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Analysis Of The Determinants Of Child Malnutrition In Bihar

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Abstract

This paper intends to investigate and analyse some of the major factors affecting key indicators of child malnutrition in the Indian state of Bihar. The anthropometric measures of stunted, severely stunted, underweight, severely underweight, wasted and severely wasted has been analysed for children under 5-year age using analysis of variance method against various factors viz. gender, type of place of residence, toilet facility, level of mother's education and wealth index within state. NFHS – 4 data have been used for the purpose. The study finds a fairly significant effect of these factors on the prevalence of child malnutrition. Proper government intervention is recommended to counter these adverse effects.

Keyword: Child malnutrition, level of mother's education, wealth index, ANNOVA

Introduction

Malnutrition is most commonly seen, ignored and undertreated health problem. Child malnutrition is a major cause of concern in developing world. Undernutrition (insufficient intake of food) causes 3.1 million child fatalities annually, or 45% of all deaths involving children under five.[1] WHO (2007) report suggests that by the start of the century, very few countries had malnutrition countries higher than that of India. Even within India there is vast disparity among the states with respect to different indicators of malnutrition. It is evident that the poorer states have worst numbers of malnutrition among children accentuating cycle of backwardness. But apart from poor income levels there are multitudes of factors that affect malnutrition at various levels.

Several methods adopted for measuring malnutrition. In this paper we have adopted six indicators relating to malnutrition. These indicators are stunting, severely stunted, underweight, severely underweight, wasted and severely wasted. Overall, the performance of Bihar indicate that it has not been performing well compared to other states. According to the NHHS 4 report, Bihar is the worst performing state in child stunting with 48 % children under 5-year age being stunted. The next worst performers are Uttar Pradesh (46%), Jharkhand (45%) and Meghalaya (44%) respectively while Kerala and Goa with 20 % of their children being stunted are the best performers. The national average of child stunting is 38%. Although in the case of wasted children, Bihar has comparable prevalence as national average (21%), but in the case of overweight children, only Jharkhand (48%) has worse scenario than Bihar (44%). The national average stands at for wasted and underweight children are 21% and 36% respectively.

In the context of Bihar, several factors are influencing child malnutrition. These factors are not only economic in nature but there are socio-economic and cultural factors too. Non-awareness toward immunization programmes and family planning measures along with societal apathy towards girl child and dangers of open defecation has a role in large scale incidence of malnutrition. Considering girl child as a burden and neglect of girl's education has multi-faceted impact on malnutrition. Economic factors include family income, wealth endowment etc.

This paper seeks to investigate some of these factors in the case of state of Bihar, one of the poorer states in India. These investigations are based on socio-economic factors like gender of the child, type of place of residence, toilet facilities and mother's level of education and wealth index within state. The wealth index is a relative measure to gauze the relative endowment of wealth.

The paper is arranged in the following ways. The next section deals with the discussion of relevant literatures across the world encompassing specific studies related to India, and Bihar. Next section presents the methodology and the data used have been discussed followed by the results and their discussions. By the end policy implications and conclusion have been incorporated.

[1] The Lancet's Series on Maternal and Child Undernutrition, Executive Summary, available at: http://www.thelancet.com/series/maternal-and-child-nutrition

Review of Literature

There are several researches undertaken on the issue of malnutrition. In particular, a wide range of literature is available on identifying the determinants of malnutrition across the globe. This section therefore, presents discussion on literature for the world in general and for India and Bihar in particular. Across the different regions of world, Griffiths et al. (2004) found that factors that predict wasting in different regions in the world which include age, mother education, length of breastfeeding, the size of the child at birth, and recent episodes of diarrhoea.

Rahman and Chowdhury (2007) looked into how certain socioeconomic, demographic, health, and community factors affected chronic malnutrition or stunting in Bangladeshi children under the age of five, they found that a number of factors, including parents' education, household economic status, media exposure, place of delivery, child's age, birth order, months of breastfeeding, birth size, mother's BMI, mother's height, age of the household head, measles vaccination, and regional differences, were significantly linked to both severe and moderate stunting. Similarly, in a study involving preschool-aged children in Egypt, El-Sayed et al. (2001) discovered a correlation between low prevalence of stunting and underweight and high socioeconomic status.

