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Original Research Article

Regional Disparity in Nutritional Status in India: An Examination

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ABSTRACT

Introduction: Child malnutrition is a wide spread public health problem globally; adequate nutrition is an essential determinant for their well-being. India has the highest occurrence of childhood under nutrition in the world. Despite recent achievement in Indian economic growth, the fruit of development has failed to secure a better nutritional status of children. The aim of this paper is to assess the regional variation of nutritional status of children.
Data and methods: The data used for this study is NFHS-3, 2005-06, India. The dependent variable e.g. the child nutritional status was analyzed using three indicators of undernutrition. These were stunting (height-for-age), wasting (weight-for-height) and underweight (weight-for-age). Various socio-demographic variables were taken as independent variables. A logistic regression method was used to assess the predictors of nutritional status.
Result: The vast regional variation in percentages of stunting, underweight and wasting exhibited some kind of regional pattern. Among the three indicators of nutritional status, percentage of stunting was generally higher in stunting followed by underweight and wasting. Stunting percentage was higher in Haryana, Uttar Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Meghalaya, Jharkhand, and Gujarat with more than 40%. Also, underweight cases were observed higher in Bihar, Jharkhand, Madhya Pradesh, and Chhattisgarh with 40% to 50%. Likewise, Bihar, Tripura, Meghalaya, Jharkhand, Madhya Pradesh had more wasting cases (more than 20%). Among the socio-demographic variables, education of parents, wealth index, type of castes, Birth order, preceding birth intervals (months) emerged as most important indicators of under nutrition.
Conclusion: Education of parents, wealth index, birth order, spacing being the significant predictors, suggesting that at least check on higher birth order with adequate spacing can reduce substantially the problem of undernutrition. Further, Program planner and policy makers should consider & strengthen collaboration and coordination of nutritional program that aimed to alleviate nutritional deficiencies and family health program.

Key words: stunting, underweight, wasting, NFHS, Logistic Regression.

INTRODUCTION

Child malnutrition is a wide spread public health problem having international consequences because good nutrition is an essential determinant for their well-being. India has the highest occurrence of childhood malnutrition in the world. With persistently high levels of under nutrition in the developing world, vital opportunities to save millions of lives are being lost, and many more millions of children are not growing and developing to their full potential.

Nutrition is a core pillar of human development and concrete; large-scale programming not only can reduce the burden of under nutrition and deprivation in countries but also can advance the progress of nation.

Despite recent achievement in economic progress in India, [1] the fruit of development has failed to secure a better nutritional status of children in the country. [2-5] India presents a typical scenario of South-Asia, fitting the adage of 'Asian Enigma'; [6] where progress in childhood malnutrition seems to have sunken into an apparent under nutrition trap, lagging far behind the other Asian countries characterized by similar levels of economic development. [7-10]

In India itself there are wide regional variations. Underweight prevalence ranges from 28.5 per cent in Kerala to 62.6 per cent in Bihar Stunting percentage in Bihar and Kerala viz.55.6% and 24.5% and wasting percentage in same state viz. 27.1%and 15.9%showing wide regional variation. [11] Stunting varies between range 24.5% in Kerala to 56.8% in U.P. Likewise wasting ranges between 9% to 35% in Manipur and M.P respectively. [12]

In most countries around the world, there are significant geographic variations in nutritional status of children. Many articles have been published on this subject. In India itself, it is true that different state differs from each other in terms of area, population, agro-climatic condition, socio-economic characteristics. Nor can any Indian state be looked upon entirely homogeneous region from any point of view. No Indian state would also strictly qualify as nodal region in sense of having all its linkage within the region. There are such studies which give evidence that places are significantly associated with the health and nutritional status outcome. [11, 13, 14]

