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Research Article

Determinants of Differential Performance of Vitamin A Coverage in India: Evidence from NFHS 3

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Abstract

One of the major obstacles for achieving the MDGs 1and 4 relating to poverty and child mortality is child malnutrition manifested through anaemia and micronutrient deficiencies. According to the NFHS 3 of 2005-06, more than two-third of the children are anaemic while only one-fourth received Vitamin A supplementation at National level.

An attempt was made in this paper to study the socio economic differentials in vitamin A coverage, particularly among children of 12-35 months, in four selected states, two each from high and low performance categories. Results of Multivariate analysis are discussed and some suggestions are provided to enhance Vitamin A coverage.

Introduction

Vitamin A deficiency (VAD) is a major public health problem in many developing countries and India is not an exception with higher levels of both absolute numbers and percentage of children having Vitamin A deficiency despite having the universal Vitamin A supplementation (VAS) programme in place for over last three decades. Millennium Development Goal 4 aims to achieve reduction in child mortality rate by two-thirds? by 2015 and Lancet special series on child survival indicated Vitamin A as a major contributor to higher levels of child mortality (Lancet, 2008). According to WHO, 57% of children below 6 years of age have potential danger from sub-clinical Vitamin A deficiency. This is confirmed in a recent study by National Institute of Nutrition (NIN) that 62% of preschool children have ocular signs of VAD whose serum retinol level was found below 20 ug/dl (microgram per decilitre), a cut-off for sub clinical sign of VAD (Laxmaiah, 2011). National Family Health Survey 3 (2005-06), the biggest national level survey in India that provides information on family health indicated vitamin A supplementation coverage less than half (48%) among children below 6 years of age. State level coverage varied from 8% in Uttar Pradesh to 48% in Kerala and West Bengal.

The focus of Vitamin A supplementation is linked to universal immunization programme which itself is tardy with only 44% full immunization coverage nationally though 75% received the BCG vaccination first after birth indicating falling levels of regular follow-up (IIPS, 2007). Maternal night blindness which was identified as a potential indicator of community level vitamin A deficiency (Christian, 2002) by International Vitamin A Consultancy Group (IVACG), and in the end line survey carried out by CARE India in 67 districts across six states (CG, JHK, MP, Odisha, RAJ, UP and WB, the states with high levels of maternal and child mortality) under RACHNA Project (2001-06) indicated 14% mothers with 0-5 months old children reported night blindness during the last pregnancy (CARE, 2006). Decline in levels of immunization as well as Vitamin A coverage is worrying on one hand while trying to combat higher levels of maternal and child mortality on the other hand. Thus, the two vulnerable groups of mothers and children are not receiving adequate protection from vitamin A deficiency which should be the top priority of intervention for NHM on the similar lines of pulse polio and full vaccination.

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Micronutrient Deficiencies are a major contributor to poor health and nutrition of children below 3 years of age. The prevalence of anaemia, which is an indicator of both poor health and poor nutrition, among children aged 6-35 months has increased from 74% in NFHS 2 to 79% in NFHS 3, mainly due to sharp increase in anaemia among young children in rural areas. Vitamin A deficiency is also a major contributor to high levels of child mortality. Vitamin A deficiency (VAD) causes slow growth and development in children in addition to the manifestations of its deficiency in the eye. Three-fifth of the pre-school children has ocular signs of VAD. Bitot Spot prevalence in pre-school children is more than the WHO recommended norm. Total Goiter Rate is more than 10%, double to that of WHO cut off of 5% according to the approach paper of GOI for the eleventh five year plan document. (GOI, 2006). Since the complete coverage of vitamin A (like full vaccination) is a strong building block of effective coverage of maternal and child health service package and prevents childhood blindness, an attempt has been made in this paper to understand the explanatory variables influencing the differential coverage levels of Vitamin A supplementation among children of 12-35 months, and follow the same tempo till they complete all 9 doses by six years of age.

