



NUTRITIONAL STATUS AND IMMUNIZATION OF CHILDREN IN WEST BENGAL: A DISTRICT LEVEL ANALYSIS

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Abstract:

Introduction: Children are the future pillar of a nation. The physical and mental development of children is an indicator for the betterment of that country.

Methods: This study is based on District Level Household and Facility Survey-4 (2012-13) and Annual Health Survey (2012-13). Total sample size for child is 7688 in West Bengal out of which 1662 fully immunized children aged 12 month to 23 month are selected. Descriptive studies and logistic regression analyses are carried out to explore the nutritional status and variation of child immunization.

Results: Though trends shows that there are overall improvements in child nutritional status and full immunization of children but still a variation exists in states of India as well as districts of West Bengal. Prevalence of any anemia is very high is among the children in almost all the districts. Religions, caste, place of residence, mother educational level are important factors for full immunization. In this study gender discrimination is seen.

Conclusion: In order to improve child health, focus should be given on community awareness. Priority should also be given to the socially and economically deprived sector of the society.

Index Terms - Children, immunization, nutritional status

I. INTRODUCTION

“There can be no keener revelation of a society’s soul than the way in which it treats its children”

Nelson Mandela

Improving the health status and reducing inequalities in the health sector have become a priority of some premier international organizations, including World Health Organisation and World Bank. Since 1997, the World Bank’s top priority on health sector is “to work with countries to improve the health, nutrition, and population outcomes of the world’s poor and to protect the population from the impoverishing effects of illness, malnutrition and high fertility”. Though outcomes in the mentioned domains, have improved over time but inequality still persists in gender, caste, income, education and geography. The socio-political-economic system influences the institutional structure determining the health of the population. Poverty remains the principal causes of child undernutrition [Hunger notes (2010)]. In order to ensure equity in access to health care, it requires overcoming those several factors in delivery of services, financial factors and the main target should be the vulnerable groups.

Child malnutrition has a positive impact on child mortality. Deprivation in childhood makes physical and mental damages. According to United Nation’s 2006 report, India has the largest number of undernourished people in the world and one of the highest levels of child malnutrition. The prevalence of underweight is highest among the children in India. The existing literature shows the importance of community level education, mother’s exposure to mass media, use of pit toilet, basic sanitation, and access to clean water, health expenditure and health care services determine the nutritional status of children. (Pandey, 2003; Bhat, 2003).

Undernutrition is the underlying cause of child mortality (Black, 2013). The prevalence of under nutrition is a major obstacle to human development and economic growth of any developing country, specially among the poor and the vulnerable, where the prevalence of malnutrition is high.

Keeping this in mind the attempt has been made in this section to describe the under nutritional status of children in West Bengal. The specific objectives of this paper are to examine the nature and extent of interstate variations in nutritional level of children in India. In an in depth analysis of DLHS unit level data, this paper also seeks to analyse the inter district variation in the extent of stunting wasting and underweight children in West Bengal. Child health is very much linked with the immunization status. The influencing factors of child's full immunization in West Bengal have been examined theoretically and empirically in several studies. Barman and Dutta (2013), using District Level Household and Facility Survey-3 (DLHS-3) 2007-2008 data explore the quality of immunization and barriers to access in West Bengal, India. From DLH- RCH-2, in a study of socio economic impact on child immunization there was a huge variation in the districts of West Bengal.

Accordingly, attempt also has been made to examine the achievement or success in respect of immunization of children in West Bengal. The determinants of full immunization are also attempted to identify for effective implementation of the immunization programme in the districts of West Bengal.

