

## Bacterial and Viral Vaccination (non EPI) Coverage among Students in Three Educational Institutions in Bangladesh

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### Abstract

**Introduction:** The implementation of the vaccine has already been shown to be a great success to reduce communicable diseases and its associated morbidity among human globally. The aim of this study was to figure out the actual rate of population who received non EPI bacterial and viral vaccines and to determine the risk factors associated with it.

**Materials and Methods:** A retrospective observational study was conducted between September 2011 and August 2014 among 3600 students aged from 18 years to 24 years. Data of total 12 non EPI vaccines (5 bacterial - Cholera and ETEC diarrhea vaccine, Meningococcal, Pneumococcal, Tetanus and Typhoid; 7 viral- Chicken pox, Cervical vaccine, Hepatitis A, Hepatitis B, Measles Mumps Rubella vaccine, Rota viral and Seasonal flu vaccine) were collected from the individuals' vaccine cards. All vaccine timelines were categorized into timely, early, delayed and missed based on recommended time of vaccination. Different parameters were considered to determine the socio-demographic factors related to vaccination.

**Results:** Total of 3600 study population were selected from three different institutes. Percentage of rural students was almost 3.2 times higher than that of urban. About 1746(48.5%) student were from middle class family. About 2125(59.03%) of the participant's had not adequate knowledge of vaccination. Out of 3600 study population for bacterial vaccine, rate of Tetanus vaccine was the highest in percentage which was 1248(34.67%). Percentage of other bacterial vaccines such as Cholera and ETEC diarrhea, Meningococcal, Pneumococcal and Typhoid vaccination percentages were only 27(0.75%), 29(0.81%), 111(3.08%) and 34(0.94%) respectively. Among viral vaccines, the highest receiving vaccine was Hepatitis B. 2763(76.75%) people were immune with hepatitis B vaccine. Percentage of Hepatitis A was 337(9.36%), Rota viral vaccine was 330(9.17%), Measles Mumps Rubella was 249(6.92%) and Chicken pox was 83(2.31%). The percentage was less in case of Cervical HPV and Seasonal flu vaccines which were 12(0.33%) and 20(0.56%) respectively. **Conclusion:** Vaccines have proven the potential capability to reduce vaccine-preventable diseases, however, findings from the study show that people have still not been aware of non EPI bacterial and viral vaccines which can protect people from life threatening diseases and their complications.

**Keywords:** Bacterial vaccine coverage, Viral vaccine coverage, Non EPI vaccine.

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### Introduction:

Immunization has become one of the major contributors to public health globally as it prevents communicable diseases among human<sup>1</sup>. Vaccines rarely provide full protection from disease. Nevertheless, Vaccines may be used to protect both individuals and whole populations<sup>2, 3</sup>. Vaccine contributes to the reduction of morbidity and

mortality worldwide<sup>4</sup>. Despite the success rate of advanced vaccine approximately 1.5 million people die each year from vaccine-preventable diseases<sup>5</sup>. Vaccine-preventable diseases remain a potential public health problem in South-East Asia<sup>6</sup> including Bangladesh for its early or delayed, incomplete, and low vaccination coverage<sup>7</sup>. The objective of this study was to estimate the extent of coverage of life saving non-EPI bacterial and viral vaccines among the students of three different institutes in its time schedule, and to investigate the factors of incomplete and failure of timely vaccination.

### Materials and Methods:

A retrospective observational study was conducted between September 2011 and August 2014 which occurred among 3600 students of three different government institutes; Rajshahi University (RU), Rajshahi Medical College (RMC) and Rajshahi University of Engineering and Technology (RUET). A sum of 2450 students was selected from different departments of RU, about 600 students were enrolled from RMC and 550 students from RUET were participated in this study. They were divided in male and female groups. Students aged 18-24 years with the availability of vaccine cards and willing to participate in this study were included. Students who had no available vaccine cards, age limits were not matched and was not willing to participate were excluded from the study. All vaccine timelines were categorized into timely, early, delayed and missed based on recommended time of vaccination. Timely vaccination was considered as receiving

a particular vaccine within the recommended time, whereas early and delayed vaccination was defined as administration of vaccine early and after the recommended time respectively. Missed vaccination was considered as failure to administration of a particular dose. Data were collected based on the availability of the vaccine card. Data of total 12 non EPI vaccines (Five bacterial- Cholera and ETEC diarrhea vaccine, Meningococcal, Pneumococcal, Tetanus and Typhoid; Seven viral- Chicken pox, Cervical vaccine, Hepatitis A, Hepatitis B, Measles Mumps Rubella vaccine, Rota viral and Seasonal flu vaccine) were collected from the individuals' vaccine cards. Written consents were taken from the respondents during the interviews. Study was conducted from September 2011 to August 2014, and different parameters were considered to determine the socio-demographic factors related to vaccination. SPSS version 19 was used for data analysis.