Objectives

Exploring the reasons for differential performance will help understand the programme effectiveness in terms of whether one target group or a geographical area is reached more effectively than others, and also the socio-economic determinants of service coverage. Further, comparing vitamin A coverage with the full immunization coverage, particularly of measles, the last one in the series of UIP, will tell us about missed opportunities as a proportion of children received vitamin A to that of measles vaccination. Thus, the overall objective is to explore the socio-economic and maternal and child health factors contributing to differential performance in vitamin A coverage. Specific objectives are:

a) To analyze the national coverage trends of Vitamin A supplementation across states in India

b) To understand the determining factors for low coverage of vitamin A in selected states in last 6 months for children in age group of 12-35 months

c) To provide suggestions for improvement in the coverage of Vitamin A in India

Data, Variables and Methods

Secondary data from NFHS 2 and 3 were used as main source for the present paper to analyze vitamin A coverage trends. While national coverage of vitamin A stands at 25%, two high performing states with more than 40% (TN and Kerala) and two low performing states with less than 15% (UP and Chhattisgarh) coverage levels were selected for a detailed analysis. NFHS3 data sets of the selected states were combined for the analysis. Bi-variate and multi variate analyses including tests of significance and logistic regression analysis were carried out using SPSS. While Vitamin A supplementation coverage in last 6 months for children of 12 to 35 months was considered as a dependent variable, child age, gender, birth order, breast feeding status, mother's education, religion, caste/tribe, wealth index were considered as independent variables in the analysis.

NFHS Trends in Vitamin A Coverage in India

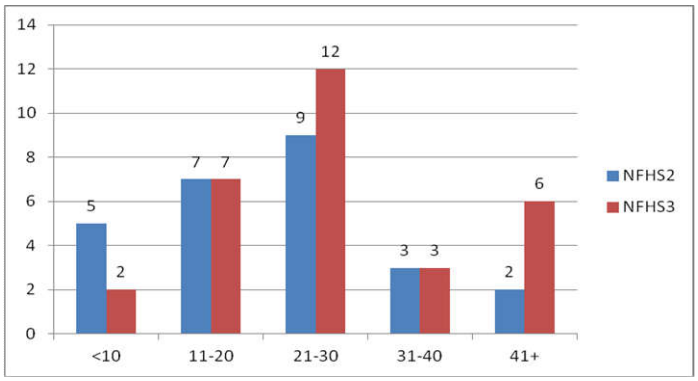
As evident from the NFHS3 results, there is a marginal improvement of 8 percentage points nationally between the two successive rounds from 17% in NFHS2 (1998-99) to 25% in NFHS3 (2005-06). As per NFHS2, the national coverage of vitamin A supplementation in children below 3 years of age was 17% with Nagaland at bottom (4 %) and Manipur at the top (41%), both from the north eastern states. According to the NFHS3, 21% of children below 3 years of age received Vitamin A supplementation with coverage ranging between 9% in UP/Nagaland and 48% in Kerala/West Bengal/Mizoram. Further, 18% of children below 6 years got vitamin A supplementation nationally, ranging between 6% in UP and 41% in Mizoram (IIPS, 2007). Moreover, 15 percent of the pregnant

women had also reported difficulty of vision in daylight or night blindness, again due to the poor coverage of vitamin A supplementation during the pregnancy period, which could be a proxy for estimating the potential coverage of children with vitamin A supplementation.

Uttar Pradesh, the most populous state of India remained at the rock bottom level in both the measurements while north eastern state Manipur reached the top for below 3 years coverage with vitamin A supplementation. So, it would be interesting to understand the coverage dynamics in the north eastern states which could throw up more learning for the country as a whole, though they are not covered as part of this study.

Comparison of state wise coverage for below 3 years children between two measurements using NFHS 3 data indicates that while the overall improvement is 8 percentage points (17 to 25), the coverage values showed a decline in nine states viz., UP, MN, HR, JK, AS, GJ, PJ, HP and GOA (between 1-10 percentage points). However, it showed marginal improvement in other 20 states, without contributing much to push the national coverage levels up as desired. Karnataka remained stagnant at 23% in both the measurements. The number of states that recorded above 40% coverage increased from 2 to 6 and the number of states with coverage levels between 21-30% rose from 9 to 12 while in the categories of 11-20 and 31-40, the number of states remained as it is with 7 and 3 states respectively, as evident from Figure 1.

Figure 1: No. of states across different coverage categories in NFHS rounds



Source: NFHS2 Report, IIPS (2000) and NFHS3 report, IIPS (2007).

