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Risk factors of diphtheria on Rohingya refugees in Bangladesh: A matched case-control study

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Abstract
Rohingya refugees are one of the most deprive, persecuted and stateless person in the world. Almost one million fleeing from Myanmar in between 1991 to 2018 and in the present time Bangladesh hosts a large number of refugee camp. Recently a large number of Rohingya refugees arrived in the cox's bazaar district specially the Kutupalong Rohingya camps. This burden population destroy the rules regulations and system of governance of the local area. For the over density of population in the refugees camps have higher risk of human health and several infectious disease like cholera, hepatitis E, and diphtheria are outbreaks. In last of the previous year, diphtheria outbreak in the refugees camps especially the Kutupalong camps, almost 500 cases reported in the first month after the detecting the first cases of diphtheria infected person. For rising a large number of cases MSF (Médecins sans Frontières) was run a provisional diphtheria treatment care centre in Kutupalong refugee camps. Thus, the study was conducted to know the risk factors of diphtheria among the Rohingya refugees specially the Kutupalong Rohingya refugee's camps and also the socio-demographical characteristic of the infected person. A matched case–control study design was conducted by a standard questionnaire. Total 346 information was collected from both cases and control groups, 173 from cases group and 173 for control groups with the matching criteria. Information classified into five categories questions, It's was respondent socio-demographic, socio-economic, knowledge about diphtheria, services accessibility and availability with prevention against diphtheria. The result of the study found that female were mostly infected by the diphtheria was 74% than the male respondent 26% and also the lower ages (less than 20 years) people were mostly victim for the disease that was 80%. And also found that the winter season when temperature fallen down below 10 degrees Celsius, that is the optimum time for outback of the disease. Respondent having history of irregular bathing (OR=1.040, $p \leq 0.001$), total number of family member whose age ≤20 years (OR=1.003, $p \leq 0.001$), Illiterate mother's education level (OR=1.452, $p \leq 0.005$), More than 15 family member in respondent room (OR=1.213, $p \leq 0.005$), very poor shelter quality (OR=1.168, $p \leq 0.005$), and also the using the Deep Tube-well and Surface Water both for washing food vessel (OR=1.251, $p \leq 0.005$) are at risk being infected by diphtheria. The study concludes that their living condition is high risk of human health because of over density population, socio economical and psychological condition so much vulnerable in the small area. Bangladesh government with others country and different types of NGO should take adequate measures to mitigate the health hazards in the refugees camps

Keywords: risk factors, matched, case-control, Rohingya refugees, Corynebacterium diphtheria, control groups

1. Introduction
In the present time Rohingya people are one of the most stateless and oppressed ethic in the world [1, 2]. This people faced lot of discrimination in their own homeland and even their government violated the human right by effective denial of their citizenship [3]. The refugee crisis in the world is increasing to fast because of the Rakhine state is closely the southeastern hilly side of Bangladesh [8]. From 1991 to 2017 several times lot of Rohingya people fled from Myanmar to Bangladesh [4]. Bangladesh government, different organizations and United Nation give the support a large number of Rohingya people to living them at refugees cam who were fled from Myanmar to Bangladesh in between 1991-1992 at that time [5]. For the violence of Myanmar's Rakhine State almost 670,000 Rohingya people were fled over to Bangladesh on 25 August 2017 [6] and almost 210,000 had fled in earlier. Recently more than 584,000 Rohingya people arrived the Kutupalong Rohingya refugee's camps and approximately 187,000 in others camps till 15th march 2018. That is the large number of Rohingya people arrived in the cox's bazaar district in Bangladesh but for the overloaded population has destroy the local communities and system of governance. For the over density population in the refugee camps specially the Kutupalong camps living condition is high risk of human health [7]. For the Rohingya people specially the children, women, and young girl's socio economical condition and psychological behavior so much vulnerable [9]. Bangladesh government's Ministry of food and disaster management and others international organization are working together to improve the socio-economical and health condition of the People [7]. Recent two year several studies was conduct for the report of poor health condition and other common factors that are most common scenario in the Rohingya refugee camps like as overpopulated environment, unhygienic sanitation, polluted water healthcare facility and maltreatment [10, 14]. Several infectious disease like as cholera, hepatitis E, measles and diphtheria are outbreaks for the poorest living conditions [17]. First 10 November 2019, a diphtheria case was reported at health care facility in Balukhali Médecins sans Frontières (MSF) Temporary medical camps. Corynebacterium diphtheria bacterium produce the diphtheria toxin that is the main reason of Diphtheria. This type of Diphtheria are transmitted by through the closes physical contact of the infected person. C. diphtheria is commonly found in the throat, nose and the ear of the infected patients [18]. And is spread one person to another person when an infected person talk, coughs and