II Data Sources and Methodology:

a. Data Sources: This study is based exclusively on the secondary data. District Level Household and Facility Survey-4 (2012-13) factsheet of states of India and districts of West Bengal, unit level data of West Bengal, Annual Health Survey (AHS, 2012-13) state fact sheet and clinical anthropometric and biochemical test (CAB) data of states of India are used. In DLHS-4 total sample size for child is 7688 in West Bengal out of which 1662 children (12 month-23 month) are selected who are fully immunized. Study includes the data on child immunization, anthropometric and biochemical measures of child and their mothers. All children listed in the household, who were born in year 2008 or later were eligible for measurement of their height and weight. Ministry of Home Affairs, Government of India conducted this survey for nine states namely Assam, Bihar, Chattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh, Uttarakhand under Annual Health Survey in the same time period (2012-13) instead of district level household survey-4.

b. Methodology:

Measuring Undernutrition:

Under nutritional status of the children are measured by anthropometric measure. In the anthropometric measure, there are four components: age, weight, height, and gender. Anthropometrics are formed taking two or all of these components together. Three indices that are commonly used in assessing the nutritional status are – weight for age, height for age (Stunted) and weight for height (Wasted). These indices are composed to a referred standard of anthropometry to access the magnitude, distribution severity of nutritional problem.

Stunting: Height for age is considered a measure of past nutrition, because a child is short today, might not have had the adequate nutritional intake at some point in the past. **Wasting:** Wasting is sensitive to changes in caloric intake or the effects of disease. It is measured by weight for height of children, it is also an important indicator for measuring children's under nutritional status. Weight-for-height describes the current nutritional status.

Underweight: This measure is used to assess if a child is normal weight, overweight or underweight according to their age. When a child weighs more than they are expected, for their age, they are called overweight. When a child weighs less than they are expected, for their age, they are called under weight.

Full immunization: Full immunization means one dose of BCG (BCG: bacillus Calmette-Guérin), three injections of DPT (DPT: diphtheria, pertussis and tetanus), three doses of polio (OPV) (excluding polio 0) and one injection of measles.

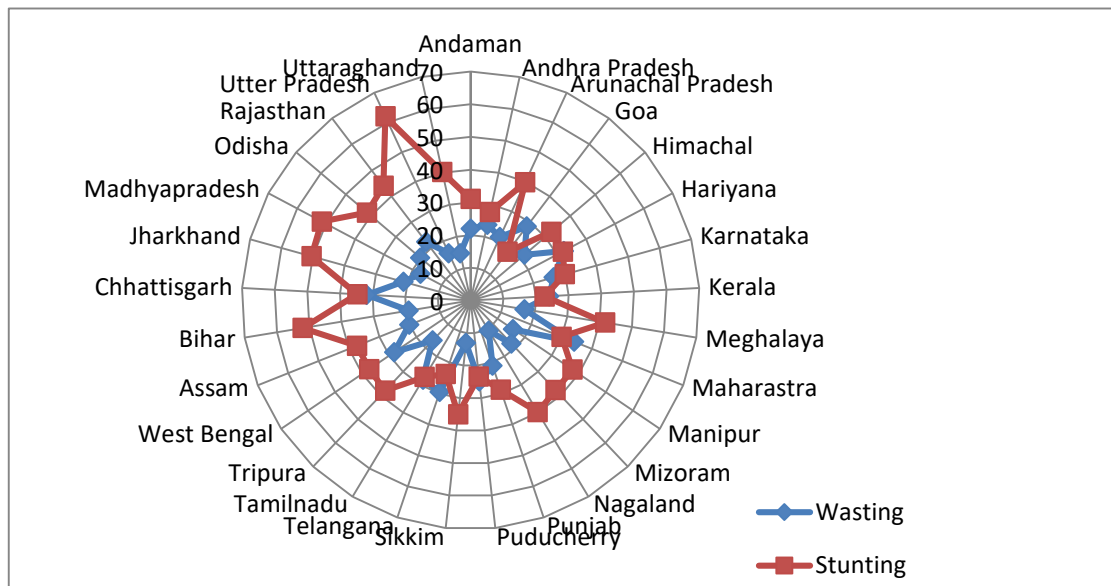
Logistic regression analysis is used. The determinants of child's full immunization have been explored using the Binary Logit model, here outcome variable is full immunization of child.

III. Inter State Variation in Children Nutritional Status in India.

Nutritional status of children is measured by three anthropometric indicators: Stunting, Wasting, Underweight and prevalence of anaemia. The nutritional status of children of major Indian states is shown in figure 1.