DATA AND METHODOLOGY

State-wise data on child malnourishment in India are available from two major sources; one is the National Nutrition Monitoring Bureau (NNMB) set up by the Indian Council of Medical Research in 1972 in 10 Indian states to carry out annual surveys of nutrition. Besides the problem of inter-temporal comparability by a change in the scientific procedure used by the NNMB in 1982, NNMB data suffer from the serious limitation of incomplete coverage since all the 29 states that exist in India are simply not covered by such surveys. It is true that an attempt was made by the department of women and child development of the ministry of human resource development of the government of India to bring out somewhat comparable data in this regard for the year 1995-96 for the states not covered by the NNMB. But such an exercise was not repeated and so an inter-temporal study of the extent of under nutrition among all the Indian states cannot be carried out with NNMB data and supplements to those by the other departments of the government. The other source is the National Family Health Survey (NFHS) that was launched in 1991 by the ministry of health and family welfare of the government of India and coordinated by the International Institute of Population Sciences. This has a much wider coverage in terms of inclusion of the states. There have so far been four rounds of such surveys NFHS- 1 for 1992-93, NFHS-2 for 1998-99, NFHS-3 for 2005-06 and NFHS-4 for 2015-16. Each round of NFHS has had two specific goals: a) to provide essential state and national level data to monitor health and family welfare programmes and policies implemented by the Ministry of Health and Family Welfare and other ministries and agencies, and b) to provide information on important emerging health and family welfare issues.

Data for this study is taken from NFHS-3. NFHS-3 interviewed 124,385 women age 15-49 and 74,369 men age 15-54 to obtain information on population, health, and nutrition in India and each of its 29 states. The survey is based on a sample of households that is representative at the national and state levels. The NFHS-3 fieldwork was conducted in two phases by 18 research organizations between November 2005 and August 2006. The urban and rural samples within each state were drawn separately and, to the extent possible, unless oversampling was required

to permit separate estimates for urban slum and non-slum areas, the sample within each state was allocated proportionally to the size of the state's urban and rural populations. A uniform sample design was adopted in all states. In each state, the rural sample was selected in two stages, with the selection of Primary Sampling Units (PSUs), which are villages, with probability proportional to population size (PPS) at the first stage, followed by the random selection of households within each PSU in the second stage. In urban areas, a three-stage procedure was followed. In the first stage, wards were selected with PPS sampling. In the next stage, one census enumeration block (CEB) was randomly selected from each sample ward. In the final stage, households were randomly selected within each selected CEB.

The dependent variable, child nutritional status, was analyzed using three indicators of undernutrition. These were stunting (height-for-age), wasting (weight-for-height) and under weight (weight-for-age)

Stunting is defined as a low height-for-age for children, and it measures the past (chronic) child undernutrition.

Wasting is defined as low weight-for-height for children, and it is a measure of current or acute undernutrition.

Underweight is defined as low weight-for-age and it reflects past (chronic) and present (acute) undernutrition.

Nutritional indicators are expressed in standard deviation units (Z-scores) from the median of the reference population. Children whose Z-score for height-for-age index, Weight-for-height index and Weight-for-age index are below minus two standard deviations (-2 SD) from the median of the reference population are considered to be stunted, wasting and underweight respectively.

Various socio-demographic variables are taken as independent variable for the study viz; place of residence (rural or urban), education of parents, wealth index, sex of child, type of cast, birth order, religion, preceding birth interval(months).

Table 1: Characteristics of the sample:

Variable	Frequency	Percentage
State		
Kerala	837	1.8
Himachal Pradesh	941	2.0
Punjab	1222	2.6
Uttaranchal	1157	2.5
Haryana	1232	2.6
Delhi	1187	2.5
Rajasthan	1907	4.1
Uttar Pradesh	6735	14.4
Bihar	2236	4.8
Sikkim	567	1.2
Arunachal Pradesh	765	1.6
Nagaland	1891	4.0
Manipur	1680	3.6
Mizoram	794	1.7
Tripura	573	1.2
Meghalaya	852	1.8
Assam	1032	2.2
West Bengal	1981	4.2
Jharkhand	1540	3.3
Orissa	1690	3.6
Chhattisgarh	1549	3.3
Madhya Pradesh	2853	6.1
Gujarat	1500	3.2
Maharashtra	2799	6.0
Andhra Pradesh	2183	4.7
Karnataka	2080	4.4
Goa	760	1.6
Jammu and Kashmir	708	1.5
Tamil Nadu	1624	3.5
Place of residence		
urban	17887	38.2
rural	28988	61.8
Education of Parents		
No education	19124	40.8
Primary	6730	14.4
Secondary	17435	37.2
higher	3586	7.7
Wealth Index		
Poorest	8362	17.8
Poorer	8601	18.3
Middle	9650	20.6
Richer	10343	22.1
Richest	9919	21.2
Sex		
male	24330	51.9
female	22545	48.1
Type of caste		
scheduled caste	8730	18.6
Scheduled tribe	7631	16.3
Others	30514	65.1
Birth order		
less than or equal to 2	28274	60.3
3-4	12083	25.8
5 and above	6518	13.9
Religion		
Hindu	33544	71.6
Muslim	6894	14.7
other	6437	13.7
Preceding birth interval (months)		
less than 24 months	8797	18.8
24-48	31784	67.8
48+	6294	13.4