sneezes closely with another person. So the very close contact with an infected person increase the chance of transmission [19]. Diphtheria symptoms can be the creation of pseudo-membrane stopping airways, and others common difficulty can be problem of breathing, myocarditis and swallowing. Mostly in between 2-5 days is the incubation period, with reproduction number 4-5 [22]. For the high infectious and transmitted case fatality rates of over 10% [20], in worldwide it's the major public concern at least one million. In 1970s 50,000 to 60,000 was deaths per year and the World Health Organization (WHO) immunization program of diphtheria toxoid containing vaccines was expanded. For this result, globally the diphtheria incidence has drastically reduced in the 2nd half of the last century that was over 90% between 1980 and 2000 but now remains the significant concern for low vaccination areas [20]. Currently, In Indonesia, Yemen, Haiti and Venezuela the outbreaks of diphtheria have occurred [21, 22]. After finding the first cases in Balukhali, there were more than 400 additional suspected cases reported in outside the refugee camps, among them 168 was reported on 9th December 2017. MSF was run the primary Diphtheria Treatment Centre (DTC) at the Rohingya camps on 17 December 2017. It is very problem to understand the infection epidemiology in the first stage of the infectious disease outbreak. It is possible to predict forecasts of next incidence [23, 24] and compute the potential effect of the control measurement by quantifying the transmission dynamics [25, 26]. MSF perform a health survey in November 2017 and estimated that measles vaccination coverage in refugees children aged in between 6-59 month was 20-25%, and this vaccination campaign children in between 9-14 years old [12]. From the previous study the vaccination data for diphtheria were not available but they assumed 20% of the age group 5-14 were immune to diphtheria [12]. Therefor the purpose of this study is to conduct a research to know the risk factors of diphtheria disease considering Rohingya refugees specially the Kutupalong Rohingya refugee's camps in Bangladesh and also to know the socio-demographical characteristic of the infected person.

2. Methodology

Study population and area: This study on Rohingya refugees at Kutupalong refugees' camps in Ukhia, Cox's Bazar, Bangladesh. Kutupalong refugee camp at Ukhia Upazila, Cox's Bazar District. This Upazila located at 21.2833°N, 92.1000°E and almost 19, 189 households in 261.8 km² area. Kutupalong refugee camp in one of the largest refugee camp in Ukhia, That inhabited mostly by Rohingya refugees who were fled from ethnic persecution at Rakhine state in Myanmar.

Study Design: A matched case–control study design was conducted for the study, where case groups were select randomly and control groups were selected by an age and sex matching criteria. Matching factors were age and sex at the same geographic area, for example if 25% of the cases are males age and 5-10 years. 25% of the controls would be taken to have similar characteristics. A case-control study is one kind of retrospective study design that studies work in reverse that means working back from outcome to exposure. This type of study more useful for that types of outcomes that are rare cases and sometimes take long time to develop [27]. There we firstly the outcome that was the person who admitted the Hospital and get treatment for the diphtheria who were actually were infected by diphtheria.

Cases and Controls Selection: In this study the cases groups are the diphtheria infected person. These case group were selected if they were admitted to the MSF medical camp at Jamtoli, Ukhia, Cox's Bazar with a symbol of diphtheria between 1st November 2018 to March 31, 2019. This Cases were selected by the random process from patients register book of the health center by generating random numbers. And also some respondents who had a previous history of diphtheria were not eligible for this study. These infected people were identify through daily review of admission and reported by the staff of MSF temporary medical camps at Jamtoli bazar, in Kutupalong refugee's camps. The control groups were selected by randomness procedure from the patient register book who were taken treatment in the same health center and release in the same geographic area within same period of time. These control groups are free from the disease (Outcome), and hospitalized patients often did not represent the general population; they were likely to suffer another simple health problems and they had access to the health care system.