From DLHS 4 (2012-13), the prevalence of stunting is much higher in Uttar Pradesh (62%), Bihar (52%), and in Madhya Pradesh (51.5%). As usual Goa (18.7%), Kerala (22.7%), Puducherry (23.4%), Telangana (23.7%) followed by Tamil Nadu (27.3%) are the best performing states. The higher prevalences of wasting are shown in Maharashtra (34.1%), Haryana (32%), Chattisgarh (31.8%) followed by West Bengal (28.2%). The prevalence of wasting is much lower in Nagaland (10%), Manipur (15.7%), Sikkim (13.1%), Uttar Pradesh (15.9%) in the rural areas.

Figure: 1



State wise Variation according to two anthropometrics measure: India
 Source: DLHS-4 (2012-13); Annual Health Survey (2012-13)

IV. Nutritional Status of Children in West Bengal: District level approach

Infant mortality rate of West Bengal is reduced from 35 per thousand live birth (2008) to 31 per thousand live birth (2013) where as the country averages is reduced from 53 to 40 per thousand live birth (2013) (Source: SRS Statistical Report 2013) Nutritional status is one of the responsible indicators for child health and also for infant mortality.

There are district wise variations of nutritional status in West Bengal. From the available data it is found that the extent of stunting, wasting and underweight are not uniform across different districts in West Bengal. District wise variations of nutritional indicators namely stunting, wasting and underweight, any anaemia presented in Table 1.

Anaemia is characterized by a low level of haemoglobin in the blood, is considered to be the major health problem in developing countries, especially among young children and pregnant women. Anaemia adversely affects the mental and motor development of children and the behaviour of infants.

Table: 1
Prevalence of Undernutrition in the districts of West Bengal

District	Stunting	Wasting	Underweight	Any anaemia (<11.0g/dl)
Darjeeling	41.7	29.9	38	81.9
Jalpaiguri	50	28.1	47	96.8
Cooch Behar	37.1	31.4	42.7	77.5
Uttar Dinajpur	42.9	29.3	38.4	85.5
Dakshin Dinajpur	30.7	28.1	42	88.8
Malda	35.6	38	46.8	90.1
Murshidabad	41.2	39.1	54.8	81.3
Birbhum	40.5	36.3	44.7	89.6
Bardhaman	32.8	27	30.5	78.2
Nadia	28.3	21.3	24.1	86.4
North 24 Parganas	30.2	20.5	27.8	84.9
Hooghly	33.6	19.6	30.1	79.5
Bankura	45.1	23	41.3	83.1
Purulia	35.8	31.1	36.9	84.4
Paschim Medinipur	41.4	30.6	44.4	89.6
Howrah	41	18.6	30.8	92.6
Kolkata	41.7	19	28	80.6
South 24 Parganas	31.8	25.2	24	88.8
Purba Medinipur	39.7	21.9	34.1	93.1
West Bengal	37.4	28.3	37.4	86.4

Source: District Fact sheet, (DLHS 4 2012-13)

From the table it is found that in West Bengal there is wide inter-districts variations of undernutrition among the under five children. In Murshidabad the status shows an alarming situation. Prevalence of any anaemia is high for all the districts in West Bengal.

V. Child Immunization

Immunization Programme is one of the key actions to protect children from life threatening diseases, which are preventable. The concept of preventing diseases by vaccination is an age old practice. Edward Jenner, a British Physician, in 1796 for the first time demonstrated the possibility of using cowpox vaccine as an immunization for smallpox in humans and used the word vaccination. Vaccination has brought in rapid strides in the recent past for prevention and eradication of many infectious diseases like small pox, polio etc.

