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Children aged 12–59 months missed through the National Vitamin A Capsule Distribution Program in Bangladesh: findings of the Nutritional Surveillance Project*

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Abstract. From January 1990 to December 2006, Helen Keller International implemented the Nutritional Surveillance Project (NSP) in Bangladesh, which has been used to conduct regular surveillance and special surveys to provide information on health and nutritional status of children and mothers, and report on the coverage and impact of nutrition and health programs in Bangladesh. The Government of Bangladesh (GOB) distributes vitamin A Capsule (VAC) among children aged 12–59 months biannually. The NSP data was analyzed to assess VAC coverage and to explore which children were less likely to receive a VAC in order to help GOB identify necessary modifications aimed at higher coverage of VAC among all eligible children. Results showed that coverage among girls and boys was not different (P=0.970). However, coverage was consistently lower among children aged 12-23 months compared to older children (24–59 months) ($P \leq 0.001$) in each of the distribution rounds. Coverage among children from poorer households was lower than among children from wealthiest households ($P<0.001$), with the extent of this difference varying by round. Coverage was significantly higher if households had had contact with a government health assistant in the last month ($P<0.001$); and among households who owned a radio or a TV compared to those who did not. The VAC distribution campaign needs to be strengthened to cover the children who are currently not reached; especially younger children, children living in underserved regions, children from poorer households and from households with less contact with health service providers or mass media.

Keywords. Vitamin A capsule, coverage, preschool children, non-recipient, nutritional surveillance, Bangladesh

1 Introduction

The Nutritional Surveillance Project (NSP), a recognized system for high quality data and information outputs (Chopra et al., 2004) operated in Bangladesh from 1990 through 2006 to fill the data need and stimulate discussions to guide national and international policy and program decisions regarding malnutrition and micronutrient deficiency. Over the 16 year period of the NSP, it broadened its scope of indicators, from monitoring the impact of disasters into an expanded health and nutrition surveillance system (Bloem et al., 2003). Besides expanding the indicators, the NSP strengthened its statistical power to examine health and nutrition status and its association with socio-economic factors; and expanded its geographical coverage by including the Chittagong Hill Tracts (CHT) since 2003. By maintaining the high quality of data and information outputs, the NSP established an exemplary system amidst calls for strengthened monitoring and evaluation to ensure effective programs in the country. Findings of the NSP have been disseminated through freely-distributed bulletins and reports, in print and online, and have been published in various forms, including peer-reviewed

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articles and books to guide program planning and policy development at national and local level.

The NSP has proven to be a flexible system that can be adapted to conduct special surveys. The NSP data on vitamin A capsule (VAC) coverage is considered a reliable source that helps to validate other survey findings, which are often generated from less reliable service data (Helen Keller International, 1998). The NSP has shared relevant data on VAC coverage for children in Bangladesh with concerned organizations either for a particular round of distribution or for a particular geographical area of interest. Following a request from UNICEF, a special analysis was undertaken of the NSP data aimed at looking into the characteristics of those children who did not receive VAC, the results of which are presented here. UNICEF used the information to focus their support to the Government of Bangladesh (GOB) on special strategies to reach those children who do not receive VAC and are at greater risk of vitamin A deficiency.

The effect of vitamin A supplementation (VAS) to reduce child mortality by 23% is well documented (Beaton et al., 1993). Under-five mortality rates above 50 for any country suggest a vitamin A deficiency (VAD) public health problem (Sommer and Davidson, 2002), including Bangladesh with a high under-five mortality rate (88/1000 live births) (NIPORT, Mitra and Associates, and ORC Macro, 2005). Although data in the NSP 2005 Annual Report showed that the current prevalence of night blindness in Bangladesh is below 1% (the WHO cut-off for considering VAD a public health problem) (Helen Keller International and Institute of Public Health Nutrition, 2006), night blindness is only the tip of the iceberg of VAD symptoms. Many more children who do not show this specific clinical sign are suffering from increased disease duration and severity and are at higher risk of death due to VAD (West, 2002). Children in Bangladesh are at high risk of VAD due to limited access to vitamin A (VA) rich foods, especially animal source foods (Akhter et al., 2006; Ahmed, 1999), high prevalence of infectious diseases; and frequent disasters further aggravate the situation (Torlesse et al., 2003). Therefore, in order to reduce morbidity and mortality and keep the national prevalence of night blindness below 1%, universal VAC coverage every six months is essential.