Glanville, Bollen, and Stecklov (2001) investigated individual-level correlates of child health in developing nations are the mother's level of education and household wealth. The study is undertaken in developing countries. According to Singh et al. (2009), there were several significant predictors of underweight among children in Nepal, including low maternal body mass index, child age, higher birth order, and lower standard of living score. In their paper Jayachandran and Pande (2015) found a contrast result while studying the birth order factor affecting malnutrition among children of Indian and sub-Saharan African regions. It was found that some children in Africa have worse outcomes than others in the context of birth order but in Indian context, firstborn children do better when their father is the eldest son in the family. After reviewing the literature on the determinants of malnutrition, Katoch (2022) discovered that the factors that were most consistently linked to malnutrition in children were the age of the child, the size of the family, the order of birth in the family, the mother's nutritional status, the mother's education, and the child's birth weight. This study has coverage of 37 countries across globe.

Akombi et al. (2017) found that poverty, the age and sex of the child (male), and the mother and father's low level of education were all linked to various types of malnutrition in Sub-Saharan Africa. Nie et al. (2019) linked changes in undernutrition in Indian children to household wealth, mother BMI, autonomy, and education. According to Khan et al. (2018), maternal BMI and household poverty were found to be powerful and significant predictors of stunting, wasting, and underweight in all Indian districts. Women's educational attainment and breastfeeding practices were also found to be significant predictors of stunting and underweight. Pathak & Singh (2011), impoverished children in India accounted for a disproportionate share of the country's malnutrition burden.

In Indian context, there are also research conducted both in rural and urban areas. Such investigation helps in finding effective factors that causes malnutrition among children. This also helps in identifying appropriate policies. In this process, Imai et al. (2014) looked into the short-term relationship between a mother's relative education and her children's nutritional status in the context of rural area. In urban context, Kumar and Singh (2013) found that mothers' poor health, low educational attainment, and limited use of health care services all contribute to undernutrition in children from low-income households.

Chalasani (2012) finds in his study on India that the two main factors contributing to differences in child health at the individual or household level are unequal wealth distribution and unequal maternal education.

A significant and growing disparity in childhood malnutrition exists between rural and urban areas in India, according to a study conducted by Kumar and Kumari (2014).

According to Mazumdar (2010), there is a disproportionate burden of malnutrition on the poor, as poverty has a significant impact on average rates of malnutrition relative to the wealth index. Malnutrition inequality and overall socioeconomic inequality have a moderately positive macroeconomic correlation.

Ladusingh and Bawdekar (2008) studied Indian scenarios. The findings of the study indicate that the state of severe malnutrition is positively impacted by developmental factors such as road connectivity, community literacy, sanitary facilities, and household standard of living. In addition, compared to the scheduled castes, another Aboriginal group, the scheduled tribe, an impoverished Aboriginal group, is more vulnerable to severe malnourishment because of inadequate development, a lack of knowledge about preserving and improving the nutritional value of food, and a lack of hygiene and sanitation.

There is limited research available in the context of Bihar. Pandey (2021), women's literacy and access to resources for the home, which also give them the ability to make decisions, are significant factors in the decline in malnutrition in Bihar. Similarly, Kumari and Aashita (2021) discovered that the mother's education level, the wealth index, and the use of contraceptives all had a major impact on malnutrition. A study by Ajmer et al. (2021), there is a significant increase in the risk of stunting in Bihar and throughout India for older children, children of higher birth orders, children who practise unsafe stool disposal, children whose mothers have less education, and children who live in impoverished households. The current paper also deals with the scenario of malnutrition in Bihar. The current paper is an addition to the available literature on Bihar.

