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Factors affecting acceptance of complete immunization coverage of children under five years in rural Bangladesh

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Abstract

Objective. This article establishes the hypothesis that predisposing, enabling and household needs influence the complete vaccination status of children. **Material and Methods**. Data from the 2004 Bangladesh Demographic and Health Survey (N= 3530) was used. The data was analyzed using descriptive and multiple logistic regression methods. **Results**. Approximately 60% of the children in rural Bangladesh were fully immunized. The full vaccination rate increased with an increase in the previous birth interval and the education level of the mother. Women with the highest wealth index were significantly more likely to fully immunize their children. Distance from health facility, parity, mother's age, mass media, children's sex and tetanus toxoid injection were also significantly positively associated with full vaccination. **Conclusions**. Findings reflect that, irrespective of need, only children from higher economic or educational groups can afford to be fully vaccinated in rural Bangladesh. In other words, predisposing, enabling and need factors appear to have a strong association with full immunization coverage

Key words: immunization; logistic regression; Bangladesh

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Factores que influyen en la aceptación de la cobertura de vacunación completa entre los niños menores de cinco años de edad en zonas rurales de Bangladesh
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Resumen

Objetivo. Establecer la hipótesis de que los predisponentes, los facilitadores y los factores de necesidad de los hogares influyen en el estado de vacunación completa de los niños. **Material y métodos.** Se utilizaron los datos de Bangladesh Demographic and Health Survey de 2004 (N= 3530). Es un estudio descriptivo en el que se utilizó el método de regresión logística múltiple para el análisis de datos. **Resultados**. Aproximadamente 60% de los niños estaban completamente inmunizados en zonas rurales de Bangladesh. La tasa de vacunación completa aumentó con un incremento en el intervalo de los nacimientos anteriores y el nivel educativo de la madre. Las mujeres con mejor nivel económico muestran un índice significativamente más alto de probabilidad en el hecho de haber administrado todas las vacunas a sus hijos. La distancia del centro de salud, la paridad, la edad materna, los medios de comunicación, el sexo del niño y la inyección de toxoide tetánico también fueron significativamente asociados de forma positiva con la vacunación completa. **Conclusiones**. Los resultados reflejan que, independientemente de su necesidad, sólo los niños de los grupos económicos o educativos más altos pueden tener mayores posibilidades de tener el esquema de vacunación completo en zonas rurales de Bangladesh. En otras palabras, los predisponentes, los facilitadores y los factores de necesidad parecen tener una fuerte asociación con la cobertura de inmunización completa.

Palabras clave: inmunización; regresión logística; Bangladesh

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Survival is an enormous challenge for children younger than five years old, especially for those under one year.[1] Immunization is perhaps one of the most effective and efficient ways of protecting the health of children and women worldwide against some of the most lethal and debilitating diseases in modern times. Nevertheless, though the Expanded Program on Immunization (EPI) was formally launched in Bangladesh in 1979, EPI efforts were seriously considered only after 1985 when the country made its commitment at the United Nations to reach universal child immunization by 1990. Due to the continuing concerns and interests of all stakeholders in EPI, the program has had remarkable success in Bangladesh to increase its immunization coverage for children, for at least one dose, from 2% in the mid-1980s to 95% currently.[2] In addition, the valid coverage of fully immunized children (all doses given at correct intervals) increased from 52% in 2001 to 63% in 2003 and to 71% in 2006.[3] Bangladesh prepared three National Plans of Action (NPA) in 1990, 1999 and 2005 to fulfill its commitment to children.

Although Bangladesh has had remarkable success in immunization coverage, a gap still exists between urban and rural areas. Seventy-five percent of the population in Bangladesh lives in the rural area and the majority of the labor force (87%) is employed in the informal economy.[4] According to the 2005 EPI Coverage Evaluation Survey, the full immunization rate with valid doses was 68% in urban areas and 63% in rural areas. In rural Bangladesh, while four out of five children are receiving at least one of the recommended vaccinations, only three in five are being fully immunized. Coverage is lowest for DPT3, polio3 and measles vaccinations.[5] In addition, approximately 1.5 million children remain unprotected, with dropout rates between 20 and 30% and a difference of vaccination likelihood between urban- and rural-born children of roughly 10%.[6] To improve the rate of full immunization coverage, we have to investigate and overcome the reasons for incomplete immunization. To this end, the present paper attempts to identify the factors associated with non-acceptance of full immunization coverage among children in rural Bangladesh.