There were several missing values in the data. To estimate the missing values expectation –maximization technique is used. A logistic regression analysis is used to examine the relationship between the state of residence and three measures of

nutritional status, while controlling socio-demographic variables described above. There are total 29 categories of state of residence, with Kerala as reference category. We present the result as odds ratio (along with their 95%confidence interval).if the odds ratio is greater than 1, the relationship is positive and if it is less than 1, the relationship is negative. In this paper we have estimated two models, the first model presents the zero-order relationship between the state of residence and nutritional status whereas the second model includes all independent variable as controls.

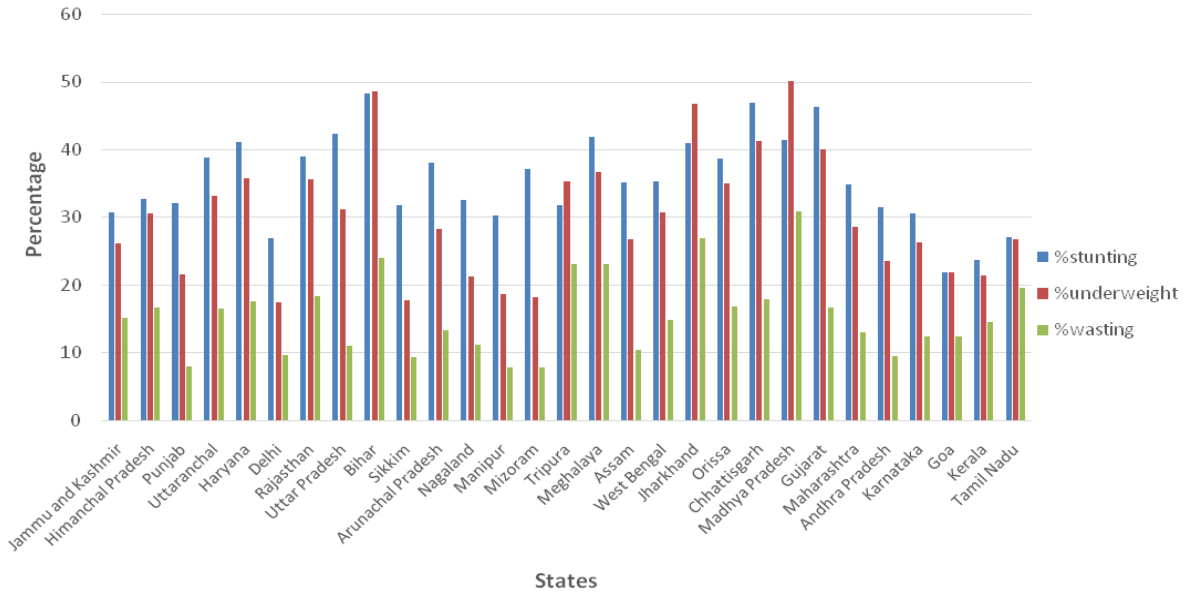

Fig.1: Stunting, underweight, wasting percentage by state, India, 2005-0

Table 2:Partial Result of Logistic Regression Analysis of stunting:

Independent variables	**Model 1**		**Model 2**	
	OR	**95% CI**	**OR**	**95% CI**
State				
Kerala				
Himachal Pradesh	1.570***	1.273- 1.937	1.346**	1.085-1.670
Punjab	1.518***	1.244-1.854	1.178	.955-1.454
Uttaranchal	2.047***	1.678-2.496	1.458***	1.187-1.790
Haryana	2.249***	1.850-2.736	1.548***	1.264-1.894
Delhi	1.186	.967-1.455	1.005	.811-1.245
Rajasthan	2.051***	1.706-2.466	1.131	.933-1.371
Uttar Pradesh	2.369***	2.005-2.798	1.338**	1.124-1.592
Bihar	3.010***	2.515-3.602	1.603***	1.328-1.934
Sikkim	1.501**	1.183-1.905	1.119	.875-1.431
Arunachal Pradesh	1.981***	1.596-2.459	1.069	.850-1.346
Nagaland	1.555***	1.291-1.874	.915	.747-1.121
Manipur	1.403***	1.160-1.697	.962	.789-1.172
Mizoram	1.898***	1.531-2.352	1.387**	1.094-1.757
Tripura	1.502**	1.185-1.905	.877	.687-1.119
Meghalaya	2.316***	1.878-2.857	1.316*	1.047-1.654
Assam	1.744***	1.421-2.139	1.022	.828-1.261
West Bengal	1.756***	1.460-2.111	1.057	.874-1.280
Jharkhand	2.228***	1.844-2.692	1.150	.944-1.402
Orissa	2.032***	1.685-2.450	1.125	.925-1.368
Chhattisgarh	2.847***	2.359-3.436	1.547***	1.271-1.884
Madhya Pradesh	2.283***	1.915-2.722	1.350**	1.123-1.623
Gujarat	2.771***	2.294-3.348	1.886***	1.550-2.294
Maharashtra	1.720***	1.440-2.053	1.381**	1.149-1.659
Andhra Pradesh	1.479***	1.231-1.776	1.085	.897-1.311
Karnataka	1.415***	1.176-1.702	.905	.748-1.096
Goa	.902	.713-1.140	.814	.640-1.035
Jammu and Kashmir	1.426**	1.138-1.787	.902	.715-1.137
Tamil Nadu	1.199	.988-1.455	.848	.694-1.035

Table2 to be continued…				
Place of residence				
urban				
rural			.990	.942-1.041
Education of Parents				
No education				
Primary			.962	.906-1.022
Secondary			.820***	.776-.867
higher			.479***	.428-.536
Wealth Index				
richest				
richer			2.444***	2.231-2.678
middle			2.218***	2.039-2.413
poorer			2.026***	1.877-2.188
poorest			1.628***	1.518-1.745
Sex				
Male				
Female			.943**	.907-.981
Type of caste				
scheduled caste				
Scheduled tribe			.901**	.834-.974
Others			.864***	.819-.910
Birth order				
less than or equal to 2				
3-4			1.097***	1.046-1.150
5 and above			1.154***	1.085-1.227
Religion				
Hindu				
Muslim			1.057	.996-1.122
Other			1.030	.943-1.123
Preceding birth interval(months)				
48+				
24-48			1.296***	1.209-1.390
less than 24 months			1.108**	1.044-1.177

Where; * indicates p<0.05, ** indicates p<0.01 and * indicates p<0.001**

Table 3: Partial result of logistic regression analysis of Underweight:

Independent Variable	**Model 1**		**Model 2**	
	OR	**95% CI**	**OR**	**95% CI**
State				
Kerala				
Himachal Pradesh	1.621***	1.307-2.012	1.354**	1.085-1.691
Punjab	1.008	.814-1.249	.815	.651-1.021
Uttaranchal	1.826***	1.487-2.243	1.230	.994-1.521
Haryana	2.049***	1.674-2.509	1.350**	1.096-1.664
Delhi	.772*	.617-.965	.625***	.495-.789
Rajasthan	2.033***	1.681-2.458	1.025	.840-1.250
Uttar Pradesh	1.661***	1.397-1.975	.856	.714-1.026
Bihar	3.478***	2.891-4.184	1.725***	1.422-2.093
Sikkim	.787	.600-1.033	.579***	.437-.765
Arunachal Pradesh	1.446**	1.151-1.817	.784*	.615-.999
Nagaland	.986	.808-1.203	.620***	.499-.770
Manipur	.842	.685-1.034	.575***	.464-.712
Mizoram	.814	.638-1.040	.648**	.496-.846
Tripura	2.001***	1.577-2.539	1.111	.870-1.420
Meghalaya	2.124***	1.711-2.636	1.279*	1.009-1.620
Assam	1.335**	1.077-1.656	.728**	.584-.909
West Bengal	1.628***	1.345-1.970	.917	.753-1.118
Jharkhand	3.219***	2.654-3.905	1.555***	1.270-1.904
Orissa	1.972***	1.625-2.392	.989	.808-1.211
Chhattisgarh	2.581***	2.127-3.133	1.254*	1.023-1.536
Madhya Pradesh	3.694***	3.083-4.426	2.073***	1.716-2.506
Gujarat	2.451***	2.017-2.978	1.572***	1.284-1.924
Maharashtra	1.463***	1.217-1.760	1.149	.949-1.390
Andhra Pradesh	1.126	.929-1.366	.797*	.653-.973
Karnataka	1.305**	1.077-1.581	.791*	.648-.964
Goa	1.027	.809-1.304	.931	.729-1.190
Jammu and Kashmir	1.300*	1.028-1.645	.771*	.605-.982
Tamil Nadu	1.336**	1.096-1.630	.931	.758-1.143
Place of residence				
Urban				
Rural			1.015	.962-1.070