In terms of improvement in the coverage magnitude between two successive rounds, some states have shown significant improvement over the others. For instance, BH (7 to 33) and TN (10 to 45) showed highest increase of more than 4 times while the coverage values got doubled in case of NL, WB, and AP. Even among the southern states, TN showed much higher improvement while KE, which is already at higher level in NFHS2 showed marginal improvement though stood at top in NFHS3, along with Mizoram. On the other hand, in Goa the coverage levels sharply declined between the two measurements of NFHS 2 and 3 (IIPS, 2007).

Though the NRHM guidelins recommend to provide vitamin A supplementation with six month interval till the child reaches the age of six years, only one-fourth of the children of 12-35 months received vitamin A supplementation in 6 months before the survey. This figure further dropped to 18 per cent for children below six years of age. The most likely age group when children would receive vitamin A supplelennation is 12 to 18 months but unfortunately the same tempo does not continue beyond two years though ideally it should continue till six years of age covering at least nine doses. Vitamin A supplementation for young children is low in most of the states, reaching a maximum of only 48 per cent for children aged 12-35 months in West Bengal and Kerala. Thus, minimum requirement of at least 2 doses before 3 years of age is not met. This indicates lack of awareness on the part of parents as well as regular follow-up from the parents and health workers for full dose coverage. Other constraints include: longer follow-up period, supply and distribution issues,

not treated on par with national vaccination schedule etc. Unless these constraints are addressed holistically, it is very difficult to improve the coverage levels of vitamin A supplementation. Nearly three-fourth of the eligible children got deprived of this vital supplementation in their early formative years.

Missed Opportunities of Vitamin A during Measles vaccination

Universal Immunization programme (UIP) is implemented as a national programme to protect children against six preventable diseases. Full Immunization of 12-24 months children is less than 50% and the rise over the three NFHS measurement periods is insignificant with less than 10% increase overall. Measles coverage, last one in the series of UIP, showed relatively steady improvement (nearly double) by 17 percentage points touching 60% in NFHS3 (IIPS, 2007). However unfortunately, Vitamin A coverage (started measuring from NFHS2 only) is still lagging behind only with 21% coverage, less than half of the Measles coverage in NFHS3.

Measles vaccination is the last one in the series of UIP schedule given to children after completing 9 months of age and this also is the right time to cover a child with vitamin A supplementation as well not withstanding the dropouts in between different vaccinations and doses. However, dropout rates between BCG, the first vaccination to Measles, the last one stands at 25% in NFHS3, which however gradually reduced from 32% in NFHS1 and 29% in NFHS2 (Chandran, 2011, p.135). Hence, the number of cases which are covered only with measles and not vitamin A can also be treated as 'missed opportunities' and the proportion of vitamin A coverage to measles coverage was considered as a measure to assess the extent of 'missed opportunities' Hence, with 25% coverage of children below 3 years of age with vitamin A supplementation in NFHS3, it can effectively be concluded that only one-tenth of the children starting with measles are receiving this vital supplementation which is a major challenge. It is evident from NFHS3 that the percentage of vitamin A coverage to Measles vaccination is below 20% in case of poor performing states like Haryana, Uttar Pradesh, Chhattisgarh while even in high performing states like Kerala and Tamil Nadu this is below 50% coverage. North-eastern states fared relatively well on this count as well as Bihar with an overwhelming performance at 73%.

Vitamin A supplementation is effective usually between 6-11 months of age and providing 1st dose of vitamin A along with Measles is the best opportunity to maximize the vitamin A coverage as well as its clinical effectiveness. Though all the states are using this opportunity, degree varied largely from 10-70%. Bihar (70%) topped the list with the least missed opportunities (though with <40% coverage of Vitamin A) followed by Mizoram (60) and West Bengal (55) (both with >40% coverage) catching more than 50% children for Vitamin A along with Measles. All other states including Kerala with >40% Vitamin A coverage, missed more than 50% of these combined opportunities (Figure 2).