Mass immunization programme, at the National level was first taken up in 1978 under “Expanded Programme on Immunization” (EPI). EPI expanded as Universal Immunization Programme (UIP) as part of Child Survival and Safe Motherhood Programme (CSSM). Since inception of National Rural Health Mission (NRHM) in 2005, Immunization has been given a separate identity. This also underlines the importance of immunization as an important strategy and intervention for the reduction of infant mortality rate. It is one of the largest immunization programmes in the world and a major public health intervention in the country.

a. Trends in Immunization coverage

Over this time period, child immunization in most of the states showed a steady trend of increase. However, still, there are a considerable number of children who missed out on full immunization. In some states a worrisome steady declining trend is also seen. These states are Tamil Nadu, Punjab, Haryana, Andhra Pradesh and Maharashtra. Madhya Pradesh, Uttar Pradesh, Bihar, Rajasthan and Jharkhand are growing faster compare to the previous round. Madhya Pradesh shows a huge increase. In achieving full immunization Kerala followed by West Bengal, Karnataka are in a better position. (DLHS-4 and DLHS -3)*.

b. Child immunization in West Bengal: An Inter districts analysis

Inter- districts analysis has been worked out in the state of West Bengal considering the four vaccinations as well as the full immunization. In West Bengal child mortality reduced from 35 per 1000 live birth(2008) to 31 per 1000 live birth in 2013 (SRS Statistical Report 2013).

There is a wide inter-state variation in child mortality in different states of India. One of the major indicators to reduce IMR and to avoid preventable diseases is child immunization. It is a basic necessity to ensure child health.

Table: 2
District wise vaccination of Children (12-23 month age group)

District	BCG	DPT 3	Measles	Polio 3	Full immunization	Rank
Darjeeling	98.5	92.0	90.2	94.9	86.5	4
Jalpaiguri	97.3	96.2	97.8	91.1	81.8	9
Cooch Behar	94.8	92.2	94.8	91.7	86.5	5
Uttar Dinajpur	96.0	87.1	86.5	84.7	76.8	12
Dakshin Dinajpur	98.2	93.1	94.1	89.1	86.6	3
Malda	92.5	91.1	88.2	85.5	80.4	10
Murshidabad	93.9	79.7	81.2	78.9	67.6	17
Birbhum	89.9	87.0	83.5	72.4	67.0	18
Bardhaman	91.7	86.1	78.9	84.5	70.7	15
Nadia	96.9	98.0	96.9	93.9	91.5	1
North 24 Parganas	91.4	83.6	80.5	70.0	56.1	19
Hooghly	98.0	96.1	88.2	96.4	83.5	7
Bankura	100	100	96.8	92.5	88.9	2
Purulia	96.6	95.5	92.9	89.8	83.6	6
Paschim Medinipur	97.1	86.5	88.2	84.7	76.6	13
Howrah	98.9	94.6	90.5	90.3	82.4	8
Kolkata	91.6	85.6	84.1	81.3	74.4	14
South 24 Parganas	95.6	85.7	79.2	83.4	70.4	16
Purba Medinipur	98.8	95.6	91.9	85.1	79.2	11
WEST BENGAL	95.9	86.5	88.7	87.0	79.5	

Source: District Fact Sheet DLHS-4 (2012-13), W.B

Table 2 suggests that in BCG inter district variation is low. Allmost all the districts have performed well; near about 90 percent coverage is achieved. District Bankura (100%) shows full coverage of BCG for the sample child. In case of taking 3 doses of DPT there is a inter district variation in West Bengal. Districts, like Bankura, Nadia, Howrah, Dakhin Dinajpur, Purulia, Darjeeling are better performing districts, whereas, North 24 Pargonas, Kolkata, South 24-Pargonags, Bardhaman are the districts with unsatisfactory performance in three doses of DPT vaccine. For Measles, districts like Uttar Dinajpur, Murshidabad, Birbhum, Bardhaman, North 24 Pargonas, Kolkata, South 24 Pargona are below the state average. For three doses of polio, there is a inter district variations in West Bengal. Darjeeling, Nadia, Hooghly are approaching towards the aim of achieving polio free society. But for Birbhum, North 24 Pargonas, Kolkata, the situation is far from the desired goal. As in case of BCG the variation is low from the following diagram it is clear that variation is prominent in case of Polio and DPT.

