, located in between 22°38' and 22°45' north latitudes and in between 90°18' and 90°23' east longitudes. The area of this city corporation is 58 Sq.km with population of 5,16,000 (approximately) and density of population is 8897 per Sq.km. In Barisal city corporation, there are around 30 large slums with a population of 27,530.

### 2.3. Sample size determination

The minimum required sample size was calculated by using a single population proportion formula  $(n_0) = \frac{Z^2 pq}{d^2}$ ; where, (d)=5% margin of error, (Z)=95% confidence intervals, estimate prevalence (p)= 83% of fully immunization among 15-59<sup>th</sup> month of children aged (Boulton *et al.*, 2018). This yielded a sample size of 259.2≈259 with 20% non-response rate.

#### 2.4. Study design and setting

A community based cross sectional study was carried out among 259 households with one child (under five years) from each household. Any mothers or caregivers with a child of 12 to 59 months lived at the selected slums and available at the time of data collection were considered eligible for the study. In case any family which had more than one number of under-five year's children, one child was selected randomly.

#### 2.5. Sampling techniques

A multi-stage cluster sampling and systemic random sampling was used to select households. Five slums were selected from 30 large slums of Barishal city through random sampling. After that all households in that selected slums were selected through systemic random sampling up to calculated sample size.

#### 2.6. Data collection

Data were collected using a structured questionnaire from June 2019 to December 2019. The questionnaire was initially developed in English and later translated into Bengali language. For the purpose of knowing hygienic practices and immunization coverage two groups of question was developed. One group was related to immunization status and another group was about the status of diseases during the last three months as well as hygiene status. Any household with an eligible child (aged 12- 59 months) was selected and the caregiver of that was interviewed through face-to-face interviews. Information about child immunizations was collected from immunization cards or the mother's verbal reports.

#### 2.7. Operational definition

Fully immunized: A child who received BCG (1 dose), Pentavalent (3 doses), OPV (4 doses), PCV (3 doses), Measles and Yellow Fever vaccine (1 dose each) and Rotarix (2 doses) which is a total of 7 vaccines and 15 doses is considered as fully immunized.

Not immunized: A child who had received none of the prescribed vaccines doses considered to protect the child from vaccine preventable diseases.

Partially immunized: A child who did not receive one or more of the prescribed vaccines doses considered to protect the child from vaccine preventable diseases.

Not fully immunized: A combination of both partially immunized and not immunized.

Pentavalent: This is a combination of Diphtheria, Pertussis, Tetanus, Haemophilus Influenza type B and hepatitis B antigens.

Age limit for immunization: At age 12 months, each child is expected to have received a total of 7 vaccines (15 doses) to complete his/her immunizations.

#### 2.8. Statistical analysis

Statistical analyses were performed by using IBM SPSS (version 23.0). Descriptive statistics along with Chi-square test were performed to find out the factors associated with hygiene practice and immunization status. Multiple logistic regression was carried out to identify significantly associated variables with good hygiene practice and immunization status and P- value less 0.05 was considered as declared statistically significant. Hosmer and Lemeshow goodness of fit ( $P > 0.05$ ) were used to test the fitness of the model during analysis.

### 3. Results

A total of 259 respondents were interviewed from five different slums in the urban area, Barisal district where more than half of the children (58.7%) were 12-35 months age group, 49.7% of children were male and rests were female children (Table 1). About fifty percent (49.7%) mother had a primary level of education and 14.8% were illiterate, rest had secondary or above. Over half (64.5%) of the children resided in single family and others in joint family. Majority of the family (60.4%) had monthly income less than ten thousand taka. About one-fourth (24.7%) of the family used only water or ash/soil with water for washing hand, majority were in good condition using soap or antiseptic (86.4%). Most of the family used water both for drinking (89.9%) and domestic purposes (80.3%) tube well water. Over one-fifth (20.8%) family had no personal toilets but majority of the family used sanitary toilet (65.6%), and suspended toilet (22.1%), open toilet (12.4%) respectively. The prevalence of good hygiene practices (65.3%) and fully immunized children was 71.4% respectively.