State level coverage variations in vitamin A doses received

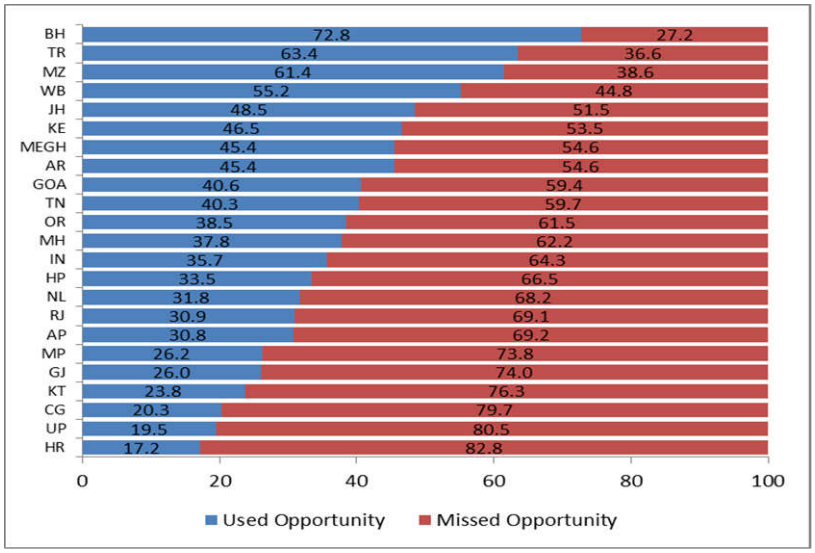
Analysis of dose wise coverage among the four selected states indicates that among the high performing states like KE and TN, vitamin A coverage is relatively consistent across doses. In low performing states, 1st dose coverage is more than 50% which slides to just 1-3 percent for 4 plus doses coverage (Figure 3) which is 10-20 percent in high performing category. Further, more than 10% of the mothers reported 'don't know' when asked about dose coverage which is very high, considering the normal survey standards. Probably, showing the sample of a capsule or a bottle of Vitamin A syrup may be helpful in reducing this high percentage of responses of 'don't know'.

Analysis and discussion of results from four select states

Based on the vitamin A coverage for children below 3 years of age, two states each from high (>40%) and low (<15%) performance categories were identified for in depth analysis using NFHS3 data. In this section, the results of this analysis are presented and discussed to identify the variations and similarities in these two categories using few selected family level socio-economic background characteristics.

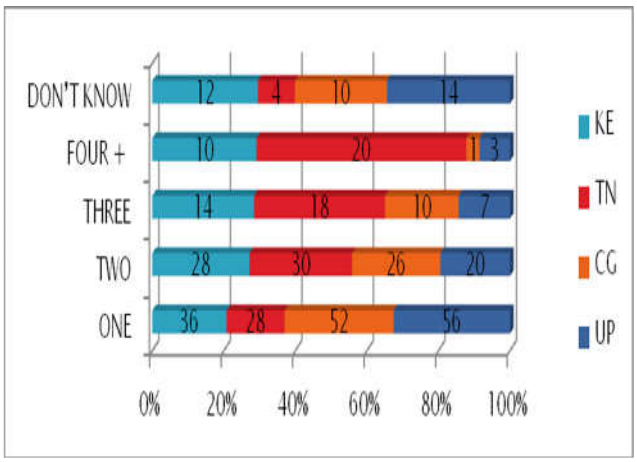
In the four select states, while only 9% of the children received vitamin A supplementation in last 6 months in Uttar Pradesh, the coverage is little above 12% in Chhattisgarh. On the other hand, 45% and 46% received vitamin A supplementation in Kerala and Tamil Nadu respectively. Overall, the two southern states together had more than four times higher coverage (45%) than their counterparts (10%) as evident from Figure 4. Further, dose wise coverage fell sharply overall across the states. Percentage of children covered with vitamin A dose 1 and 2 dropped by 70% in UP (from 24 to 7 per cent), it was relatively low in Chhattisgarh where it dropped by 60% (from 44 to 17 per cent). On the other hand, Tamil Nadu and Kerala also registered similar drop which, however, hovered around 30 percent, indicating strong follow-up both by parents and health workers coupled with relatively higher literacy and awareness levels about the importance of the vitamin prophylaxis supplementation in the southern states compared to northern states.

Figure 2: Missed opportunities for Vitamin A coverage during Measles vaccination



Source: NFHS3 report, IIPS (2007).