Since VAS had been given via the National Immunization Days (NIDs) against polio and these were being phased out, in 2003, the GOB implemented a new strategy, the National Vitamin A Plus Campaign (NVAC), with an objective to maintain high VAC coverage. From 2003 to 2005, the national VAC coverage among children aged 12–59 months remained as high as 80% (Fig. 1). Data at divisional level, however, showed divergence: notably coverage in 2004–2005 of VAC in the CHT was below 70%. In most other divisions, the proportion of non-VAC recipients varied between 10–20%. To reach all children aged 12–59 months with supplements, special strategies might be needed. It is therefore, important to describe the children that are not reached in terms of their family's socio-economic characteristics, and living conditions in order to design these special strategies.

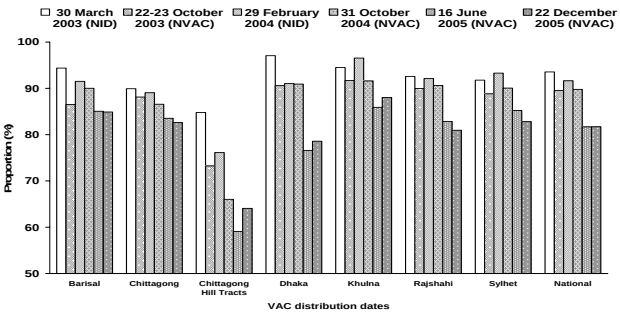

Figure 1. Coverage of VAC supplementation among 12–59 months of children on NIDs/NVACs in the rural Divisions and the Chittagong Hill Tracts and the nationwide coverage in rural areas by VAC distribution dates in 2003–2005, (National n=9305–9719/ distribution rounds).

2 Equipment and methods

The data were collected between 2003 and 2006 through the NSP of Helen Keller International in collaboration with the GOB's Institute of Public Health Nutrition (IPHN) through a household survey. Mothers or caregiver of child were asked whether their eligible children had received a VAC in the last 6 months. Data collectors used a flash card to help the respondents recall VAC receipt. Every year, the NSP conducted six rounds of data collection on a two-monthly basis. In each of the six rounds of the NSP, cross-sectional data collection included 15 000 households with children under-five years; annually this equals 90 000 households. This analysis selected eligible children (12–59 months at the time of distribution) to assess VAC coverage, and explored which children were less likely to receive a VAC in rural Bangladesh. Given the high coverage of VAC among children in Bangladesh, the non recipient would be a small group and a large enough sample is needed to examine the association of factors with VAC coverage. The strength of NSP is that it is a large data set that allows examining such a relationship, even after excluding the non-eligible children.

Data collected in rural Bangladesh between April–May 2003 and February–March 2006 were analyzed to assess VAC coverage among children aged 12–59 months. Analysis were performed on six bimonthly data-collection rounds that directly followed each of the six specific NID and NVAC (VAC – distribution coupled with NID and National Vitamin A Plus Campaign, respectively) distribution dates. The 6–11 months age group is also eligible for VAC supplementation (Helen Keller International and Institute of Public Health Nutriton, 2004) but as they are reached through a different distribution channel (measles immunization) the 6–11 months age group is not included in the analysis presented in this paper.

Table 1. Characteristics of surveyed population.