Table 3 to be Continued…				
Education of Parents				
No education				
Primary			.906**	.851-.964
Secondary			.777***	.733-.823
Higher			.481***	.425-.544
Wealth Index				
Richest				
Richer			2.632***	2.389-2.899
Middle			2.318***	2.118-2.537
Poorer			2.019***	1.859-2.193
Poorest			1.606***	1.488-1.733
Sex				
Male				
Female			.991	.951-1.032
Type of caste				
scheduled caste				
Scheduled tribe			.942	.869-1.021
Others			.840***	.796-.888
Birth order				
less than or equal to 2				
3-4			1.117***	1.063-1.175
5 and above			1.166***	1.094-1.243
Religion				
Hindu				
Muslim			1.030	.967-1.096
Other			.844***	.767-.928
Preceding birth interval(months)				
48+				
24-48			1.191***	1.107-1.281
less than 24 months			1.077*	1.011-1.147

Where; * indicates p<0.05, ** indicates p<0.01 and * indicates p<0.001**

Table 4: Partial result of logistic regression analysis of wasting:

Independent Variable	**Model 1**		**Model 2**	
	OR	**95% CI**	**OR**	**95% CI**
State				
Kerala				
Himachal Pradesh	1.185	.916-1.534	1.128	.869-1.464
Punjab	.510***	.384-.677	.482***	.360-.645
Uttaranchal	1.163	.908-1.489	.996	.775-1.281
Haryana	1.258	.987-1.603	1.075	.841-1.375
Delhi	.629**	.479-.826	.602***	.455-.797
Rajasthan	1.330*	1.062-1.666	1.002	.794-1.263
Uttar Pradesh	.726**	.590-.893	.559***	.451-.692
Bihar	1.866***	1.504-2.315	1.400**	1.120-1.750
Sikkim	.610**	.433-.859	.531***	.375-.752
Arunachal Pradesh	.910	.685-1.209	.672**	.499-.906
Nagaland	.747*	.588-.950	.599***	.462-.777
Manipur	.500***	.385-.651	.417***	.319-.546
Mizoram	.501***	.363-.692	.432***	.306-.611
Tripura	1.771***	1.347-2.329	1.358*	1.028-1.794
Meghalaya	1.768***	1.377-2.270	1.325*	1.007-1.742
Assam	.684**	.518-.904	.524***	.396-.695
West Bengal	1.023	.813-1.287	.805	.637-1.017
Jharkhand	2.168***	1.735-2.711	1.553***	1.232-1.957
Orissa	1.190	.945-1.500	.871	.686-1.106
Chhattisgarh	1.283*	1.017-1.619	.920	.723-1.171
Madhya Pradesh	2.644***	2.146-3.256	2.064***	1.663-2.562
Gujarat	1.183	.935-1.498	.997	.784-1.268
Maharashtra	.885	.709-1.104	.813	.649-1.020
Andhra Pradesh	.617***	.485-.784	.551***	.431-.704
Karnataka	.831	.658-1.048	.687**	.542-.871
Goa	.835	.625-1.115	.818	.611-1.096
Jammu and Kashmir	1.054	.795-1.396	.847	.637-1.128
Tamil Nadu	1.441**	1.147-1.810	1.271*	1.006-1.605
Type of residence				
Urban				
Rural			1.031	.964-1.103
Education of Parents				
No education				
Primary			.931	.860-1.009
Secondary			.889**	.825-.958
Higher			.831*	.722-.956