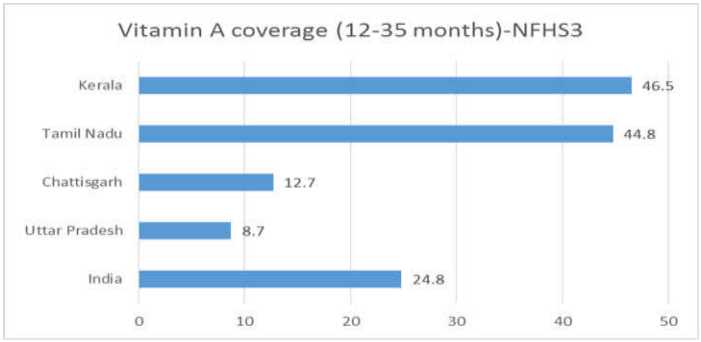
Figure 3: Dose wise coverage variation in select states



Source: NFHS3 report, IIPS (2007).

Since Vitamin A deficiency (VAD) causes slow growth and development in children in addition to the manifestations of its deficiency in the eye leading to childhood blindness (Lakshmaiah, 2011), this finding of higher coverage of second dose in southern states is also corroborated by the fact that the child malnutrition levels are relatively lower in these states than the northern states.

Figure 4: Vitamin A coverage (12-35 months) in four select states



Source: NFHS3 report, IIPS (2007).

The ICDS scheme is the main vehicle for child nutrition and care of children up to their preschool age under the aegis of Ministry of Women and Child Development (WCD). It is designed to link with health services for immunization, vitamin A supplementation, and referral of high risk children and pregnant women to the government health facilities. However, persistent problem of child malnutrition and micro-nutrient deficiencies could not be contained to the appreciable levels due to its failure to target and effectively reach out to children below 3 years of age by when majority of these child health related issues to be handled owing to its lopsided centre-based approach in ICDS with supplementary food focus coupled with weak communication skills of workers and poor networking linkages with communities where these centers are operating (Gragnolati, 2006). Lack of effective coordination between health and ICDS departments at the ground level through ASHA and AWW complicates the issue further as both functionaries and departments come under different secretaries leaving the much needed coordination to the field level work only.

Further, child nutrition including vitamin A under micronutrient supplementation comes under FNB (Foods and Nutrition Board) of WCD while supplies and services come from Ministry of Health and Family Welfare (MOHFW). Major resources are spent on supplementary nutrition proving ineffective with less focus on disease control and prevention. Supplementary Nutrition focuses on children of preschool besides malnourished (grades 3 and 4) and pregnant women and lactating mothers, losing focus for the health care and service provision at early ages of children. Possible reasons for low coverage and high dropout rates between successive doses was primarily because of a weak and lethargic health system and poor coordination between health and ICDS functionaries at the service delivery point and poor follow-up from the parents.

Health delivery services at the grassroots level have not improved despite rising allocations of funds and human resources. Further, ever increasing per capita expenditure on accessing health services and decreasing proportion of GDP investments in health sector confirm this deteriorating situation and a clear pointer to the failure of the system to equalise public expenditures on healthcare services (Acharya, 2007).

In general, with such a complex arrangement, all health care services of women and children are getting adversely affected with poor coverage levels on almost all indicators starting from ANC registration (before birth) till Vitamin A completion of the new born child (at the age of 6 years). Without any radical changes to the existing system and its overall operational mechanism, unfortunately, not much positive change could be anticipated in the child health status, particularly in terms of child malnutrition and micro nutrient coverage levels.

In order to explore the socio-economic correlates of Vitamin A coverage in the selected states, some important predictor variables were selected based on the literature review and available NFHS data points. These include : child's age, gender, mother's age at first birth, mother's education, religion, full child immunization, having health card, access to AWC services, mass media exposure, and wealth index were considered.