Material and Methods

Participants

The study described in the present article was based on secondary data from the national 2004 Bangladesh Demographic and Health Survey (BDHS). The sample for this analysis consisted of 3 530 rural children aged 12-59 months, where rural areas of Bangladesh contain more than 70% of the country's total population and 82% of total poor people.[7]

Conceptual framework

The authors used Andersen and Newman's (1973) predisposing-enabling-need (PEN) explanatory model[8-9] to assess the immunization status of the children. Based on the model, utilization of childhood immunization is determined as a function of three sets of individual characteristics: 1) predisposing characteristics (e.g. age, level of education, previous birth interval and health-related attitude), 2) enabling characteristics (i.e. income and other socio-economic factors), and 3) need characteristics (i.e. accessibility, perceived health status and treatment facilities).

Data analysis

Descriptive statistics (percentages) were used to describe the data. Two-way tables were utilized to assess the relationship between dependent and independent variables and the chi-square test was used to observe differences. Bivariate analyses were used to describe the association between independent and dependent variables and a multivariate analysis was used to show the factors affecting outcome variables. To determine which factors were most strongly associated with full immunization status, binary logistic regressions were employed. The logistic model was fitted by considering the relative risk that a woman had fully vaccinated her last child, which was dichotomized by assigning 1 if the respondent fully vaccinated their child and 0 if not. For the logistic regression analysis, all variables were entered in one step and removed from the model according to the tolerance statistic (fitting the model using the "enter" criteria in SPSS for Windows 12.0). Adjusted odds ratios with their 95% confidence intervals (CI) were then calculated. Data were analyzed using SPSS, Version 16.0. A child was considered fully immunized when having received BCG, three doses of DPT and polio and measles. If a child had failed to receive any one of the doses of DPT or polio, or any one of the vaccines, he or she was considered partially immunized, and if a child had not received any one of the vaccines, he or she was considered as not immunized. This study was approved by the Research Review Committee of the University of Rajshahi, Bangladesh.

Results

Vaccination coverage

Table I shows that polio1 has the highest coverage rate in both urban and rural areas. The percentage receiving the DPT vaccine decreases when higher doses are given; this situation is the same in the case of the polio vaccine. The measles vaccine has the lowest coverage rate, with 68% for urban children and 62.4% for rural children, and overall in Bangladesh only 64.1% of children received the measles vaccine. According to our findings, only 61.7% children were fully immunized and 6.1% were not immunized at all, which we undoubtedly consider unsatisfactory. Findings also reveal that a wide gap in vaccination coverage exists between urban and rural areas.

Differentials in childhood vaccination coverage

Next, we investigated the differential impact of predisposing, enabling and need factors for the utilization of childhood immunization (Table II). Significantly, children of mothers aged 20-34 years were more likely to be fully immunized (χ^2= 57.87, p<0.001) than children of younger (age <20 years) and older mothers (age≥35 years). Education showed a positive relationship with child immunization coverage (χ^2=27.79, p<0.001), where 70.1% of children of mothers with higher education were fully immunized compared to 63.0% of those with secondary education and 60.6 and 55.5 % of those with primary and with no education, respectively. In addition, we observed that children of mothers with lower parity were more likely to be fully immunized (χ^2= 67.81, p<0.001) and male children were more likely to be fully immunized than female children (61.6% vs 57.8%, respectively, χ^2=6.008, p<0.05).

Partial immunization coverage is higher for females (34.5%) than for males (32.1%). This is also the case for children with no immunization. The percentage of full immunization coverage increased with longer previous birth intervals (χ^2=26.18, p<0.001). Children of mothers who received sufficient antenatal care (at least five or more antenatal care visits) were significantly more likely to be fully immunized than children of those mothers who received insufficient antenatal care and those who had received no antenatal care (p<0.001). It was also observed that mothers who had received two or more doses of tetanus toxoid (TT) injections (χ^2=268.14, p<0.001) were more likely to fully immunize their children than their counterparts.

With regard to socioeconomic index, 68.3% of children of mothers in the richest index were completely immunized, followed by 63.5, 62.1, 59.9 and 51.4% for the rich, middle, poor and poorest socioeconomic indices, respectively. The difference between mothers with and without paid jobs with regard to full immunization coverage of their children, was roughly 6% (χ2=8.43, p<0.05). The children of mothers whose husbands had good jobs were most likely to be fully immunized (76.0%).