Now considering all the four vaccines, full immunization is calculated. Above table shows that there is also some inter district variation in full immunization coverage. Districts Nadia (91.5%) ranked first in achieving full immunization followed by Bankura (88.9%) and Dakshin Dinajpur (86.6%). Purba Medinipur, Paschim Medinipur, Bardhaman, Uttar Dinajpur, Murshidabad, South 24 Pargonas, Birbhum, Kolkata, North 24 Pargonas are the districts which lie below the state average of full immunization

The socially backward communities faced multiple deprivations on account of their low position in the hierarchy of the caste system. In full immunization, the achievement of ST population is worst among all other social categories. From Table-3 it is seen that among the SC population there is wide inter- district variation in the extent of full immunization.

Table: 3
Full Immunization according to Social Class

District	SC	ST	OBC	OTHER
Darjeeling	86.67	81.82	83.33	93.75
Jalpaiguri	78.79	55.56	25.00	88.24
Cooch Behar	81.08	*	50.00	89.66
Uttar Dinajpur	88.46	33.33	58.62	68.33
Dakshin Dinajpur	83.78	75.00	*	89.47
Malda	78.57	*	91.67	71.74
Murshidabad	70.59	66.67	76.47	58.97
Birbhum	75.00	66.67	57.14	73.33
Bardhaman	72.41	66.67	55.56	71.88
Nadia	92.31	*	*	86.21
North 24 Parganas	52.94	33.33	*	66.67
Hooghly	77.78	63.64	85.71	80.65
Bankura	86.36	80.00	86.67	77.27
Purulia	78.26	84.62	88.24	82.35
Paschim Medinipur	88.00	54.55	40.00	76.47
Howrah	76.47	*	80.00	80.95
Kolkata	88.89	NA	50.00	63.16
South 24 Parganas	82.35	*	78.57	67.86
Purba Medinipur	65.00	*	85.71	78.00

Source: Author's calculation from unit level data

West Bengal, DLHS-4 (2012-13)

** sample is very low

Districts like Nadia, Kolkata, Paschim Medinipur, Uttar Dinajpur, Bankura, Darjeeling, Dakkhin Dinajpur, South 24 Pargonas, Cooch Behar are better performing districts and lie above the state's SC average. In North 24 Pargonas and Purba Medinipur the situation is worse.

The state average for the OBC children is 76.65%. Within the 'Other' category in the districts of North Bengal, mainly Darjeeling (93.75%), Jalpaiguri (88.24%), Cooch Behar (89.66%), Dakkhin Dinajpur (89.47%) are the better performing districts and the situation is opposite in Murshidabad only 58.97% from the other category are fully immunized.

c. Determinants of Full Immunization in West Bengal: A Logit Regression Model

Attempts have been made in this section to identify the factors affecting the extent of immunization in West Bengal using the Logit Regression Model.

Caste, education, religion, Govt. Sponsored programmes are considered to be the important factors influencing the incidence of immunization. Accordingly, the specification of the regression model and the hypothesis they are presented below.

$$Li = \ln[Pi/(1-Pi)] = \alpha + \beta_1 (\text{Religion}) + \beta_2 (\text{Caste}) + \beta_3 (\text{Locality_hh}) + \beta_4 (\text{mother_exposure}) + \beta_5 (\text{mother_edu}) + \beta_6 (\text{ANC_mother}) + \beta_7 (\text{Sex_ch}) + \beta_8 (\text{Benefit_JSY}) + \epsilon_i$$

Table: 4

Determinants of Full Immunization in West Bengal: A Logit Regression Model

Dependent variable	Definition
Full Immunization	Last surviving Child within 12-23 months age group received BCG, 3-injection of DPT, 3doses of Polio (excluding polio 0) and Measles.
Independent variable	Definition
X ₁ = Religion	Religion of the household. If the household is from Muslim community then it is coded 1 and other wise 0.
X ₂ = Caste	There are four Social group- Schedule caste (SC), Schedule Tribe (ST), Other Backward Caste (OBC), General (Other). We construct three dummy for SC, ST, OBC, Other and Other is the reference category.
X ₃ = Locality	If the respondent is from Rural area then Locality= 1 and if from Urban area then, Locality=0
X ₄ = mother exposure	If the respondent have television that implies that women is exposed to media. Here we code Media=1, if the respondent have television in home.
X ₅ = mother education	Illiterate (Ref), medium education (up to class VIII), Higher (class IX and above)
X ₆ = ANC	If the mother took any ANC visit it is coded as 1
X ₇ = SEX	Sex of the last surviving child. Boy =1, Girl =0
X ₈ = Benifit_JSJ	total amount received from JSY scheme during pregnancy and or after delivery

Regression Results:

The results are presented below.