**Table 1. Basic characteristics of study population (N=259).**

Characteristics	Total N (%)	GHP N (%)	P value
<b>Age of the children in month</b>			
15-35	152 (58.7)	104 (61.5)	0.202
36-59	107 (41.3)	65 (38.5)	
<b>Sex of the children</b>			
Male	128 (49.4)	84 (49.7)	0.901
Female	131 (50.6)	85 (50.3)	
<b>Educational status of mother</b>			
Illiterate	45 (17.4)	25 (14.8)	0.323
Primary	125 (48.3)	84 (49.7)	
Secondary or above	89 (22.8)	60 (35.5)	
<b>Family type</b>			
Single	167 (64.5)	101 (59.8)	<b>0.030</b>
Joint	92 (35.5)	68 (40.2)	
<b>Family income (Monthly)</b>			
<10,000BDT	168 (64.9)	102 (60.4)	<b>0.037</b>
>10,000BDT	91 (35.2)	67 (39.6)	
<b>WASH facilities</b>			
<b>Hand washing materials</b>			
Only water or Ash/Soil with water	64 (24.7)	23 (13.6)	<b>0.000</b>
Water with soap/antiseptic	195 (75.3)	146 (86.4)	
<b>Drinking water source</b>			
Tube well	233 (89.9)	147 (86.9)	0.855
River/cannel/ponds	26 (10.1)	22 (13.1)	
<b>Domestic water source</b>			
Tube well	208 (80.3)	136 (80.5)	0.927
River/cannel/ponds	51 (19.7)	33 (19.5)	
<b>Having personal toilet of this family</b>			
Yes	205 (79.2)	161 (95.3)	<b>0.000</b>
No	54 (20.8)	08 (4.7)	
<b>Types of toilet using of this family</b>			
Sanitary	170 (65.6)	137 (81.1)	
Suspended	57 (22.1)	29 (17.2)	<b>0.000</b>
Open	32 (12.4)	3 (1.8)	
<b>Prevalence</b>			
GHP	169 (65.3)		
Fully immunized	185 (71.4)		

\*GHP=Good Hygiene Practices. P value for chi-square test. Bolded Italic values indicated statistically significant ( $P<0.05$ ).

By using multiple logistic regression analysis, good hygiene practices status was tested with each of the potential predictors as independent variables. Children of the joint families were more likely to have significantly negative relationship of good hygiene practices with the single family (AOR=0.54; 95% CI: 0.31-0.95;  $P<0.05$ ). The family having monthly income of >10,000 BDT was negatively related with the family having monthly income <10,000 BDT (AOR=0.52, 95%CI: 0.32-0.97;  $P<0.05$ ). The family using water with soap/antiseptic as hand washing materials had five times higher good hygiene practices status than the counterpart (AOR=5.32; 95%CI: 2.91-9.73;  $P<0.001$ ). The family having sanitary toilet facilities were most likely to have highly positive relationship of good hygiene practices status (AOR=81.1, 95%CI:13.2-505.7;  $P<0.001$ ) and again the family having suspended toilet facilities over two times positive relationship of good hygiene practices status (AOR=2.77, 95%CI:1.57-13.44;  $P<0.05$ ) with the family having open toilet facilities (Table 2).

**Table 2. Determinants of factors associated with good hygiene practices.**

Characteristics	GHP N (%)	AOR ( 95% CI)	P value
<b>Age of the children in month</b>			
12-35	104 (61.5)	1.4 (0.84-2.35)	0.202
36-59 <sup>R</sup>	65 (38.5)	1.0	
<b>Sex of the children</b>			
Male	84 (49.7)	1.2 (0.62-1.72)	0.901
Female <sup>R</sup>	85 (50.3)	1.0	
<b>Educational status of mother</b>			
Illiterate	25 (14.8)	0.61 (0.29-1.26)	0.180
Primary	84 (49.7)	0.99 (0.56-1.77)	0.974
Secondary or above <sup>R</sup>	60 (35.5)	1.0	
<b>Family type</b>			
Single <sup>R</sup>	101 (59.8)	1.0	
Joint	68 (40.2)	0.54 (0.31-0.95)	<b>0.031</b>
<b>Family income (Monthly)</b>			
<10,000BDT <sup>R</sup>	102 (60.4)	1.0	
>10,000BDT	67 (39.6)	0.52 (0.32-0.97)	<b>0.038</b>
<b>WASH facilities</b>			
<b>Hand washing materials</b>			
Only water or Ash/Soil with water <sup>R</sup>	23 (13.6)	1.0	
Water with soap/antiseptic	146 (86.4)	5.32 (2.91-9.73)	<b>0.000</b>
<b>Drinking water source</b>			
Tube well	147 (86.9)	0.93 (0.43-2.02)	0.855
River/cannel/ponds <sup>R</sup>	22 (13.1)	1.0	
<b>Domestic water source</b>			
Tube well	136 (80.5)	1.03 (0.54-1.96)	0.927
River/cannel/ponds <sup>R</sup>	33 (19.5)	1.0	
<b>Types of toilet using of this family</b>			
Sanitary	137 (81.1)	81.1 (13.2-505.7)	<b>0.000</b>
Suspended	29 (17.2)	2.77(1.57-13.44)	<b>0.007</b>
Open <sup>R</sup>	3 (1.8)	1.0	

\*GHP= Good hygiene practices; AOR= Adjusted odds ratio; CI= Confidence interval; <sup>R</sup>= Reference value; Bolded Italic values indicated statistically significant.