Sample Size: In this study sample size calculated by a formal mathematical equation that relates with level of significant, power, sample size, effect size, and a measure of variability (similar to standard deviation). For case-control study using difference in proportions formula:

$$n = \left(\frac{r+1}{r}\right)\frac{(\bar{p})(1-\bar{p})\,(Z_\beta + Z_{\frac{\alpha}{2}})^2}{(p_1-p_2)^2}$$ [n = Sample size in the case group]

Where, r = 1, ratio of cases to controls,

Z_β= 0.84, Power (% chance of detecting) considering 80% power

$Z_{\frac{\alpha}{2}}$=1.96. Represents the desired level of statistical significance (Two size confidence level).

p_1= 20%, proportion of cases with exposure [12]

p_2= Hypothetical proportion of controls with exposure

OR=2, Odds ratio of 2 or greater.

$$p_{controlsexp} = \frac{OR\, p_{caseexp}}{p_{caseexp}(OR-1)+1}$$

$$p_{controlsexp} = \frac{2.0(.20)}{(.20)(2.0-1)+1} = \frac{.40}{1.20} = 33.33$$

Average proportion exposed= (0.33.33+0.20)/2= 0.26665

$$n_1 = \left(\frac{r+1}{r}\right)\frac{(\bar{p})(1-\bar{p})(Z_\beta + Z_{\alpha/2})^2}{(p_1-p_2)^2}$$

$$n_1 = 2 * \left[\frac{(.265)(1-.265)(.84+1.96)^2}{(.33-.20)^2}\right] = 172.5594087 \approx 173$$

As ratio of controls to cases r=1 (equal number of cases and controls), so $n_2 = 173$. Therefore, Total sample n= 346 (173 cases, 173 controls)

Data Collection: After clearly defining cases and controls, same size of sample were collected from the both groups. The primary data were used in the study that was collected

by direct interview method. A standard questionnaire was used for each groups (cause and control groups) to collect the information and total 346 information was collected from both cases and control groups, 173 from cases group and 173 for control groups with the matching criteria. This questionnaire was five types of classified question that is respondent Socio-Demographic indicators, Socio-Economic Condition, Knowledge about Diphtheria, Services accessibility and availability and prevention against diphtheria and using the questionnaire collected 56 number of information collected from the respondents. This primary information was collected during 1st November 2018 to March 31, 2019. The information collected from the respondents which included Socio-Demographic indicators likes sex, age, marital status, religious, education level, number of family members, number of children, occupation, for Bangladesh and Myanmar. Also collected the information's about Respondent's Knowledge about Diphtheria, like have any knowledge about the disease Diphtheria or not, level of knowledge, symptoms, reason, health problem, Vaccines and treatments etc. Also, it was also confirmed that each questionnaire answer had been correctly recorded.

Data Analysis: For this study Stata version 14.2 SE (StataCorp (2015). Statistical Software: Release 14. College Station, TX: StataCorp LP.) was used for the data management and analysis and also Microsoft Office Excel (2016) used for produce different graphs. Respondent's age, Total number of family members, household's average monthly income, amount of properties, diphtheria infected person, and number of disease recovered person and also member live in his/her room was converted as continuous variable to categorical variable. Descriptive statistic was applied along with some graphical presentation to examine the frequency and percentage of the socio economical and background characteristic of the respondent. Chi-square tests were applied to examine the association between diphtheria infection and respondents different types of characteristics e.g. father's education, number of children in the households (<10 year), shelter quality, monthly income, religion, household characteristic, sources of bathing water, and history of eczema, tonsillitis etc. Binary logistic regression odds ratio (ORs) with 95% confidence interval (CI) was applied to determine the risk factors for diphtheria where diphtheria infected status (1=yes, 0=no) consider as the outcomes variable and father's education level, respondents' education level, number of children, shelter quality, number of room in a household, number of member in respondent room, household income, shared food vessel status, taking bathed <5 per week status, bed shared status, slept with more than 2 per bed status, sources of bathing water, history of tonsillitis, history of eczema etc. (Table 5) consider as an explanatory variable. If any covariates were significantly associated with the exposure variable and outcome variable both than it was consider as confounder in the binary logistic regression model. And in the study, the effect of confounder while they were associated the exposure variable was controlled.

3. Results

3.1: Distribution of the Matching Factor Age and Sex at the Same Geographic Area.

Table 1 represents the distribution of the age and sex of the respondents that are the matching factors in the study. This matching factor provide the best result by improving the precision level. This study conduct by collected the same number of male and female, same number of respondent in different age groups to fulfill the matching criteria and we found that 74% female were infected by diphtheria and only 26% were male. And also found that most of the infected person belong in 05-09 age group 31%, than 16% in between 10-14 year old. Only 20% age respondent age greater than 20-year others 80% infected person age below 20 years.

Table 1: Distribution of age and sex of the respondents (N=346).