Table 1: Vitamin A coverage in last six months for children in 12-35 months age group by background characteristics in Select States of NFHS 3

Background Characteristics	HPS (KE)		HPS (TN)		LPS (CG)		LPS (UP)	
	%	N	%	N	%	N	%	N
Age (months) (χ^2)	**8.8(2)**	**	**NS**		**NS**		**NS**	
12-17	59.7	124	52.3	136	27.7	141	13.9	696
18-23	37.9	95	39.5	154	14.2	137	9.2	668
24-35	42.6	209	44.3	364	7.7	293	5.8	1426
Sex (χ^2)	**NS**		**NS**		**8.9(1)**	**	**6.4(1)**	*
Male	43.6	218	42.2	376	16.7	284	9.9	1498
Female	46.3	210	48.4	278	12.2	295	7.1	1292
Residence (χ^2)	**NS**		**NS**		**14.6(1)**	***	**22.8(1)**	***
Urban	43.8	144	49.1	300	25.7	98	10.5	569
Rural	47.9	284	41.2	354	12.1	481	8.2	2221
Mass media Exposure (χ^2)	**NS**		**6.1(1)**	*	**NS**		**41.6(1)**	***
Yes	72.3	353	51.2	395	36.3	242	21.1	574
No	72.3	382	57.2	551	32.6	302	15.1	655
Full Immunization(χ^2)	**133.4(1)**	***	**NS**		**177.6(1)**	***	**861.2(1)**	***
Yes	88.7	470	56.4	149	81.8	148	74.3	301
No	56.4	265	56.3	797	30.7	396	15.3	928
Age At 1st birth (χ^2)	**NS**		**NS**		**15.8(3)**	***	**161.2(3)**	***
<15	67.0	63	61.2	142	28.7	160	12.3	288
15-19	68.3	181	53.3	311	35.0	233	18.6	469
20-24	72.6	230	54.5	277	40.0	102	21.3	277
25 +	76.5	261	52.6	216	43.4	49	33.4	195
AWC existed for more than 5 years in PSU(χ^2)	**NS**		**NS**		**NS**		**24.7(1)**	***
Yes	71.4	652	54.6	924	33.2	391	15.8	732
No	79.8	83	51.2	22	36.8	153	20.5	497
Mother's Edn. (χ^2)	**NS**		**8.3(3)**	*	**38.1(3)**	***	**231.8(3)**	***
No education	1.2	7	35.2	99	8.7	303	6.4	1817
Primary	3.7	15	23.2	49	19.4	49	17.5	73
Secondary	43.8	178	50.4	294	18.3	170	10.7	561
Higher	49.6	228	46.6	212	28.3	57	15.3	338
Religion (χ^2)	**14.3(3)**	**	**6.3(3)**	*	**NS**		**41.5(3)**	***
Hindu	55.2	193	44.8	564	13.7	556	9.3	2188
Muslim	38.1	173	48.4	37		19	5.9	587
Christian	41.8	60	42.6	53		2		
Have health card (χ^2)	**NS**		**NS**		**27.8(1)**	***	**376.1(1)**	***
Yes	74.7	531	53.5	265	48.4	180	37.7	441
No	70.3	204	57.5	681	33.1	364	14.8	786
Wealth Index (χ^2)	**NS**		**NS**		**32.1(4)**	***	**132.8(4)**	***
Lowest	1.7	4	20.4	70	8.3	260	8.8	808
Second	8.3	19	41.7	95	17.2	152	4.5	737
Middle	39.6	43	50	215	14.1	85	8.4	531
Fourth	47.9	165	51.9	164	14.4	40	9.5	415
Highest	45.7	197	42.3	110	42.4	42	17.6	299
Overall State	46.5	428	44.8	654	14.4	579	8.7	2990

Level of Significance: * p<0.005 ** p<0.01 *** p<0.001 NS- Not Significant

Table 1 presents Vitamin A supplementation coverage in last 6 months for the children in age group of 12-35 months by various background characteristics. The analysis across four states, two each from high (Kerala and Tamil Nadu) and low (Chhattisgarh and Uttar Pradesh) performing groups covered (4651) more than one fifth (22%) of the national sample (20,802) covered during the third round of NFHS carried out during 2005-06.

The children in the age group of 12-17 months had the highest coverage levels among the children of 12-35 months in both high and low performing groups. In case of HPS group, the coverage slumped by 10 to 20% in age group of 18-23 months, and picked up again in 24-35 months by 5 percentage points. However, in case of LPS, the coverage consistently dropped from 12-23 months to 24-35 months by one third in case of Chhattisgarh and nearly half in case of Uttar Pradesh. Child's age was found significant ($p<0.05$) only in case of Kerala where all child health services are realized as required according to the child age while in other states there is no such strong association was observed.