Immunization status children alone with potential predictors as independent variables were examined by multiple regression analysis. The adjusted regression model indicates factors significantly predictors of full immunization of children among participants, as educational status of mother: primary level of education (AOR =0.19; 95%CI: 0.16-0.86;  $P<0.05$ ) had significantly negative relationship with secondary level of education as well as illiterate mother (AOR=0.06; 95% CI: 0.09-0.79;  $P\leq 0.001$ ). The children who are lived in single family had positive relationship (AOR=0.08; 95% CI: 0.12-0.96;  $P\leq 0.001$ ) with the children living in joint family. ISC or immunization services center had significant relationship on immunization status of children. Mother who practice immunization from less than 10-minute walking distance from their living place had more than one and half times positive relationship than the counterpart (AOR =1.71; 95% CI: 1.02-2.87;  $P<0.05$ ). Mother who could not show immunization card at the time of interview had more than two and half times negative relationship (e.g. AOR=2.73; 95% CI: 1.3-5.78;  $P<0.05$ ) with who had immunization card at that time (Table 3).

**Table 3. Odd ratio (multiple regression) of factors determining status of immunization of 12-59 months children.**

Characteristics	Fully immunized N (%)	AOR ( 95% CI)	<i>P</i> value
<b>Age of the children in month</b>			
15-35	105 (56.8)	0.62 (0.34-1.13)	0.117
36-59 <sup>R</sup>	80(43.2)	1.0	
<b>Sex of the children</b>			
Male	92 (49.7)	0.89 (0.51-1.56)	0.674
Female <sup>R</sup>	93 (50.3)	1.0	
<b>Educational status of mother</b>			
Illiterate	28 (15.1)	0.06 (0.09-0.79)	<b>0.001</b>
Primary	93 (50.3)	0.19 (0.16-0.86)	<b>0.004</b>
Secondary or above <sup>R</sup>	64 (34.6)	1.0	
<b>Family type</b>			
Single	113 (61.1)	0.08 (0.12-0.96)	<b>0.001</b>
Joint <sup>R</sup>	72 (38.9)	1.0	
<b>Family income (Monthly)</b>			
<10,000BDT <sup>R</sup>	122 (65.9)	1.0	
>10,000BDT	63 (34.1)	0.83 (0.46-1.49)	0.531
<b>Distance of ISC from home</b>			
Closest (<10min walking distance)	23 (12.4)	1.71 (1.02-2.87)	<b>0.043</b>
Long distance <sup>R</sup> (>10min walking distance)	162 (87.6)	1.0	
<b>Having immunization card</b>			
Yes	166 (89.2)	2.73 (1.3-5.78)	<b>0.009</b>
No <sup>R</sup>	20 (10.8)	1.0	
<b>Affected any infectious disease last 3 month</b>			
Yes <sup>R</sup>	133 (71.9)	1.0	
No	52 (28.1)	0.98 (0.52-1.87)	0.960

\*<sup>R</sup>= Reference value; AOR= Adjusted odds ratio; CI= Confidence interval; ISC= Immunization services center; Bolded Italic values indicated statistically significant.

#### 4. Discussion

This study found that 169 children (65.3%) were in good hygiene practice status and 185 children (71.4%) were fully immunized. Regarding personal hygiene practices from this study, it is stated that majority (65.6%) of the respondents used sanitary latrine. Similar result was found in selected slums of Dhaka city 59% (Farah *et al.*, 2015), however, Raihan *et al.* (2014) found that near one-fourth (22%) of the respondents used sanitary toilet and about 58% behaved kacha and 20% used open toilets. Another study on Rupsha Ferighat slum, Khulna found that most (52%) of the households used obviously good latrines, which are not hygienic. These latrines indicated 26% metaled open latrines and 21% ring slab latrine without water seal (Rana, 2009). The difference of findings may be due to difference of study place, population (tribal community) or it may be due to activities of different types of social welfare, government and non-government organization such as Brac, Poshikha, Sodesh etc. These organization had created improved non-shared latrine in slum area to make Barisal district free from open defecation.