Characteristics	No. of cases (%)	No. of controls (%)	Total (%)
Sex			
Female	128 (74)	128 (74)	256(74)
Male	45 (26)	45 (26)	90(26)
Age Group (years)			
≤04	40(23)	40(23)	80(23)
05-09	54(31)	54(31)	108(31)
10-14	28(16)	28(16)	56(16)
15-19	16(9)	16(9)	32(9)
20+	35(21)	35(21)	70(20)

3.2: Total Active Diphtheria Infection and New Diphtheria Infection.

From Figure 1, it can be said that most of diphtheria infected person middle of the December and the onset time of disease mostly from the first week of November when the temperature in in Bangladesh belong very low rather than another month. From the figure is can also be said that end of the January month the rate of the incidence of the disease vary low because the incidence rate of the disease decreases with the end of winter and also due to increasing high temperature at the end of the march, New diphtheria infection and active infections were almost same.

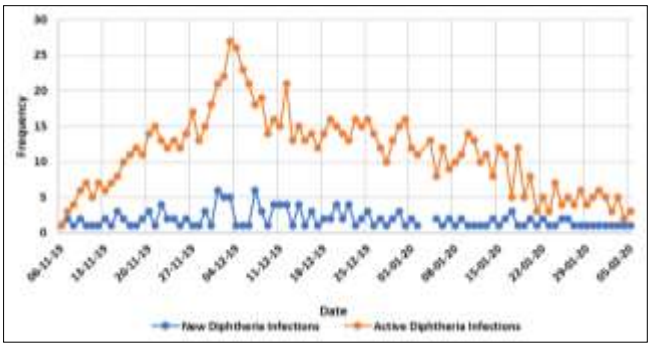

Fig 1: New Diphtheria Infections and Active Diphtheria Infections in the study period.

3.3. Socio-Demographic Characteristics of the Respondents

Background Characteristics of the respondents are show in table 2. A total of 346 respondents were collected for the study where 99.42% respondents were Muslim and only 0.58% respondents were Hindu. Among the study participants, 65.32% fathers and 75.14% mothers were illiterate. 45.38% respondents' family members were in between 06 to10 and 26.01% respondents' family members were more than 10. Shelter quality of 60.98% respondents were very poor, total number of family member in between 03 to 04 whose age ≤ 20 years were 37.57% and 33.24% respondents total number of family member whose age ≤ 20 years were more than 5. Among of the all respondent only

38.44% household's monthly income more than 8,000 BDT, and 14.16% respondent household's monthly income less than 2000 BDT. 63.58 % respondents' room contain more than 8 family members. Among the all respondents, 93.64% respondents daily shared their food vessel, 98.27% respondents shared their daily using towel with each other's, 95.95% respondents shared their bed daily and also 19.65% respondents taken irregular bathing. 36.71% respondents using deep tube-well and surface water both for washing food vessel, 71.10% respondents using deep tube-well for bathing. And very few respondent had the history of diphtheria relevant disease.

Table 2: Background Characteristics of the respondents (N=346).