The gender gap in Vitamin A service coverage for children below three years of age is more favourable to girls in case of HPS, though TN has wider gap of 6 percent while Kerala has only half of it. The trend was observed to be reverse in case of LPS, Chhattisgarh recording relatively larger difference of 5% compared to 3% in case of Uttar Pradesh. Interestingly, in case of both the LP States, gender was found significantly associated ($p<0.01$ for Chhattisgarh and $p<0.05$ for Uttar Pradesh) with poor Vitamin A coverage levels indicating the continuing gender discrimination even in case of availing life saving child health care services.

In general, higher percentage of children in urban areas received vitamin A supplementation (even in Chennai a marginal difference of 1% was found between slum and non-slum areas indicating inequitable approach in service provision) compared to those children in rural areas and the coverage differences between urban and rural areas were around 8 and 2 percent respectively for Tamil Nadu and Uttar Pradesh. Kerala is an exception, where the urban-rural differential was 4 percentage points higher for rural areas. While the differentials were relatively small for all the states, in case of Chhattisgarh, the coverage in rural areas (12%) is less than half of that in urban areas (26%) indicating the adverse effect of access issues due to widespread population groups with large tracts of forest areas. Rural-urban differential was found significant only in case of LP States where the service coverage is poor in rural areas while in HP States all areas are reached with effective service coverage networks.

General awareness about child care practices and vitamin A in particular, is critical for higher coverage levels and in all the 4 states of both high and low performance categories, mothers who completed primary education and above, have consistently shown good levels of vitamin A supplementation coverage. Percentage of illiterate women with no formal education was 52 per cent and 61 per cent respectively in Chhattisgarh and Uttar Pradesh and the Vitamin A coverage was below 10 percent in these categories which gradually improved with mother's educational status and influence of this variables turned out to be highly significant ($p<0.001$) in both the states of LP States category. This indicates the importance of spreading awareness about the significance of vitamin A supplementation in reducing child mortality levels is very crucial through promoting women's education and empowerment.

Though Vitamin A coverage by religion did not show any definite trend, Hindu families had relatively higher coverage in all the states except Tamil Nadu where Muslim children had about 4 percent higher coverage than Hindu children. While access to AWC services was significantly associated only in Uttar Pradesh ($p<0.001$), having health card to avail mother and child care services, mother's age at first birth, and full immunization of child were found significant in case of both the LP states ($p<0.001$), including Chhattisgarh. However, these factors were not found significant in case of both the HP states as education and awareness levels are generally high with relatively good access to health services. With regard to the wealth index, coverage was relatively better for children belonging to highest category of wealth index and this variable was found significant only in case of both the LP States ($p<0.001$).

Discussion of Regression Results

Multivariate binary logistic regression was used to find out the factors affecting receipt of Vitamin A. This analysis was carried out using individual and combined data of the four selected states, two each from low and high performing categories. Maternal and child health variables such as the age of mother at first birth, mother's exposure to mass media, child's full immunization status, and availability of health card were added as covariates. The results are presented in table 2 and discussed below.

Table 2: Binary Logistic Regression results by State

Variables	categories	UP	CG	KE	TN
		Exp(β)	Exp(β)	Exp(β)	Exp(β)
Age of child (Ref: 2-3 years)	<1 year	**0.746***	0.773	**0.373****	0.887
	1-2 years	0.787	0.924	0.561	**.576****
Sex of child (Ref: Female)	Male	1.002	**1.699***	0.906	1.244
Place of residence (Ref: Urban)	Rural	0.814	0.778	1.249	1.285
Religion (Ref: Other religions)	Hindu	1.081	1.173	1.937	1.917
	Muslim	0.977	1.403	1.742	1.492
Mass Media Exposure (Ref: Exposed)	No exposure	**.733***	1.039	0.9	**1.657****
Full immunization (Ref: Fully immunized)	No full immunization	**0.350*****	**0.236*****	**0.359*****	1.399
Wealth Index (Ref: Richest)	Poorest	1.034	0.705	1.089	0.815
	Poorer	0.831	0.744	2.308	1.345
	Middle	1.041	0.67	1.205	1.423
	Richer	0.946	0.481	1.164	1.581
Age at First Birth (Ref:25 plus)	<15	0.889	1.082	0.886	1.023
	15-19	0.898	1.215	1.869	0.959
	20-24	0.73	0.912	1.342	0.916
Mother's education (Ref: higher education)	No education	**0.418*****	0.33	0.478	1.244
	Primary	**0.339*****	0.434	0.552	1.371
	Secondary	0.816	0.64	0.931	**1.959***
Have a health card (Ref: Has Card)	No card	**0.182*****	**0.367*****	0.302	1.203
AWC existed for more than 5 years in the PSU (Ref: Yes)	Did not exist for more than 5 years	1.007	1	1.393	**2.226***