Method and data source

The objective of this paper is to identify factors affecting child malnutrition in Bihar significantly. The paper used data of NFHS-4 for the year 2015-16 sourced from Survey data of the Demographic and Health Surveys (DHS) Program. The indicators of child malnutrition used for this purpose are stunted, severely stunted, overweight, severely overweight, wasting and severely wasted. These data are available for all the districts of Bihar. The respondents of NFHS-4 are further categorised in different categories. There are variables which have only two categories viz. Gender, Toilet facilities and Type of place of residence. Therefore, the paper uses independent sample t test for comparing means of these categories as factor affecting indicators of malnutrition. Variables like level of mother's education and wealth index of family are divided into more than two categories. Therefore, for these variables, the paper uses one-way ANOVA for identifying the factors affecting child malnutrition. Thus, the paper has identified socio-economic and cultural factors affecting child malnutrition based on several literature. The purpose of using analysis of variance is to see the performance of children belonging to a group compared to children belonging to another group particularly in the context of Bihar. For this purpose, several studies used logistics regression analysis due to the fact that data is categorical. However, this paper uses analysis of variance. The analysis is divided in two parts. First part deals with independent variables having two categories and the second part deals with independent variables having more than two categories.

Results and Discussion

As discussed above, the paper uses analysis of variance as method to compare means in order to identify socio-economic and cultural factors affecting malnutrition significantly. The summary of the data is given in table 1.

Table 1. Summary of the Data

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Stunted	22,556	0.00	1.00	0.4781	0.49953
Severely Stunted	22,556	0.00	1.00	0.2289	0.42013
Underweight	22,556	0.00	1.00	0.4407	0.49649
Severely Underweight	22,556	0.00	1.00	0.1544	0.36131
Wasted	22,556	0.00	1.00	0.2121	0.40877
Severely Wasted	22,556	0.00	1.00	0.0732	0.26039
Region	25,437	1.00	5.00	2.9780	1.40755
Birth order	25,437	1.00	3.00	1.9604	0.72928
Religion	25,437	1.00	3.00	1.1713	0.37978
Social Group	25,226	1.00	4.00	2.6535	0.98060
Toilet Facility	24,217	1.00	2.00	1.7200	0.44901
Household Size	25,437	1.00	4.00	2.3938	0.92259
Mother's Highest Educational Level	25,437	0	3	0.79	0.976
Wealth Index Within State	25,437	1	5	2.83	1.368
Type of Place of Residence	25,437	1	2	1.90	0.302
Sex of Child	25,437	1	2	1.48	0.500

Source: Author's Calculation based on NFHS-4 data

Table 1 presents descriptive statistics of variables. Variable wise number of observations are given, indicating that number of observations varies for different variables. Both mean and standard deviation of indicators of malnutrition are also given in the table.

Analysis of factors having two categories

In the first case, it is analysed whether gender has significant impact on child malnutrition or not. Gender being dichotomous variable, the performance of male and female gender is analysed using independent sample t test for all the selected indicators of malnutrition. The group statistics of both the gender is given in table 2, for all identified indicators of child malnutrition. In the case of stunted, the average prevalence of malnutrition among male children is 0.47 whereas the same for female children is 0.48. Average prevalence of severely stunted among male children is 0.23 and for female children is 0.22. In the case of underweight, average prevalence among male children in Bihar is 0.43 while the same among female children is 0.45. The case of severely underweight suggests that average prevalence of malnutrition among male children is 0.15 and prevalence of the same among female children is 0.16. Wasting is another indicator of malnutrition. Severity of the same is also considered for the analysis. In the case of wasting, average prevalence among

male children in Bihar is 0.22 whereas that of the female children is 0.21. The rate of prevalence of the severity of this among male children is 0.08 and the same among female is 0.07.