Mass media exposure showed a strong positive relationship with immunization status (χ^2=42.25, p<0.001), with 70.8% of the children of respondents who had mass media exposure (regularly watching TV and listening to radio) having been fully immunized, while non-immunization was found to be higher for children of respondents with no mass media exposure. Of the women who said there was a health facility nearby, 70.1% of children were fully vaccinated compared to 54.8% who said there was no health facility nearby (χ^2=68.89, p<0.001). Children of mothers for whom permission to go to the hospital alone was restricted were less fully immunized than mothers with unrestricted permission. A higher proportion full immunization coverage was found for families receiving visits from a family planning/health worker.

Determinants of full immunization coverage

Results of the multivariate analysis are presented in Table III. The age of mothers remained a significant factor for having a child fully immunized, after adjusting

Table I
Differential in vaccination coverage by place of residence (percentages). Bangladesh 2004 Demographic and Health survey

Residence	*BCG*	*DPT1*	*DPT2*	*DPT3*	*Polio 1*	*Polio 2*	*Polio 3*	*Measles*	*All vaccines*	*No vaccine*
Urban	92.7	92.0	85.3	77.7	95.4	86.5	78.8	68.0	66.0	4.1
Rural	88.9	87.5	79.3	70.7	92.5	80.5	72.3	62.4	59.7	7.0
Total	90.1	88.9	81.2	72.9	93.4	82.4	74.4	64.1	61.7	6.1

Table II

IMMUNIZATION DIFFERENTIAL ACCORDING TO BACKGROUND CHARACTERISTICS. 2004 BANGLADESH DEMOGRAPHIC AND HEALTH SURVEY

Characteristics	*Immunization status of children (percentages)*			χ^2, *diff, p-value*
	Not immunized	*Partially immunized*	*Fully immunized*	
Predisposing factors				
Women's age (years)				57.87,4,<0.001
<20	8.5	43.0	48.6	
20-34	6.4	30.4	63.2	
35+	7.4	29.6	63.1	
Mother's education				27.79,6,<0.001
No education	8.7	35.7	55.5	
Primary education	6.9	32.5	60.6	
Secondary education	4.7	32.3	63.0	
Higher education	6.7	23.1	70.1	
Parity				67.81,4,<0.001
1	4.4	27.4	68.2	
2	7.7	42.0	50.3	
3+	15.7	36.1	48.2	
Sex of child				6.008,2,<0.05
Male	6.3	32.1	61.6	
Female	7.7	34.5	57.8	
Wanted last child				1.209,2,>0.05
Yes	7.1	32.7	60.2	
No	6.8	34.6	58.6	
Preceding birth interval				26.18,4,<0.001
0-23 months	8.9	35.1	56.0	
24-47 months	9.0	35.1	55.9	
48+ months	5.2	29.6	65.2	
Antenatal care				41.21,4,<0.001
No care	8.6	36.5	55.0	
Sufficient	5.5	31.0	70.9	
Insufficient	4.7	24.4	63.5	
Tetanus injections before birth				268.14,4,<0.001
None	15.5	49.6	34.9	
One dose	9.9	39.3	50.8	
Two or more doses	4.0	27.3	68.7	
Enabling factors				
Wealth index				46.53,8,<0.001
Poorest	9.4	39.2	51.4	
Poor	7.2	32.8	59.9	
Middle	6.3	31.6	62.1	
Rich	5.8	30.7	63.5	
Richest	4.3	27.4	68.3	
Occupation				8.43,2,<0.05
Paid job	4.2	30.5	65.3	
Unpaid	7.4	33.7	59.0	
Husband 's occupation				12.586,6,>0.05
Manual worker	6.7	34.6	58.7	
Agriculture/self-employed	9.1	25.0	65.9	
Professional/technical/managerial	7.0	14.0	76.0	
Other	10.0	33.2	59.7	
Frequency of mass media exposure				42.25,4,<0.001
Regular	2.6	26.6	70.8	
Irregular	5.6	31.8	62.6	
None at all	9.5	36.2	54.3	
Need factors				
Distance from health facility				68.89,2,<0.001
<1 km	3.6	26.3	70.1	
≥1 km	8.2	37.0	54.8	
Permission to go to the health center alone				3.29, 2,>0.05
Unrestricted	7.0	30.2	62.8	
Restricted	7.0	33.9	59.1	
Visits by family planning/gov't. health worker				41.23,2,<0.05
Yes	5.2	29.9	64.9	
No	7.1	33.5	59.4	