Indicators		Proportion/Median (*n*)
Child sex (%)	Male	51.8 (24457)
	Female	48.2 (22829)
Child age at VAC receipt, months (%)	12–23	27.5 (12975)
	24–35	28.0 (13432)
	36–47	26.6 (12535)
	48–59	17.9 (8344)
Maternal age, years (%)	<20	4.4 (1944)
	21–35	85.7 (40419)
	36–45	9.6 (4723)
	>45	0.4 (200)
Maternal education, years (%)	Non-educated	44.1 (22153)
	Primary (1–5 years)	27.3 (13094)
	Secondary (6–10 years)	25.8 (10954)
	Higher secondary and above (11 and above years)	2.8 (1085)
Family size (median)		5 (47286)
Division (%)	Barisal	13.8 (6536)
	Chittagong	15.2 (7118)
	Dhaka	14.0 (6622)
	Khulna	13.2 (6261)
	Rajshahi	13.7 (6249)
	Sylhet	15.3 (7235)
	Chittagong Hill tracts	14.8 (6994)
Per capita monthly household total expenditure (median, taka)		563.2 (47286)
Ownership of Radio (%)		26.0 (47286)
Ownership of TV (%)		19.0 (47286)
NGO membership (%)		35.3 (47283)
Households visited by Government Family Welfare Assistant in the previous month of interview (%)		40.8 (47283)
Households visited by Government Health Assistant in the previous month of interview (%)		49.3 (47283)

Coverage for six distribution rounds in 2003–2005 was calculated among 59 374 children (12–59 months) who were eligible to receive a VAC at the distribution date. Analysis of 2003–2005 data pertaining to the first five VAC distribution rounds (excluding data collected in 2006 following 2005 December distribution round) collected from 47 286 children aged 12–59 months, explored the association of VAC receipt with child and household level characteristics. Households were ranked according to their total monthly expenditure per capita and then divided into five groups with equal numbers of households (expenditure quintiles). The first quintile includes the poorest, the fifth the wealthiest households.

Statistical analyses were performed using SPSS 11.5 (SPSS Inc. Chicago, IL). Results are expressed as percentages and 95% confidence intervals where appropriate. Differences between groups were examined using χ2-test for categorical variables, and Mann-Whitney U test for continuous variables with non-normal distribution. Multivariate logistic regression was performed to examine the association of factors with receipt of VAC in the last six months. Variables showing significant association in univariate analyses were included in the multivariate models. A P-value <0.05 was considered to be statistically significant.

3 Results

Table 1 represents demographic and other characteristics of the surveyed population. Overall 89.2% of the surveyed rural Bangladeshi children received a VAC in 2003–2005 VAC distribution rounds.

3.1 Factors associated with VAC receipt

The proportion of girls and boys receiving VAC in five consecutive rounds in 2003–2005 were (93.6% vs. 93.5%, 89.1% vs. 90.0%, 92.3% vs. 91.0%, 89.8% vs. 89.7%, 81.5% vs. 81.9%), and was similar among girls and boys in all rounds (*P*=0.634 0.077, 0.446, 0.969, and 0.317 respectively).

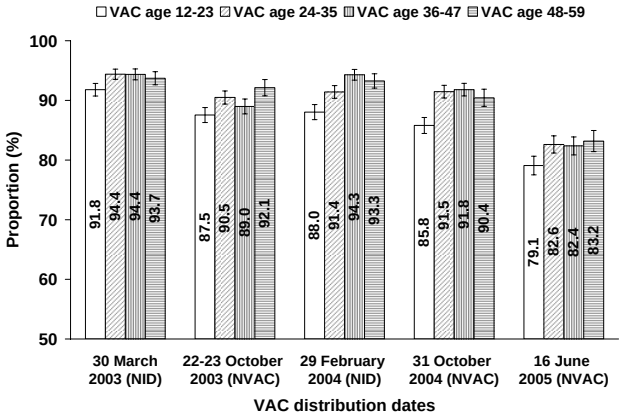

Figure 2. Coverage of VAC in rural Bangladesh between March 2003 and June 2005 distribution rounds among children aged 12–59 months by age group (n=2536–2549, 2638–2765, 2422–2582, 1499–1874/ distribution date for 12–23 months, 24–35 months, 36–47 months, and 48–59 months respectively). Error bars represent 95% confidence interval.