The logistic regression results indicate that in UP and Kerala, compared to children of 2-3 years, children below one year old had a lower chance of receiving Vitamin A probably because Vitamin A doses are given after the child completes one year of age. Mass media exposure had a significant positive impact on receipt of Vitamin A in UP (though with lower coverage) whereas it has a reverse effect in TN (though with higher coverage). Full immunization has a positive impact positively on the receipt of Vitamin A in UP, CG and Kerala. In UP, higher education of mothers has a positive impact on receipt of Vitamin A. Having a health card for the child has a very strong positive effect on receipt of Vitamin A in UP and CG. The overall conclusion could be that socio-economic variables have relatively lower effect on Vitamin A coverage and it is much to do with service delivery mechanisms/supply and distribution system. The likelihood of Vitamin A

supplementation improves with full immunization, mothers with higher education (above primary) and those having health cards. Focus on Mass media exposure, full immunization coverage, awareness and education of women and providing health cards as a communication tool would help improve vitamin A supplementation coverage levels.

Suggestions for improvement

According to preliminary results of phase 1 states of NFHS4 (including Tamil Nadu) there are appreciable improvements in both measles and vitamin A coverage from NFHS3 levels (IIPS, 2016), vitamin A supplementation coverage of children in 12-35 months registering a 43% jump (up from 25% in NFHS3 to 68% in NFHS4). However, as a way forward, following suggestions are provided to improve and sustain the situation and enhance the efforts of government to reach its targets of child health in general and on child malnutrition and micro nutrient deficiencies in the policy documents such as: National Population Policy, NRHM, Policy on Vitamin A deficiency, twelfth five year plans etc. besides the plans to meet MDG /SDG commitments.

- Lessons learned from successful approaches used in Odisha and Bihar such as, regular follow-up by health and ICDS workers with the support of strong field level management information system, should be emulated across the nation to foster improved coordination between health and ICDS functionaries at policy and field levels
- Provide first dose of vitamin A along with Measles vaccination between 9-12 months of age, with an overall strategy that would push coverage levels of vitamin A, Measles as well as full immunization simultaneously
- Strengthen health system with strong components of awareness, access, supplies and distribution networks and follow-ups etc., with public private partnership approach with agencies working on 'blindness prevention' such as ORBIS, Vision 2020, Help Me See, etc.
- Adhere to Vitamin A administration on mission mode in the Universal Immunization Programme and link with booster dose coverage for other vitamin A doses fully by the time the child completes 5 years
- Conduct annual coverage surveys (30 clusters or extended 40 cluster method as used in immunization coverage surveys suggested by WHO) procedure and report coverage figures. These surveys should help in determining the clinical linkages between micro nutrient deficiencies and prevalent childhood health problems
- NFHS should try to include data points with focus on critical pieces of information like: mode of vitamin A administration, post natal coverage of mothers with Vitamin A along with BCG dose for the new born, first vitamin A supplementation along with measles, prevalence of any infection or redness in eye for children in last 2 weeks like diarrhea and ARI, demonstrate Vitamin A capsules or syrup to the respondents to reduce the percentage of ‘don’t know’ responses while assessing the receipt of Vitamin A supplementation
- Awareness should be improved through mass media for full coverage of vitamin A doses before the child completes 5 years of age
- Communication skills of health and ICDS functionaries should be strengthened to ensure positive health seeking behaviour among the target groups

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