Table III

Logistic regression analysis of children's full immunization status. 2004 Bangladesh Demographic and Health survey

Characteristics	Response	Unadjusted OR	Unadjusted 95% CI	Adjusted OR	Adjusted 95% CI
Predisposing factors					
Women's age (years)	<20®	1.00	–	1.00	–
	20-34	1.820[a]	1.552, 2.135	2.919[a]	1.997, 4.258
	35+	1.808[a]	1.410, 2.318	2.518[a]	1.867, 3.398
Mother's education	No education®	1.00	–	1.00	–
	Primary education	1.230[c]	1.047, 1.446	1.132	0.958, 1.448
	Secondary education	1.362[a]	1.148, 1.615	1.109	0.848, 1.450
	Higher education	1.880[b]	1.278, 2.764	1.178[b]	0.599, 0.866
Parity	1®	1.00	–	1.00	–
	2	0.472[a]	0.406, 0.549	0.417[a]	0.340, 0.511
	3+	0.434[a]	0.353, 0.532	0.307[a]	0.231, 0.408
Sex of child	Male®	1.00	–	1.00	–
	Female	0.855[c]	0.748, 0.979	0.804[c]	0.678, 0.954
Preceding birth interval	0-23 months®	1.00	–	1.00	–
	24-47 months	0.995	0.789, 1.255	0.855	0.663, 1.102
	48+ months	1.471[c]	1.157, 1.870	1.711[c]	1.536, 2.944
Antenatal care	No care®	1.00	–	1.00	–
	Sufficient	1.999[a]	1.485, 2.691	1.365	0.871, 2.138
	Insufficient	1.424[a]	1.238, 1.68	1.129	0936, 1.362
Tetanus injections before birth	None®	1.00	–	1.00	–
	One dose	1.929[a]	1.537, 2.423	1.968[a]	1.512, 2.561
	Two or more doses	4.088[a]	3.361, 4.972	4.228[a]	3.346, 5.344
Enabling factors					
Wealth index	Poorest®	1.00	–	1.00	–
	Poorer	1.413[c]	1.162, 1.718	1.467[b]	1.015, 1.865
	Middle	1.549[a]	1.278, 1.876	1.208	0.932, 1.565
	Richer	1.643[a]	1.346, 2.006	1.212	0.911, 1.613
	Richest	2.032[a]	1.569, 2.633	1.472[a]	1.154, 2.153
Occupation	Paid job®	1.00	–	1.00	–
	Non-paid	1.306[c]	1.051, 1.623	1.119	0.864, 1.450
Frequency of mass media exposure	None®	1.00	–	1.00	–
	Irregular	1.413[a]	1.229, 1.625	1.153	0.957, 1.391
	Regular	2.041[a]	1.420, 2.935	1.546[b]	1.707, 2.881
Need factors					
Distance from health facility	<1 km®				
	≥1 km				
Permission to go to the health center alone	Unrestricted®	1.00	–	1.00	–
	Restricted	0.855	0.712, 1.024	0.921	0.736, 1.151
Visits by family planning/gov't. health worker	No®	1.00	–	1.00	–
	Yes	1.268	0.959, 1.676	1.237	0.864, 1.770

Note: ®=Reference category and a, b and c indicate $p<0.001$ (highly significant), $p<0.01$ (significant) and $p<0.05$ (less significant), respectively

for other variables, with an approximately threefold difference in adjusted odds ratios between the youngest and middle age groups. Respondents who had primary, secondary and higher education were more likely to fully immunize their children than those with no education (adjusted odds ratio 1.132, 1.109 and 1.178, respectively).