**Results:**

Table I shows total 3600 study population was selected from three different institutes. Among them, 2450, 600 and 550 were from RU, RMC and RUET respectively. Percentage of male 1898 (52.72%) was slightly higher than female 1702 (47.28%). Percentage of rural population 2743 (76.19%) was almost 3.2 times higher than urban population 857 (23.81%). The proportion of uneducated, primary/secondary education and highly educated parents were 791 (21.97%), 1571(43.64%) and 1238 (34.39%) respectively. Most of the study populations were from middle class family about 1746 (48.5%). Most of the participant's 2125 (59.03%) had not adequate knowledge about vaccine and its functions.

**Table-I: Factors associated with rate of vaccination (n=3600):**

Related factors	RU (2450)	RMC (600)	RUET (550)	Total number & percentage %
Sex				
Male	1221	184	493	1898 (52.72%)
Female	1229	416	57	1702 (47.28%)
Place of birth				
Rural	1917	369	457	2743 (76.19%)
Urban	533	231	93	857 (23.81%)
No education	543	71	177	791 (21.97%)
Parent's education				
Primary/secondary level	1274	143	154	1571 (43.64%)
Higher level	633	386	219	1238 (34.39%)
Economic status				
Higher	522	288	129	1037 (28.81%)
Middle	1343	114	289	1746 (48.5%)
Lower	487	198	132	817 (22.69%)
Participant's awareness about vaccine				
Aware	694	414	367	1475 (40.97%)
Not aware	1756	186	183	2125 (59.03%)

Table II illustrates the rate of receiving different vaccines among participants. Out of 3600 study population for bacterial vaccine, rate of Tetanus vaccine was highest in percentage which was 1248 (34.67%). Percentage of other bacterial vaccines like Cholera and ETEC diarrhea, Meningococcal, Pneumococcal and Typhoid vaccination percentages were only 27 (0.75%), 29 (0.81%), 111 (3.08%) and 34(0.94%) respectively. Among viral vaccines, the highest receiving vaccine was Hepatitis B. 2763 (76.75%) students were immune with hepatitis B vaccine. Percentage of Hepatitis A was 337 (9.36%), Rota was 330 (9.17%), Measles Mumps Rubella was 249

(6.92%) and Chicken pox was 83(2.31%). Percentage was below in case of Cervical HPV and Seasona flu vaccine which were 12(0.33%) and 20(0.56%) respectively.

**Table -II: Vaccination schedule for recommended vaccines in study population (n=3600):**

Vaccine name	Total number of vaccine recipient with percentage (n) and %	Doses (D)	RU(2450)+RMC (600)+RUET(550)= 3600			
			Early	Timely	Delayed	Missed dose
Bacterial vaccine						
Cholera and ETEC diarrhea	27(0.75%)	D-1		27(0.75%)		
		D-2		26(0.72%)		1(0.03%)
		D-3		21(0.58%)		6(0.17%)
		D-4	1(0.03%)	14(0.39%)		12(0.33%)
Meningococcal	29(0.81%)	Single		29(0.81%)		
Pneumococcal	111(3.08%)	Single		111(3.08%)		
Tetanus	1248(34.67%)	D-1		1248(34.67%)		
		D-2		1248(34.67%)		
		D-3	3(0.08%)	1124(31.22%)		121(3.36%)
		D-4	2(0.06%)	1055(29.31%)		201(5.58%)
		D-5		982(27.28%)	253(7.03%)	13(0.36%)
Typhoid	34(0.94%)	3 yearly		34(0.94%)		
Viral vaccine						
Chicken pox	83(2.31%)	D-1		83(2.31%)		
		D-2		83(2.31%)		
Cervical HPV	12(0.33%)	D-1		12(0.33%)		
		D-2		9(0.25%)		3(0.08%)
		D-3		5(0.14%)		7(0.19%)
Hepatitis A	337(9.36%)	D-1		337(9.36%)		
		D-2	1(0.03%)	275(7.64%)		58(1.61%)
Hepatitis B	2763(76.75%)	D-1		2763(76.75%)		
		D-2		2763(76.75%)		
		D-3	1(0.03%)	1554(43.17%)		234(6.5%)
		D-4		1603(44.53%)	166(4.61%)	20(0.56%)
Measles Mumps Rubella	249(6.92%)	D-1		146(4.06%)		
		D-2		146(4.06%)		
Rota viral	330(9.17%)	D-1		181(5.03%)		
		D-2		181(5.03%)		
Seasonal flu	20(0.56%)	Yearly		9(0.25%)		11(0.31%)