Table 2. Gender Wise Group Statistics of Child Malnutrition in Bihar

Indicators of Malnutrition	Gender of child	N	Mean	Std. Deviation	Std. Error Mean
Stunted	Male	11641	.4733	.49931	.00463
	Female	10915	.4832	.49974	.00478
Severely Stunted	Male	11641	.2301	.42094	.00390
	Female	10915	.2276	.41929	.00401
Underweight	Male	11641	.4315	.49531	.00459
	Female	10915	.4506	.49757	.00476
Severely Underweight	Male	11641	.1472	.35427	.00328
	Female	10915	.1621	.36853	.00353
Wasted	Male	11641	.2166	.41192	.00382
	Female	10915	.2072	.40535	.00388
Severely Wasted	Male	11641	.0747	.26298	.00244
	Female	10915	.0715	.25761	.00247

Source: Author's Calculation

Table 3 presents result of independent sample t test. The t test values are given for two scenarios based on assumptions related to the variance in the data set. One is related to equal variance assumed and other is related to equal variance not assumed. Levene's statistics is used to understand the variances in data set. The null hypothesis of Levene's statistics is there exists equal variance in the data set. If the test statistics is significant then the null hypothesis is rejected and it is therefore, suggested to take t statistics for the case of equal variance not assumed. Similarly, the null hypothesis for t statistics is that there is no significant difference between the mean of male and female. If the t statistics is less than 0.05, the null hypothesis is rejected and it is concluded that there is a significant difference in the means of male and female and vice versa. In table 3, considering stunting, the t statistics is insignificant as the statistics has P-Value more than 0.05. Similar is the case of severely stunted children where there is no significant difference in the prevalence of malnutrition among both the gender of the children. The case of underweight and severely underweight is however different. Levene's test suggests to use t statistics for equal variance not assumed. The t statistics suggests that there is significant difference in the prevalence of underweight and severely underweight among male and female genders. Thus, this suggests that gender is affecting the prevalence of malnutrition among children in Bihar.

Table 3. Gender as Factor of Malnutrition, Result of Independent Sample t Test

Indicators of Malnutrition		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Stunted	Equal variances assumed	8.241	0.004	-1.482	22554	0.138	-0.00986	0.00666
	Equal variances not assumed			-1.482	22458.32	0.138	-0.00986	0.00666
Severely Stunted	Equal variances assumed	0.836	0.361	0.457	22554	0.648	0.00256	0.0056
	Equal variances not assumed			0.457	22471.79	0.648	0.00256	0.0056
Underweight	Equal variances assumed	32.161	0.000	-2.885	22554	0.004	-0.01908	0.00661
	Equal variances not assumed			-2.884	22447.21	0.004	-0.01908	0.00661
Severely Underweight	Equal variances assumed	38.422	0.000	-3.1	22554	0.002	-0.01492	0.00481

	Equal variances not assumed			-3.096	22313.68	0.002	-0.01492	0.00482
Wasted	Equal variances assumed	11.741	0.001	1.712	22554	0.087	0.00932	0.00545
	Equal variances not assumed			1.713	22501.45	0.087	0.00932	0.00544
severely wasted	Equal variances assumed	3.565	0.059	0.944	22554	0.345	0.00327	0.00347
	Equal variances not assumed			0.944	22510.86	0.345	0.00327	0.00347

Source: Author's calculations

The results for wasted and severely wasted indicate that prevalence of wasting and severity of the same is significantly different among both the gender as the p-value of t statistics is 0.009 in the case of wasting and 0.003 in the case of severely wasted. Thus, gender is a significant factor affecting wasting in Bihar.

Table 4. Descriptive Statistics of Malnutrition among Children Living in Rural and Urban Areas of Bihar

Indicators of Malnutrition	Type of Place of Residence	N	Mean	Std. Deviation	Std. Error Mean
Stunted	Urban	2334	.3920	.48831	.01011
	Rural	20222	.4880	.49987	.00352
Severely Stunted	Urban	2334	.1598	.36651	.00759
	Rural	20222	.2369	.42517	.00299
Underweight	Urban	2334	.3779	.48496	.01004
	Rural	20222	.4480	.49730	.00350
Severely Underweight	Urban	2334	.1238	.32945	.00682
	Rural	20222	.1579	.36465	.00256
Wasted	Urban	2334	.2159	.41156	.00852
	Rural	20222	.2116	.40845	.00287
Severely Wasted	Urban	2334	.0810	.27286	.00565
	Rural	20222	.0722	.25890	.00182