Characteristics	No. of cases (%)	No. of controls (%)	Total (%)
Religious status			
Muslim	171(98.84)	173(100)	344(99.42)
Hindu	2(1.16)	0(0.00)	2 (0.58)
Father's education level			
Illiterate	119(68.79)	107(61.85)	226(65.32)
Primary or Can sign	54(31.21)	66(38.15)	120(34.68)
Mother's education level			
Illiterate	139(80.35)	121(69.94)	260(75.14)
Primary or Can sign	34(19.65)	52(30.06)	86(24.86)
Respondents' education level (respondent age ≤10 years)			
Illiterate	71 (71.00)	88(70.97)	159(70.98)
Primary or Can sign	29(29.00)	36(29.03)	65(29.02)
Total family members			
0–05	36(20.81)	63(36.42)	99(28.61)
06–10	85(49.13)	72(41.62)	157(45.38)
10+	52(30.06)	38(21.97)	90(26.01)
Shelter quality			
Good	7(4.05)	20(11.56)	27(7.80)
Poor	50(28.90)	58(33.53)	108(31.21)
Very Poor	116(67.05)	75(54.91)	211(60.98)
Total number of family member whose age ≤ 20 years			
0–02	35(20.23)	66(38.15)	101(29.19)
03–04	70(40.46)	60(34.68)	130(37.57)
05+	68(39.31)	47(27.17)	115(33.24)
Household's monthly income (BDT)			
≤ 2000	28(16.18)	21(12.14)	49(14.16)
2,000-4,000	43(24.86)	38(21.97)	81(23.41)
4,001-6,000	22(12.72)	20(11.56)	42(12.14)
6,001-8,000	16(9.25)	25(14.45)	41(11.85)
>8,000	64(36.99)	69(39.88)	133(38.44)
Total family members in the respondents' room			
0–03	12(6.94)	17(9.83)	29(8.38)
04–07	45(26.01)	52(30.06)	97(28.03)
08+	116(67.05)	104(60.12)	220(63.58)
Household characteristics			
Family member with diphtheria	5(2.89)	1(0.58)	6(1.73)
Shared food vessel (daily)	168(97.11)	156(90.17)	324(93.64)
Shared towel (daily)	171(98.27)	169(97.69)	340(98.27)
Shared bed (daily)	170(98.27)	162(93.64)	332(95.95)
Irregular bathing (≤4 in a week)	46(26.59)	22(12.72)	68(19.65)
Sources of bathing water			
Deep Tube-well	114(65.90)	132(76.30)	246(71.10)
Surface Water	23(13.29)	14(8.09)	37(10.69)
Deep Tube-well and Surface Water both	36(20.81)	27(15.61)	63(18.21)
Sources of water for washing food vessel			
Deep Tube-well	51(29.48)	80(46.24)	131(37.86)
Surface Water	50(28.90)	38(21.97)	88(25.43)
Deep Tube-well and Surface Water both	72(41.62)	55(31.79)	127(36.71)
History of relevant disease			
History of diphtheria	5(2.89)	3(1.73)	8(2.31)
History of tonsillitis	2(1.16)	1(0.58)	3(0.87)
History of heart problems	2(0.58)	0(00)	2(0.58)
History of eczema	5(2.89)	4(2.31)	9(2.60)

3.4 Factors Association with the Diphtheria Infection

Diphtheria Infections was most significant for irregular bathing (≤4 in a week) ($p<0.01$) and also very poor shelter quality ($p<0.05$). Total number of family ($p<0.05$) and also the family member whose age ≤ 20 years high significant factor for diphtheria ($p<0.01$). Respondents of from those house hold who were shared food vessel daily was high significance to diphtheria infection ($p<0.05$) than who

family member not shared food vessel in daily and also who shared bed in daily (p<0.05). Illiterate mother's (p<0.05) was another significant factors for diphtheria infection (Table 3).

Table 3: Factors association with Diphtheria Infections (N=346).

Characteristics	No. of cases (%)	No. of controls (%)	Chi-Square(df)	P-Value
Father's education level				
Illiterate	119(68.79)	107(61.85)	1.8372	0.175 ns
Primary or Can sign	54(31.21)	66(38.15)		
Mother's education level				
Illiterate	139(80.35)	121(69.94)	5.0136	0.025*
Primary or Can sign	34(19.65)	52(30.06)		
Respondents' education level (respondent age ≤10 years)				
Illiterate	71 (71.00)	88(70.97)	0.0000	0.996ns
Primary or Can sign	29(29.00)	36(29.03)		
Total family members				
0–05	36(20.81)	63(36.42)	10.6178	0.005*
06–10	85(49.13)	72(41.62)		
15+	52(30.06)	38(21.97)		
Shelter quality				
Good	7(4.05)	20(11.56)	8.9419	0.011*
Poor	50(28.90)	58(33.53)		
Very Poor	116(67.05)	75(54.91)		
Total number of family member whose age ≤ 20 years				
0–02	35(20.23)	66(38.15)	14.1189	0.001*
03–04	70(40.46)	60(34.68)		
05+	68(39.31)	47(27.17)		
Household's monthly income (BDT)				
≤ 2000	28(16.18)	21(12.14)	3.5675	0.468ns
2,000-4,000	43(24.86)	38(21.97)		
4,001-6,000	22(12.72)	20(11.56)		
6,001-8,000	16(9.25)	25(14.45)		
>8,000	64(36.99)	69(39.88)		
Total family members in the respondents' room				
0–03	12(6.94)	17(9.83)	2.0218	0.364ns
04–07	45(26.01)	52(30.06)		
08+	116(67.05)	104(60.12)		
Household characteristics				
Shared food vessel (daily)	168(97.11)	156(90.17)	6.9899	0.008*
Shared towel (daily)	171(98.27)	169(97.69)	0.6784	0.410 ns
Shared bed (daily)	170(98.27)	162(93.64)	4.7642	0.029*
Irregular bathing (≤4 in a week)	46(26.59)	22(12.72)	10.5425	0.001*
Sources of bathing water				
Deep Tube-well	114(65.90)	132(76.30)	4.7920	0.091ns
Surface Water	23(13.29)	14(8.09)		
Deep Tube-well and Surface Water both	36(20.81)	27(15.61)		
Sources of water for washing food vessel				
Deep Tube-well	51(29.48)	80(46.24)	10.3318	0.006*
Surface Water	50(28.90)	38(21.97)		
Deep Tube-well and Surface Water both	72(41.62)	55(31.79)		