Out of total 3600 students, only 27 (0.75%) students were vaccinated with Cholera and ETEC diarrhea vaccine whereas after receiving first dose, timely vaccination was performed in 26 (0.72%), 21 (0.58%) and 14 (0.39%) in dose-2, dose-3 and dose-4 respectively, however, there was history of delayed vaccination in 1 (0.03%), 6 (0.17%) and 12 (0.33%) in dose-2, dose-3 and dose-4. At the same time in case of receiving dose-4 early vaccine was performed in 1(0.03%) student. Single-dose-bacterial-vaccine; Meningococcal and Pneumococcal were taken by 29 (0.81%) and 111 (3.08%) participants respectively. At the same time every 3-year-Typhoid-vaccine was received by 34 (0.94%) participants. In case of Tetanus vaccine the proportion students who had received 1st dose of vaccination was 1248 (34.67%). Timely vaccination rate was 1248 (34.67%), 1124 (31.22%), 1055 (29.31%) and 982 (27.28%) population in 2nd, 3rd, 4th and 5th dose respectively. However there was history of 121 (3.36%), 201 (5.58%) and 253 (7.03%) delayed vaccination in 3rd, 4th and 5th doses respectively. Just as early vaccination was also reported 3 (0.08%) in 3rd dose and 2 (0.06%) in 4th dose vaccination. In case of 5th dose about 13 (0.36%) participant failed to receive their scheduled vaccines. Viral-vaccine; Chicken pox had received by 83 (2.31%) participant and all took their 2nd dose of vaccine timely. Similarly Measles Mumps Rubella vaccine had taken by 146 (4.06%) population and following dose was also received at the schedule time by all. Three-dose- Cervical HPV vaccine recipient rate was only 12 (0.33%). Second dose had taken timely by 9 (0.25%) and delayed rate was 3 (0.08%). Third dose was received in the schedule date by 5 (0.14%) participant however delayed by 7 (0.19%) students.

About 337 (9.36%) of all students were received 1st dose of Hepatitis A vaccine. During the second dose schedule time early recipient rate was 1(0.03%), timely recipient rate was 275 (7.64%) and delayed recipient rate was 58 (1.61%). The highest received vaccine was Hepatitis B. Approximately 2763(76.75%) students had history of hepatitis B vaccination. Following dose was taken in the schedule date by all participants. At the time of dose, three 1(0.03%) had early vaccination history, 1554 (43.17%) took timely and 234 (6.5%) received delayed vaccine. Fourth dose timely recipient rate was 1603 (44.53%) whereas 166 (4.61%) had delayed vaccination and about 20 (0.56%) failed to receive the scheduled vaccine.

Two-dose-Rota-vaccine was received by 181 (9.17%) participant in their schedule time. Seasonal flu vaccine was received by 20 (0.56%) participant, out of that only 9 (0.25%) continued their yearly vaccination nonetheless 11 (0.31%) didn't continue this yearly vaccine as schedule.

#### Discussion:

Vaccination is the most effective interventions for preventing and lowering the burden of disease. Nonetheless, faulty and incomplete vaccination is a crucial problem for our country.

A number of factors were associated with the failure of the vaccination schedule in this study. Parents' education, economic status and awareness about vaccine were the most significant influencing factors. In this study, parents' education was significantly associated with the failure of timely vaccination. Who had no formal education, had completed a primary or secondary level of education were more likely to have failed to receive multi-dose vaccines as compared with who had completed a higher level of education. Similar patterns have been observed; parents with a lower educational level<sup>8,9,10</sup> were less likely to utilize immunization services<sup>11,12,13</sup>.

Our results demonstrated that the financial status acted as an influencing factor for the failure of timely multi-dose vaccines (Cholera and ETEC diarrhea, cervical HPV, hepatitis A, hepatitis B), however, such failures were not observed in single-dose vaccines such as Meningococcal and pneumococcal vaccine. Similarly, more expensive vaccines like diarrhea, meningococcal, pneumococcal, typhoid, cervical HPV, Rota and seasonal flu vaccines were significantly more likely to be at higher risk of failing to receive. Only 0.75%, 0.81%, 3.08% 0.94%, 0.33%, 9.17% and 0.56% people had history of receiving those vaccines respectively. However, such relationship was not observed in tetanus vaccine which is a low cost vaccine.

It was observed that 0.36%, 0.56% and 0.31% didn't complete their vaccination schedule for Tetanus, Hepatitis B and seasonal flu vaccine respectively. Awareness about vaccine and diseases were another critical issue for utilization of vaccination services. Who was not aware about the relationship between vaccine and diseases were

significantly more likely to have failed to receive multi-dose vaccines.

In case of multi-dose-vaccines, early vaccination was noted for Cholera and ETEC diarrhea, Tetanus, Hepatitis A and Hepatitis B. Delayed vaccination was reported for most of the multi dose vaccines. Early vaccination may cause failure to produce proper protective antibody response against diseases<sup>14,15,16</sup>. Whereas delayed<sup>17, 18</sup> and missed vaccination takes longer and inappropriate production of antibody<sup>19, 20, 21</sup>. Although small percentage of people received early vaccine than delayed vaccine however both are considered as inappropriate.

#### Conclusion:

Although Expanded Programme of Immunization (EPI) is one of the most vital and successful interventions of government in Bangladesh, and contributing significantly to reduce mortality and morbidity from vaccine preventable diseases, however, people are still not aware of other non EPI bacterial and viral vaccines which can protect people from life threatening diseases and their complications. Increasing of peoples' awareness of vaccines should increase the rate of vaccine-coverage and protect people from unusual health hazards.

**Conflict of Interest:** None.

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