Source: Author's calculation

Table 5 presents results of independent sample t test. The test statistics suggests that place of residence is significantly affecting stunting, sever stunting, underweight and sever underweight. However, this factor is not significantly affecting wasting and its severity. This conclusion is been based on the test statistics. In the case of stunting, t statistics is -0.97 which has significant p-value at 0.01. The t statistics is taken for equal variance not assumed as Levene's statistics is significant, rejecting the null hypothesis of equal variance assumed. The result show that prevalence of stunting in rural and urban areas are significantly different. The average rate of prevalence of stunting in rural is 0.49 compared to 0.39 in urban areas. It clearly suggests that prevalence rate of stunting is significantly high in rural areas of Bihar. The results for severely stunting indicates a similar pattern. t statistics is -9.45 with p-value less than 0.01 suggesting that the prevalence rate of severe stunting is significantly different in both rural and urban areas. The average prevalence rate in rural areas is higher than that among children living in urban areas. As per details in table 4, average prevalence rate is 0.24 in rural areas, whereas it is 0.16 in urban areas.

The results related to underweight and severely underweight also indicate that prevalence rate is significantly different in rural and urban areas as the t statistics for underweight and severely underweight is -6.59 and -4.68 respectively. These statistics are significant at p-value less than 0.01. The average rate of prevalence as per table 4 for both the cases suggests that children living in rural areas have higher rate of prevalence than children living in urban areas. In the case of wasted and severely wasted, the t statistics suggests that rate of prevalence of these problems of malnutrition are not significantly different in rural and urban areas. The t statistics for wasted is 0.49 with p-value of 0.63 (not significant at 0.05). The same is in the case of severely wasted is 1.47 with p-value of 0.14 (not significant at 0.05). Average rate of prevalence of wasting among children living in rural areas is 0.21 compared to 0.22 in urban areas. In the case of severely wasted, it is 0.072 in rural areas as compared to 0.81 in urban areas. Thus, the prevalence rate of these two problems is similar in rural and urban areas in Bihar. It is, therefore, construed that type of place of residence does not significantly affect wasting and its severity.

Table 5. Result of Independent Sample t Test for Prevalence of Malnutrition in Urban and Rural Areas

Indicators of Malnutrition		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Stunted	Equal variances assumed	867.97	0.00	-8.81	22554.00	0.00	-0.10	0.01
	Equal variances not assumed			-8.97	2926.54	0.00	-0.10	0.01
Severely Stunted	Equal variances assumed	352.53	0.00	-8.40	22554.00	0.00	-0.08	0.01
	Equal variances not assumed			-9.45	3105.38	0.00	-0.08	0.01
Underweight	Equal variances assumed	323.69	0.00	-6.46	22554.00	0.00	-0.07	0.01
	Equal variances not assumed			-6.59	2928.67	0.00	-0.07	0.01
Severely Underweight	Equal variances assumed	80.66	0.00	-4.32	22554.00	0.00	-0.03	0.01
	Equal variances not assumed			-4.68	3032.45	0.00	-0.03	0.01
Wasted	Equal variances assumed	0.93	0.34	0.49	22554.00	0.63	0.00	0.01
	Equal variances not assumed			0.48	2889.29	0.63	0.00	0.01
Severely Wasted	Equal variances assumed	9.26	0.00	1.53	22554.00	0.13	0.01	0.01
	Equal variances not assumed			1.47	2839.53	0.14	0.01	0.01

Source: Author's calculation

Toilet facility in family is another factor taken for examination. The objective of choosing this factor is the objective that family with toilet facilities have significantly different and lower rate of prevalence of the indicators of malnutrition compared to the families with no toilet facilities. The NFHS data provides these statistics. Table 6 presents descriptive statistics of the same. Table 7 presents result of independent sample t test for the indicators of malnutrition and toilet facility as independent variable.