Parity and child's sex were shown to be major confounders for full immunization coverage. Previous birth interval (≥48 months) remained a significant independent factor for complete immunization coverage (adjusted odds ratio 1.711, 95% CI 1.536, 2.944). The unadjusted odds for full immunization were significantly higher when the mothers received sufficient antenatal care (unadjusted odds ratio 1.999, 95% CI 1.485, 2.691), but this significance was lost in the adjusted model. Full immunization was significantly associated with mothers receiving TT injections, after adjusting for potential confounding factors. This association was strengthened as the number of doses increased. Women in the richest category were 1.472 times more likely to fully immunize their children (95% CI 1.154, 2.153) than women in the poorest wealth index. Full immunization coverage was higher for children of mothers with paid jobs than for those whose mothers were engaged in unpaid jobs. However, this factor remained insignificant after adjustment for other variables. Respondents having mass media exposure (regularly watching TV and listening to radio) were more likely to fully immunize their children than mothers who had no exposure (adjusted odds ratio 1.546, 95% CI 1.707, 2.881). Women who said that there was a health facility nearby (<1 km) were more likely to fully immunize their children than those who said there was no health facility nearby (adjusted odds ratio 2.11, 95% CI 1.465, 2.561). Women whose permission to go to the hospital alone was restricted were less likely to fully immunize their children than those for whom permission was unrestricted. Visits from family planning/health workers were associated with an increase in full immunization coverage. However, neither of the above two variables show any significant effect on immunization status of the child.

Discussion

In this paper, we have examined a number of predisposing, enabling and need factors that influence the acceptance of complete vaccination coverage for children younger than five years of age in rural Bangladesh. The study highlighted an inadequate full immunization coverage in Bangladesh. Approximately 62% of children under age five were fully immunized in Bangladesh and substantial differences in complete vaccination rates were found for children in urban and rural areas (around 6%). This is probably partly due to the general distribution of healthcare facilities in the country, which tends to disproportionately favor urban areas. It may also be attributed to the lack of awareness of the importance of vaccination among mothers in rural areas in comparison to those in urban areas.

The results from both bivariate and multivariate analyses confirmed the importance of maternal education for the acceptance of complete vaccination, which is consistent with findings from other studies.[10,11] Maternal education may also act as a proxy variable for a number of background variables that reflect a woman's higher socio-economic status, thus enabling her to seek proper medical care for her child when necessary.

It is well recognized that age plays an important role in women's utilization of medical services.[12] Maternal age may sometimes serve as a proxy for the women's accumulated knowledge of healthcare services, which may have a positive influence on acceptance of full immunization of children. Results of bivariate and multivariate analyses showed that mothers in the middle age group were more likely to fully immunize their children than the youngest and oldest age groups. This may be due to the development of modern medicine and the improvement in educational opportunities available to women in recent years, whereby women in the middle age group might have more knowledge about modern healthcare services and value modern medicine more than the older women.

Distance from a health facility was found to be a significant predicator of full immunization. The women who reported having a health facility nearby (<1 km) were more likely to fully immunize their children than those who said there was no health facility nearby. Other studies in developing countries have also suggested that walking or traveling time and distance are key factors that influence the utilization of healthcare services.[13,14] It has also been shown that wealth index has a positive effect on the acceptance of full immunization. Mothers from wealthy families are expected to seek modern/medical health services for their families whenever necessary.[15] The results of the present study also support the hypothesis that women with a higher economical status were more likely to fully immunize their children than poorer counterparts.

Having more children may cause resource constraints, which has a negative effect on healthcare utilization.[16, 17] The study showed that mothers with greater parity were less likely to immunize their children. Sex discrimination against female children was

also seen in child immunization in rural Bangladesh. The study revealed that male children were more likely to be fully immunized than females. Mothers having received TT injection was also found to be one of the significant predictors of full immunization coverage for children.

Based on bivariate analysis, women's occupation and antenatal care were found to be significantly associated with the acceptance of full immunization coverage. Women engaged in paid jobs are usually more educated and aware of the health of their family members and therefore know the harmful effects of non-immunization.[18] It was expected that antenatal care visits would have a positive impact on immunization coverage of children,[19] and the present study found that 70.9% mothers who received sufficient antenatal care fully immunized their children, compared to 55.0% of mothers who did not receive antenatal care. In addition, mass media has a positive effect on a child's immunization status. In recent years, a number of governmental and non-governmental organizations have expanded their maternal and child health-related programs on television, radio, and newspapers, likely having increased mothers' knowledge about immunization.