Table 4 to be Continued…				
Wealth Index				
Richest				
Richer			1.604***	1.421-1.811
Middle			1.455***	1.299-1.629
Poorer			1.406***	1.267-1.559
Poorest			1.242***	1.130-1.366
Sex				
Male				
Female			.898***	.853-.945
Type of caste				
scheduled caste				
Scheduled tribe			1.048	.949-1.156
Others			.920*	.859-.986
Birth order				
less than or equal to 2				
3-4			1.057	.992-1.127
5 and above			1.088*	1.004-1.179
Religion				
Hindu				
Muslim			1.024	.944-1.110
Other			.953	.846-1.074
Preceding birth interval(months)				
48+				
24-48			.803***	.733-.880
less than 24 months			.924*	.856-.997

Where; * indicates p<0.05, ** indicates p<0.01 and * indicates p<0.001**

RESULT

Figure 1 present stunting, underweight, wasting percentage of children for 29 states, obtained from the NFHS-3.There are vast state difference in these percentage, exhibiting some kind of regional patterns. Among these three indicators of nutritional status, percentage of stunting, is generally higher in states followed by underweight and wasting. Stunting percentage is generally higher in Haryana, Uttar Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Meghalaya, Jharkhand, and Gujarat with more than 40% cases. Also, underweight cases are observed higher in Bihar, Jharkhand, Madhya Pradesh, and Chhattisgarh with 40% to 50% cases. Likewise, Bihar, Tripura, Meghalaya, Jharkhand, Madhya Pradesh have more percentage of wasting cases (more than 20%).

Characteristics of sample are shown in Table 1. Most of cases (61.8%) are from rural area, and the rest are from urban area.40.8% of the parents having no education and merely 7.7% of the parents having higher education.

We begin the analysis by examining the zero-order relationship between states of residence and stunting, underweight, and wasting, which is shown in the model 1 of Table 2, Table 3, and Table 4 respectively. In model 1 of Table 2, the unadjusted odds ratio indicates that every state except Tamil Nadu, Goa and Delhi, the chances of being in the stunting category are significantly higher as compared to Kerala. And the risk of child being stunted is maximum in Bihar (3.010), Chhattisgarh (2.847). In model 1 of Table 3, the unadjusted odds ratio indicates that chances of child to be underweight for all state is significantly greater than in Kerala except Punjab, Sikkim, Nagaland, Manipur, Mizoram, Andhra Pradesh, and Goa, and the state which are more susceptible to risk of underweight are Bihar (3.478), Jharkhand (3.219) and Madhya Pradesh (3.694). Similarly, model 1of table 4, indicate that every state except Himachal Pradesh, Uttarakhand, Arunachal Pradesh, West Bengal, Odisha, Gujarat, Maharashtra, Karnataka, Goa, and J&K, the chances of child to be wasted is significantly higher than in Kerala. The state like Madhya Pradesh (2.644) and Jharkhand (2.168) are more susceptible to the risk of wasting.

However, the results change when various confounders are taken into account. In model 2 of Table 2, Table 3, and Table 4 various socio-economic variables are taken under consideration.

In model 2 of Table 2, which controls for set of socio-economic variables, the odds ratio are reduced to insignificant for various states like Rajasthan, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Tripura, Assam, West Bengal, Odisha, Andhra Pradesh, Karnataka, J&K, whereas they remain significant for rest of the states with particularly Uttaranchal (OR=1.458;CI=1.1871.790), Haryana (OR=1.548;CI=1.2641.894), Bihar (OR=1.603;CI=1.328-1.934), Chhattisgarh (OR=1.547;CI=1.271 -1.884), Gujarat (OR=1.886;CI=1.550-2.294), highly significant.

In Model 2 of Table 3, the states like Uttaranchal, Uttar Pradesh, Rajasthan, Orissa, Arunachal Pradesh, Tripura, West Bengal, Maharashtra, and Tamil Nadu reduced to insignificant. While remaining states were significant with particularly Bihar (OR=1.725; CI=1.422-2.093), Jharkhand (OR=1.555; CI=1.270-1.904), M.P (OR=2.073; CI=1.716-2.506), Gujarat (OR=1.572; CI=1.284-1.924), highly significant. There are few states viz; Sikkim, Nagaland, Manipur, which become significant in model 2, however they were not significant in model 1.