The result in the case of stunting indicates t statistics of the test assuming no equal variance (based on Levene's test) is -22.28 with p-value less than 0.01. This suggests that prevalence rate of stunting varies significantly among children belonging to families with toilet facilities when compared to the children belonging to families without toilet facilities. Average rate of prevalence of stunting among children belonging to families with no toilet facilities is 0.53 compared to 0.36 among children belonging to families with toilet facilities. Therefore, prevalence rate of stunting among children belonging to families with no toilet facilities is significantly higher than those who belong to families with toilet facilities.

Table 6. Descriptive Statistics of Malnutrition among Children in Family with and without Toilet Facility

Indicators of Malnutrition	Toilet facility	N	Mean	Std. Deviation	Std. Error Mean
Stunted	Yes	6107	.3642	.48124	.00616
	No	15410	.5280	.49923	.00402
Severely Stunted	Yes	6107	.1448	.35188	.00450
	No	15410	.2650	.44133	.00356
Underweight	Yes	6107	.3437	.47498	.00608
	No	15410	.4829	.49972	.00403
Severely Underweight	Yes	6107	.0951	.29343	.00375
	No	15410	.1793	.38362	.00309

Wasted	Yes	6107	.1890	.39151	.00501
	No	15410	.2211	.41499	.00334
Severely Wasted	Yes	6107	.0601	.23768	.00304
	No	15410	.0781	.26839	.00216

Source: Author's Calculation

In the case of sever stunting, it may be observed from the table 7 that prevalence rate of severely stunted children with toilet facilities significantly differs from that among children belong to families with no toilet facilities as the t statistics is -20.95 with p-value less than 0.01. Average rate of prevalence of severe stunting is 0.15 among children belonging to families with toilet facilities while for those belonging to families with no toilet facilities for which the rate is 0.27.

Table 7. Result of Independent Sample t Test for Prevalence of Severe Stunting among Children belonging to Families with and without Toilet Facilities

Indicators of Malnutrition		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Stunted	Equal variances assumed	1008.65	0.00	-21.93	21515.00	0.00	-0.16	0.01
	Equal variances not assumed			-22.28	11589.59	0.00	-0.16	0.01
Severely Stunted	Equal variances assumed	1813.76	0.00	-19.02	21515.00	0.00	-0.12	0.01
	Equal variances not assumed			-20.95	13944.30	0.00	-0.12	0.01
Underweight	Equal variances assumed	1575.94	0.00	-18.68	21515.00	0.00	-0.14	0.01
	Equal variances not assumed			-19.09	11742.49	0.00	-0.14	0.01
Severely Underweight	Equal variances assumed	1098.63	0.00	-15.45	21515.00	0.00	-0.08	0.01
	Equal variances not assumed			-17.31	14536.46	0.00	-0.08	0.00
Wasted	Equal variances assumed	113.82	0.00	-5.20	21515.00	0.00	-0.03	0.01
	Equal variances not assumed			-5.33	11825.16	0.00	-0.03	0.01
Severely Wasted	Equal variances assumed	86.02	0.00	-4.59	21515.00	0.00	-0.02	0.00
	Equal variances not assumed			-4.83	12564.58	0.00	-0.02	0.00

Source: Author's Calculation

Analysis of factors having more than two categories

In this section we analyse the two factors viz. wealth index and level of mother's education affecting malnutrition in Bihar. Table 8 presents the Levene's statistics of dependent variables i.e. indicators of malnutrition and wealth index as the factor affecting it. One-Way ANOVA is used for the analysis of mean comparison of different categories as per wealth index. The Levene's statistics are significant in the case of all dependent variables. This indicates that the hypothesis of homogeneity of variance is rejected. Therefore, Dunnet T3 statistics that does not assume equality of variance, is used in order to understand the differences between groups or categories of all the dependent variables.

The result of the One-Way ANOVA is given in table 9. The table indicates that there is significant difference between income groups suggesting that the average prevalence of malnutrition is different among children of different family incomes. The table 10 presents the result of the same and shows only those comparisons for which t statistics is significant.