In this study, most (75.3%) of the respondents were using soap water after excretion, and rest were using water alone or ash/soil with water (24.7%) for washing hand. However, a study conducted by P. Dwivedi AS. on environmental sanitation, sanitary habits and personal hygiene among the Baigas of Samnapur Block of Dindori District, Madhya Pradesh India displayed that 100% of people did not wash their hand with soap water after excretion, they were using soil, leaves or stone, for washing hand (Dwivedi and Sharma, 2007). The underlying causes of high percentage in this issue are different sanitation and hygiene related policies and programs running in these slums by Barisal city corporation together with different public and private sector as Nagor Unnon Kenra, Brac, Proshikha, UNICEF and World Vision Bangladesh. In our study, 65.3% have good personal hygiene practice and 34.7% do not have good personal hygiene and 65.6% of the houses have good sanitary toilet facilities. A study was done by Karn *et al.* (2011) in Mornag district of Nepal on personal hygiene and sanitary practices in a rural village displayed that 64% had good personal hygiene practice and 58% had good sanitary condition, which is almost same as our study.

This study evaluated immunization coverage and its associated factors among children aged 12–59 months. Childhood complete immunization status was confirmed by mothers/caregivers recall or by using child health card. Overall, this study found high immunization coverage (71.4%) compare to a current survey by Uddin *et al.* (2010). On child immunization coverage in urban slums of Bangladesh was 54% (Uddin *et al.*, 2010), and a cross sectional study in urban poor settlements of Delhi, India was 46.7% (Devasenapathy *et al.*, 2016). The underlying success of this study is due to the nature of a pluralistic health system, where the public, private sector or non-governmental organizations actively participate to offer healthcare services in Barisal city. Further, community mobilization and public health awareness-related programs have also played a significant role in creating demand for vaccine uptake in Barisal district.

However, the status of full immunization in this study is about 14.6% less than the National coverage of Bangladesh(86%) (Sarker *et al.*, 2019). This is due to several issues such as low socioeconomic status, tight scheduling of parent's for occupational activities, family types (35.5% are joint family), that's why poor chance of providing child care or managing time to immunized children or lack of awareness towards childhood immunization. This study identified 'Ignorance' (regarding schedule and importance of vaccination) to be the most common reason, which led to unwillingness to spend time and money for immunization. Another great issue for dropping out vaccination is shift of the parents from one place to another. Rainey *et al.* (2010) also identified the same issue that family characteristics relevant to vaccination status included caretaker ethnicity, and education level together with socio-economic status. However, the association between childhood vaccination status and maternal age is controversial in different literatures (Johri *et al.*, 2015; Xeuatvongsa *et al.*, 2017; Ganczak *et al.*, 2013).

Our study established that maternal education is significantly associated with incomplete or inadequate vaccination which was similar in a study in Bangladesh (Sheikh *et al.*, 2018). Children of younger and less educated mothers were more likely to have been incompletely vaccinated. Globally, similar patterns have been observed; mothers with a lower educational level were less likely to fully utilize immunization services as like. Numerous studies have shown the association between shortage of vaccinating or completing the vaccination schedule and maternal/paternal occupation or low socio- economic status of the household, as maternal/paternal occupation is often thought to be a factor for the level of income/socio-economic status of the household (Rainey *et al.*, 2011; Larson *et al.*, 2014).

The results are based on information about the status of hygiene practices and immunization coverage through personal observation and immunization cards or the self -reports of women. So, potential effect of recall or personal bias on our finding cannot be neglected.

The generalizability might be limited due to its small sample size. However, this study is still relevant owing to its rigorous methodology followed. Consequently, a longitudinal study is suggested to investigate the factors associated with immunization and hygiene practices of slums for under five children.

## 5. Conclusions

Hygiene practices status (65.3%) and immunization status (71.4%) in urban slums of Barishal are reported less compared to national level (86% immunization coverage). So, this is still public health concern in Bangladesh. Various programs and intervention on hygiene, sanitation and immunization, are needed raise awareness among the people of urban slums in Bangladesh. The immunization coverage and hygiene practices can be improved by taking simple steps such as education about immunization and hygiene practices. In addition, reliable registers for immunization services and hygiene facilities will improve data quality and accuracy as well as defaulters' tracking and identification. Moreover, disadvantaged populations should continue to be reached with hygiene facilities as well as immunization services using out-reach activities.

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## Data availability

All relevant data are within the manuscript.

## Conflict of interest

None to declare.

**Author Contributions**

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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