Note. Level of significance: * for P < 0.05, ns for not significant.

3.5 Factors for Diphtheria Infection

To identify the factors of diphtheria infections among the Kutupalong Rohingya refugee's, binomial logistic regression analysis was used, where dependent variable was case and control groups; independent variable includes mother's education level, total family members, shelter quality, total number of family member whose age ≤20 years, shared food vessel (daily), irregular bathing (≤4 in a week), and the sources of water for washing food vessel (Table 4). Result show that Irregular bathing (≤4 in a week) respondent (OR=1.090, p<0.001) had higher likelihood of having Diphtheria infection than the regular bathing respondents. The likelihood of having diphtheria infection 1.297 times higher than among the respondents who daily shared their bed (OR=1.297, p < 0.05) with others family members than who did not history of bed sharing. Respondents whose mother were illiterate (OR=1.437, p<0.05) had more than 1.437 times higher risk of having diphtheria than whose mother could sign or primary educated. The change of having diphtheria infection was associated with the history of large number of family member (15+) with 1.127 odd ration of 0 to 5 members (OR=1.127, p < 0.005). Respondents whose shelter quality was very poor (OR=1.249, p < 0.005) had more than 1.249 times higher risk of having diphtheria than the respondents whose shelter quality is good. And also the change of having diphtheria infection was associated with the history of l number of family member whose age ≤20 years (5+) with 1.003 odd ration of 0 to 2 members (OR=1.003, p < 0.001). Using only Deep Tube-well (OR=1.358, p < 0.005)

or Deep Tube-well and Surface Water both using (OR=1.251, p < 0.005) for washing food vessel, that was another risk factors for the diphtheria infection (Table 4).

Table 4: Risk factors for Diphtheria Infections (N=346).

Characteristics	Unadjusted OR	CI (95%)		P value	Adjusted OR	CI (95%)		P value
		Lower	Upper			Lower	Upper	
Mother's education level								
Illiterate	1.437	0.067	1.059	0.026	1.452	0.072	1.065	0.027*
Primary or Can sign	1				1			
Total family members								
0–05	1				1			
06–10	1.275	0.209	1.241	0.006	1.321	0.221	1.521	0.004*
15+	1.127	0.287	1.458	0.003	1.213	0.312	1.548	0.002*
Shelter quality								
Good	1				1			
Poor	0.901	-0.038	1.841	0.060	0.978	-0.024	1.981	0.056^{ns}
Very Poor	1.249	0.347	2.151	0.007	1.168	0.207	2.130	0.017*
Total number of family member whose age ≤20 years								
0–02	1				1			
03–04	0.788	0.252	1.324	0.004	0.752	0.184	1.321	0.009*
05+	1.003	0.450	1.557	0.000	1.032	0.447	1.617	0.001*
Household characteristics								
Shared food vessel (daily)	1.297	0.277	2.318	0.013	1.196	0.110	2.283	0.031*
Irregular bathing (≤4 in a week)	1.090	0.350	1.470	0.001	1.040	0.430	1.650	0.001*
Sources of water for washing food vessel								
Deep Tube-well	1				1			
Surface Water	1.276	0.175	1.273	0.010	1.358	0.060	1.223	0.030*
Deep Tube-well and Surface Water both	1.281	0.223	1.216	0.005	1.251	0.217	1.282	0.006*

Note. Level of significance: * for P < 0.05, ns for not significant.

4. Conclusions

This study found a higher risk of diphtheria infection among the Rohingya refugees in Kutupalong camps with their lower living condition was high risk of human health. Overall, it can be said that, Irregular bathing, total family member, Illiterate mother's, very poor shelter quality, using water both for washing food vessel, are the risk factors for the diphtheria disease. To improve their health condition as well as mitigate the large number of outback of diphtheria, Bangladesh government and different types of national and international organization should be come forward with a good planning.

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