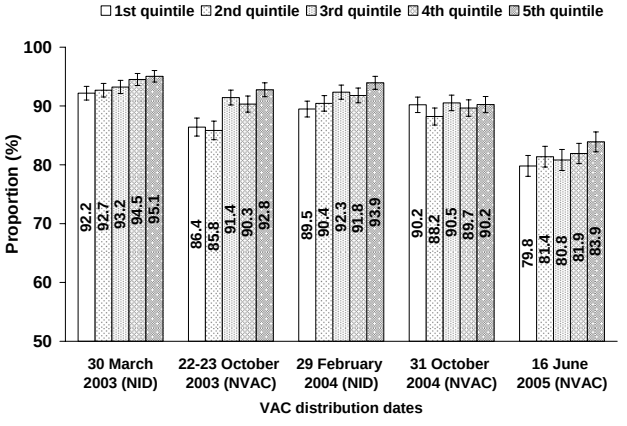

Figure 3. VAC coverage among children aged 12–59 months in rural Bangladesh in March 2003–June 2005 VAC distribution rounds by expenditure quintiles (n=9719, 9305, 9416, 9416, 9431 for March 2003–June 2005 distribution rounds respectively). Error bars represent 95% confidence interval.

However, coverage was significantly lower among children aged 12–23 month at the time of VAC distribution compared with older children (24–59 months) (P<0.001) (Fig. 2).

Figure 3 shows the proportion of children receiving VAC for distribution rounds in 2003–2005 by expenditure quintiles. Coverage among children from poorer households (1st and 2nd quintiles[a]) was significantly lower than among children living in the wealthiest households (5th quintile), with the extent of the difference varying by round (P<0.001).

Coverage also varied significantly between households' access to media as reflected by who owned or did not own a radio or TV, with a 3–7% higher coverage among households who owned a radio or TV, compared to those who did not.

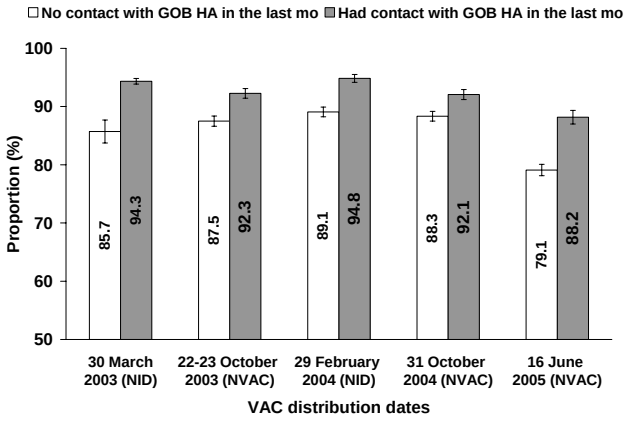

Figure 4. VAC coverage among children aged 12–59 months in rural Bangladesh in households who had (n=2382–3989) and had not any contact (n=5730–7049) with the government Health Assistant in March 2003–June 2005 VAC distribution rounds (all P<0.001). Error bars represent 95% confidence interval.

Coverage did not vary between children of households involved in NGO activities or not (89.4% non-member, 88.4% NGO-member, P=0.05), but VAC coverage was significantly higher among children of households that were in contact with a Government Health Assistant in the last month or a GOB Family Welfare Assistant (Fig. 4).

Multivariate model, adjusted for child level and other factors showed that children living in the Chittagong Hill Tracts had a lower odds of receiving VAC compared with other divisions. Also, children of mothers with higher education level were more likely to receive a VAC than those children of mothers with no formal education (Table 2).

4 Discussion

The national VAC coverage among children aged 12–59 months was quite high for all six distribution rounds in 2003–2005 (2003: 93.6%, 89.5%; 2004: 91.6%, 89.8%; 2005: 81.7%, 81.7%) and met the national target of 80%. However coverage varied by region, among age groups of children, by maternal education level, access to media and contact with health workers. Programs can address such gaps to increase coverage further and save the lives of vulnerable children.