Despite the increase in healthcare services and launching various programs in Bangladesh, full immunization coverage for children younger than five is currently still highly inadequate. That respondents who had higher levels of education, mothers who engaged in paid jobs and with the richest socieoeconomic level, those having mass media access, who received TT vaccines, and who had sufficient antenatal care were more likely to fully immunize their children reflects the reality that only people from a higher economic or educational group can afford to seek healthcare for their child, irrespective of need. The study therefore concludes that in order to achieve 100% immunization coverage in Bangladesh, (i) government should ensure the availability of health care centers that provide immunization, especially in the rural area; (ii) sufficient education should be provided to rural women, which will encourage them to seek immunization at the appropriate age of the child; (iii) parents should be encouraged to have small families by using contraception; (iv) maternal health care centers should be available to provide antenatal care; and (vi) mass media promotion programs should be undertaken so that parents understand the beneficial effect of immunization coverage and to encourage them to fully immunize their children.

References

1. Chowdhury AMR, Aziz KMA, Bhuiya A. The 'near miracle' revisited: social science perspectives of the immunization program in Bangladesh. Amsterdam: Het Spinhuis, 1999:138.
2. Expanded Program on Immunization (EPI). National Coverage Evaluation Survey Report. Dhaka: Ministry of Health and Family Welfare, 2000.
3. Expanded Program on Immunization (EPI). National Coverage Evaluation Survey Report. Dhaka: Ministry of Health and Family Welfare, 2006.
4. National Institute of Population Research and Training (NIPORT). Bangladesh Demographic and Health Survey 1999-2000. Dhaka: Mitra and Associates, ORC Macro, 2001.
5. Jamil K, Bhuiya A, Streatfield K, Chakrabarty N. The immunization program in Bangladesh: impressive gains in coverage, but gaps remain. Health Policy and Planning 2005;14(1):49-58.
6. Uddin J, Ashraf A, Sirajuddin AKM, Alam M, Tunon C. Incorporation of community's voice into Health and Population Sector Program of Bangladesh for its transparency and accountability. Dhaka: ICDDR, B, 2001:Working Paper No 148.
7. Bangladesh Bureau of Statistics (BBS). Report of the household income and expenditure survey 2000. Bangladesh: Statistics Division, Ministry of Planning, Government Republic of Bangladesh, 2003.
8. Dutton D. Financial, organizational and professional factors affecting health care utilization. Social Sciences and Medicine 1986;23(7):721-735.
9. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. Milbank Memorial Fund Quarterly 1973; 81:95-123.
10. Phukan RK, Barman MP, Mahanta J. Factors associated with immunization coverage of children in Assam, India: over the first year of life. Journal of Tropical Pediatrics 2008;1.
11. Ibnouf AH, Van den Borne HW, Maarse JAM. Factors influencing immunization coverage among children under five years of age in Khartoum State, Sudan. South African Journal of Family Practice 2007;49(8).
12. Fosu GB. Childhood morbidity and health services utilization: cross-national comparisons of user-related factors from DHS data. Social Science and Medicine 1994;38:1209-1220.
13 Muller J, Smith T, Mellor S, Rare L, Genton B. The effects of distance from home on attendance at a small rural health centre in Papua New Guinea. International Journal of Epidemiology 1998;27(5):878-884.
14. Wilson JB, Collison AH, Richardson D, Kwofie G, Senah KA, Tinkorang EK. The maternity home waiting concept: the Nsawam, Ghana experience. International Journal of Gynecology and Obstetrics 1997;59(suppl 2):165-172.
15. Gwatkin DR. Health inequalities and the health of the poor: What do you know? What can we do? Bull World Health Organ 2000;78(1):3-18.
16. Bhatia JC. Levels and causes of maternal mortality in Southern India. Studies in Family Planning 1992;24:310-318.
17. Pebley AR, Goldman N, Rodriguez G.Prenatal and delivery care and childhood immunization in Guatemala: do family and community matter? Demography 1996;33:231-247.
18. Chowdhury MR, Bhuiya A, Simeen Mahmud S, Salam AKMA, Karim F. Immunization divide: Who do get vaccinated in Bangladesh? Journal of Health, Population and Nutrition 2003;21(3):193-204.
19. Hemat S, Takano T, Kizuki M, Mashal T. Health-care provision factors associated with child immunization coverage in a city centre and a rural area in Kabul, Afghanistan. Vaccine 2009;11:27(21):2823-2829.