Table 5
Logit Regression Result for West Bengal

Variable	Full Immunization	
	Coefficient	dy/dx
Religion	-.552***	-.102
SC	-.026	-.004
ST	-.436*	-.081
OBC	.025	.004
Locality	.525***	.092
Media	.140	.024
Mother_edu medium education	.101	.017
Higher education	.328*	.054
ANC	.1.10***	.236
SEX of the child	.278**	.046
Finance_JSJ	.000	.000
Constant	-.354	
N	1404	

Source: Scholar's own calculation from unit level data of W.B, DLHS 4 (2012-13),

Note: *** 1% level of significance
 ** 5% level of significance
 * 10% level of significance

Result and Discussion

Before going to the regression results, let us have a look at the possible collinearities among the predictor variables to avoid the problems of multicollinearity. But the Pearson Correlation Matrix (not shown) shows the maximum correlation coefficient is 0.3 which is much less than the threshold magnitude.

Table 5 depicts the binary logistic regression results and dimensions of full immunization. Children with full immunization coverage were assigned the value 1 and who are not fully immunized is coded as 0 which means the partially immunized children are here the reference category. Here among the religious group, Hindu community is the reference group. Results depicts that more the children are from Muslim community less will be the case of full immunization compared to other communities. One of the reasons may be because of the conservative attitude of the household head. Hence, our hypothesis 1 is true and $\beta_1 < 0$.

From the analysis it is seen that only ST has a negative and significant impact on child immunization.. Here $\beta_2 < 0$.

Positive and significant impact of locality on full immunization implies that as the children are from rural area probability of fully immunized child increases. The result is shocking but it is a good sign of over the entire situation. In West Bengal special attention is given in rural areas by the ASHA worker, Anganwari centers, ICDS centre, and local Health centre. They reach at the grass root level to provide health facilities free of cost. So, hypothesis 3 is not true in this case. (Surwade et al 2013)

Regression analysis led to the conclusion that mother's education level significantly and positively associated with full immunization of the child. As the mother is highly educated probability of full immunization of the child is high. Hypothesis 5 is true i.e. $\beta_5 > 0$

Again it is suggested that, in case of full immunization, as the women takes antenatal care (ANC) the probability of immunized her child increases very much. They remain aware of the importance of immunization and hypothesis 6 is true: $\beta_6 > 0$

If the last surviving child is a boy it has a positive and significant impact on immunization, and the probability of getting fully immunized is high that means hypothesis 7 is true $\beta_7 > 0$

VI. Concluding remarks

This study analyses the incidence of malnutrition and determinants of child immunization in West Bengal by controlling a wide variety of variables including parental characteristics, household characteristics. Children of age group 12 months to 23 months are taken for full immunization. From the study we can conclude as follows:

Under NRHM child immunization has been given a top priority. The objective of this programme is to reduce the child mortality rate especially the infant mortality rate by vaccinating the child against life threatening diseases. Religion and caste play an important role in the process of immunization. Study found that Muslim children are less likely to be fully immunized. This may be due to the social factor of conservativeness of the family member. Children from ST population are also less likely to be fully immunized. Social exclusion or lack of awareness or ignorance may be responsible for it. One interesting result is found that rural children are more likely to be fully immunized compare to the urban child. In various governments sponsored schemes like NRHM, ICDS etc. Services are extended at the door steps especially in the economically and socially backward areas. ASHA workers play an important role in this regard. Moreover, Janani Surkhsya Yojana (JSY) is observed to be successful in bringing the mothers under the services provided by Government.

Note*

* Detail tables have not been included in this text. These are available with the author on request.

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