4.1 VAC in reducing morbidity and mortality

The effect of vitamin A in averting mortality among under-five children is a proven strategy (Bishai et al., 2005). Acute respiratory illness and diarrhea, common in most developing countries including Bangladesh are two major causes leading to under-five deaths (Wardlaw et al., 2006; Piechulek et al., 2003). The analysis of data presented in this paper found that prevalence of diarrhea in the last seven days was significantly higher among non-recipient children (8.1% vs.

Table 2. Multivariate logistic regression analysis of factors associated with child receipt of a vitamin A capsule in the last six month in Bangladesh between March 2003 and June 2005 VAC distribution rounds.

Characteristic		Adjusted O.R.[1]	95% C.I.	*P*
Division	Barisal	1.00	–	–
	Chittagong	1.14	1.01–1.27	0.028
	Dhaka	1.18	1.05–1.33	0.005
	Khulna	1.74	1.53–1.98	<0.001
	Rajshahi	1.25	1.12–1.41	<0.001
	Sylhet	1.15	1.03–1.29	0.016
	Chittagong Hill Tracts	0.50	0.45–0.55	< 0.001
Age at VAC receipt, months	12–23	1.00	–	–
	24–35	1.37	1.27-1.47	<0.0001
	36–47	1.35	1.25–1.46	<0.0001
	48–59	1.38	1.26–1.50	<0.0001
Maternal age, years	<20	1.00	–	–
	20–35	1.34	1.17–1.52	<0.0001
	36–45	1.36	1.16–1.59	<0.0001
	>45	1.13	0.74–1.71	0.575
Maternal education, years	0	1.00	–	–
	1–5 (primary)	1.25	1.16-1.35	<0.0001
	6–10 (secondary)	1.42	1.42–1.30	<0.0001
	11 and above	1.53	1.21–1.95	<0.0001
Household monthly total expenditure quintiles	1st quintile (Poorest)	1.00	–	–
	2nd quintile	0.96	0.89–1.04	0.361
	3rd quintile	1.04	0.95–1.13	0.355
	4th quintile	1.08	0.99–1.18	0.088
	5th quintile (least poor)	1.17	1.06–1.29	0.001

[1] Adjusted for variables above and data collection rounds, sex of children, and visit of Government health assistant, family welfare assistant in the last month.

6.3%, $P<0.001$). Also diarrhea episodes were longer among VAC non-recipient children (0.42 vs. 0.30 days, $P<0.001$). VAD increases the severity of diseases, especially diarrhea; as was reported by a recent study among Indonesian children (Berger et al., 2007). Earlier data of NSP (Helen Keller International and Institute of Public Health Nutrition, 2006) found that malnutrition peaked at 12–23 months of age. These findings emphasize the need to increase coverage, especially among younger children who are not reached with VAC and are at increased risk of morbidity and mortality. Increased involvement of health providers and religious leaders and use of media and local publicity mediums can play a major role to further increase coverage (Thorne-Lyman et al., 2000).

Mortality is higher among children (The United Nation's Children Fund, 2005) from poor households; and children of poorer households are most in need of VAS as they are more susceptible to VAD because of limited access to VA-rich foods and frequent exposure to illness (Victora et al., 2003). The analysis results found that a significantly higher proportion of children from poorer households had not received a VAC compared to children in the wealthiest households (5th quintile) in almost all the distribution rounds. The coverage was similar among the lowest two quintiles. Similar findings were reported by another study exploring inequalities in use and access of immunization service in Bangladesh (Chowdhury et al., 2003).

4.2 Need for fixed distribution months for VAC supplementation

During 2003–2005, the interval between the VAC distribution rounds for children aged 12–59 months in Bangladesh ranged from 4 to more than 8 months (Box 1). The international recommendation for supplementing children 12–59 months states that children should receive a VAC every four to six months. Results from other studies have shown that in vitamin A deficient populations, the effect of VAC may not even last for six months (Bloem et al., 1995; Gorstein et al., 2003). Therefore, children should receive 2–3 doses annually and the interval between two doses should not be longer than 6 months. The GOB has translated this into a national policy for distributing VAC biannually among children

Box 1. The National Immunization day (NID) & National Vitamin A Plus Campaign (NVAC).