In Model 2 of Table 4, Rajasthan and Chhattisgarh reduced to insignificant. While remaining states were significant with particularly Punjab (OR=0.482; CI=0.360-0.645), Delhi (OR=0.602;CI=0.455-0.797), U.P (OR=0.599;CI=0.451-0.692), Sikkim (OR=0.531;CI=0.375-0.752), Nagaland (OR=.599;CI=0.462-0.777), M.P (OR=2.064; CI=1.663-2.562), etc. highly significant. Also, there are two states, Arunachal Pradesh, and Karnataka which become significant in model 2, however they were not significant in model 1. This is to be expected, given the fact that region and states differs enormously in terms of their social and economic conditions.

Among the socio-demographic variables, education of parents, wealth index, type of castes, Birth order, preceding birth intervals (months) emerge as most important.

In all the three indicators of nutritional status, (stunting, underweight, wasting), it is observed that higher the education level of parents, lower is the risk of child being stunted, underweight, and wasted.

In wealth index it is apparent that as the level of wealth index decreasing, the risk of child being stunted, wasted and underweight increasing.

In stunting both schedule tribe and caste other than schedule caste, is coming out to be significant and is at lower risk than schedule caste. While in underweight and wasting caste other than SC and ST is coming out to be significant and at lower risk than SC.

In stunting and underweight the birth order greater than 2 are coming out to be significant and are at greater risk. And in case of wasting, birth order of 5 and above is coming out to be significant with higher risk.

For the Preceding birth interval, it is apparent that shorter is the birth interval, higher is the risk of getting stunting, underweight and wasting.

DISCUSSION AND CONCLUSION

One of the most important public health problems in India is that of malnutrition in children. This not only obstructs the growth of children, but also has long-term implications. It has a negative impact on future human performance, health and life expectations of children. A recent study estimated that about 53% of all deaths in young children are attributable to being underweight. [14]

This study showed nutritional status of children is coming out to be significant with various socio-economic variables specially education of parents, wealth index, Birth order. Thus, national public health intervention programmer and stakeholder working on improving child nutrition should focus on these determinants to reduce undernutrition output. Program planner and

policy makers should consider & strengthen collaboration and coordination of nutritional program that aimed to alleviate nutritional deficiencies and family health program.

There is vast regional variation in nutritional status in India. In order to explain the reason behind these variation, we analyses individual level data from the National Family Health Survey, 2005-06 (NFHS-3) and examine the roles of various social economic and demographic covariates of three measures nutritional status: stunting, underweight, wasting. In certain cases geographic location, environmental condition may influence health condition. In our analysis in majority of cases, state, or regional difference in nutritional status are largely explained by social, economic and demographic characteristics of people. For example, Bihar, Madhya Pradesh, Chhattisgarh, Meghalaya, Mizoram, Jharkhand etc. which are regions characterized by lower socio-economic status. We find that when pertinent background variables are controlled, the risks of malnutrition in various states are no different from that of Kerala. These findings are similar to those in some previous studies, [14] which uses different sets of data and different analytical technique.

Finding of our analysis suggest that even if few states like (Madhya Pradesh, Jharkhand, Bihar, Mizoram, Meghalaya etc.) attained socio-economic status that of Kerala, the children in these states are at higher risk of being undernourished. It appears that public health policies and programmes (e.g.; the National Health Policy of 2002) have not been able to reach the most Vulnerable section of population in these states.

We also found that background variables are usually more powerful predictor of nutritional status of children. Parents with no education have children with the worst nutritional statuses but this improves progressively as parents gain higher levels of education. Illiterate parents are not aware of the necessities and ways and means of providing nutritionally balanced food to children. The children of Bihar, Madhya Pradesh, Jharkhand, Mizoram etc. are found to be affected most as far as nutritional levels are concerned. Likewise, wealth index too playing its significant role in nutritional status. Nutritional status become better as one go from lower wealth index to higher. This is justifiable because in higher wealth index children have better access of food and environment. Higher birth order, and preceding birth interval (months) were also having their important role in nutritional status of children. So, these factors and states need to be taken under consideration while designing policies and plans regarding nutrition of children.

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