Vitamin A distribution in Bangladesh has been implemented since 1973, while it was distributed door to door until the NID against polio was introduced in 1995. NID's were in place to eradicate polio through administering oral doses of the polio vaccine to all under-five children. Because of its very high coverage, on-site administration of VAC supplementation was piggybacked to the NID's to reach children 12–59 months. However, with polio having virtually come under control, NID's would be discontinued. Therefore, the National Vitamin A Plus Campaign (NVAC) was started in 2003 with an objective to sustain the less than 1% prevalence of night blindness among children aged less than 5 years by using an integrated approach to deliver a package of interventions that include vitamin A supplementation and other health and nutrition services. The National Nutrition Program (NNP) provides financial supports for the capsules since NNP is implemented. UNICEF procures the VAC, while CIDA, MI, UNICEF contribute to the campaign cost. IPHN leads the VAC distribution to rural and urban areas in Bangladesh and implements through GOB administrative units.

VAC distribution date	NID/NVAC	The "Plus" component
30 March 2003	NID (Oral polio vaccine + VAC)	– No additional component
22 October 2003	NVAC (VAC + deworming*)	– Demonstration of salt testing for iodine content in all high schools and raising awareness on iodine deficiency disorders (IDD)
29 February 2004	NID (Oral polio vaccine + VAC)	– No additional component
31 October 2004	NVAC (VAC + deworming*)	– the benefits of breastfeeding, food sources of Vitamin A and importance of immunization and VAS
16 June 2005	NVAC (VAC + deworming*)	– Awareness on exclusive breastfeeding and complementary feeding – Importance of pregnant and lactating mothers diet – Importance of vegetables in diet
22 December 2005	NVAC (VAC + deworming*)	– Awareness on VAC for young children at completion of 9 months of age – VAC for women within 6 weeks of delivery

* Children 12–59 month eligible for VAC and 24–59 months for deworming.

aged 12–59 months, but fixed distribution months are yet to be implemented. In Bangladesh, VAC distribution dates are currently set at national level meetings followed by a number of preparatory meetings with divisional representatives.

Ideally, VAS in Bangladesh should be done each year during the same two specific months, 6 months apart, so that the interval between two rounds would not exceed 6 months, and hence not increase the risk of VAD by extending the period between two doses. Such a scheme is already implemented in many other countries, such as Cambodia, Indonesia (Helen Keller International, 2001), Nepal (Grubesic, 2004), Niger and Tanzania. Fixing the months of VAC distribution will likely increase coverage as well because it will facilitate improved coordination of distribution-related activities at the different administrative levels of rural and urban Bangladesh further in advance, as well as, increase participation of households who will know to bring their children to receive a VAC during that specific month.

5 Conclusions and recommendations

The coverage of VAC among children aged 12–59 months in rural Bangladesh reached the national target of 80% in all rounds between 2003 and 2005. Nevertheless, the VAS campaign needs to be strengthened to also cover the 10–20% of children who are currently not reached, especially the younger children aged 12–23 months, children living in the CHT region, children from households with less contact with health service providers and children from poorer households.

Previous NSP study findings (Thorne-Lyman et al., 2000) have shown that proper use of media as well as local systems, such as using loud-speakers and informing NGOs and Imams at mosques, can increase awareness about VAC distribution dates among caretakers of all eligible children. Since the protective effect of VAC in children is unlikely to be sustained for more than six months (Gorstein et al., 2003), enforcing the strategy of conducting VAC campaigns in two fixed distribution months every year, no more than six months apart, is needed to ensure that children are provided the best protection against VAD disorders and that coverage is further increased. This will also require sustained funding for VAS and regular, timely release of these funds.

The NSP data collected through household surveys provides insights regarding the characteristics of children who do not receive VAC, and such information are valuable to monitor program performance and identify areas to address in the future. Continuous and effective monitoring of VAC coverage at national and regional level is essential to track progress towards reducing under-five mortality in Bangladesh and reaching the Millennium Development Goals.

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