Results for all groups are placed at Annexure I along with their respective descriptive statistics. The result indicates that there is significant difference in the prevalence of stunting among children living in poorest families and those living in poorer, middle, richer and richest families. Descriptive statistics placed at annexure I suggests that average prevalence of stunting among children in poorest families is 0.57 and 0.54, 0.49 in middle income families while 0.42 and 0.29 among richest families in thar order. There is also significant difference in the average prevalence of stunting among children living in poorer families when compared to children living in middle income, richer and richest families. There is also significant difference in the average prevalence of stunting in children living in middle income families when compared with children belonging to the richer and richest. Similar result is noted in the case of richest and richer.

In the case of severely stunted, average prevalence of severity of stunting among children living in poorest, poorer, middle income, richer and richest families are 0.31, 0.27, 0.24, 0.18 and 0.10 respectively. As per table 10, significant difference is observed in the prevalence of severity of stunting among children living in poorest families when compared to other four categories. The case of poorer is little different. There is significant difference in the average prevalence rate among children living in poorer families compared to the children living in middle income, richer and richest families. In the case of middle income families, there is significant difference in the rate of prevalence of stunting when compared to children living in other four categories. Similar is the case of children living in richer and richest families.

Table 8. Levene's test of Homogeneity of Variance of Malnutrition among Children in with Family Income as Factors

Indicators of Malnutrition	Levene Statistic	df1	df2	Sig.
Stunted	572.459	4	22551	.000
Severely Stunted	793.024	4	22551	.000
Underweight	693.126	4	22551	.000
Severely Underweight	454.636	4	22551	.000
Wasted	47.351	4	22551	.000
severely wasted	24.980	4	22551	.000

Source: Author's calculation

The result for underweight and severity of the same indicates that there is a significance difference in the average prevalence of rate of underweight and its severity among children living in different categories of families. The descriptive statistics shows that the average prevalence rate of underweight among children living in poorest, poorer, middle income, richer and richest families are 0.52, 0.50, 0.45, 0.40 and 0.28 respectively. In the case of severity of underweight, average rate of prevalence among children living in poorest, poorer, middle income, richer and richest families are 0.21, 0.19, 0.15, 0.11 and 0.08 respectively. As per table 10, a significant difference in the average prevalence of underweight among children living in poorest families compared to children living in middle income, richer and richest families is observed. The rate of prevalence of underweight is not significantly different between children living in poorest and poorer families. However, there is a significant difference in average rate of prevalence of underweight among children living in poorer families and those belonging to middle income, richer and richest families. Significant difference is also observed in the case of children living in middle income families and children living in other four types of families. It is observed that average rate prevalence among children living in richest families are significantly and lowest compared to children living in other four categories. Similar kind of differences are observed in the case of severity of underweight.

In the case of wasted and the severity of the same, there is significant difference in the rate of prevalence of wasting among children living in poorest families when compared to children living in richer and richest families. The average rate of prevalence of wasting among children living in poorer and middle-income families are significantly different when both are compared to the average rate of prevalence of wasting among children living in richer and richest families. The severity of wasting is also significantly different among children living in poorest/poorer families when compared to the children living in richer and richest families.

As per the descriptive statistics in annexure I, the average prevalence rate of wasting among children living in poorest, poorer, middle income, richer and richest families are 0.22, 0.23, 0.21, 0.19 and 0.19 respectively. In the case of severity of wasting, average rate of prevalence among children living in poorest, poorer, middle income, richer and richest families are 0.08, 0.08, 0.67, 0.67 and 0.06 respectively. In the case of wasting, the prevalence rate among children living in richest/richer families are significantly lower than the poorest and the poorer. In the case of severity of wasting, the prevalence rate among children living in richest/richer families are significantly lower than children living in poorest/poorer families.

Table 9. Result of the One-Way ANOVA: Factor Family Income

Indicator of Malnutrition		Sum of Squares	df	Mean Square	F	Sig.
Stunted	Between Groups	195.573	4	48.893	202.958	.000
	Within Groups	5432.608	22551	.241		
	Total	5628.181	22555			
Severely Stunted	Between Groups	109.132	4	27.283	158.897	.000
	Within Groups	3872.073	22551	.172		
	Total	3981.205	22555			
Underweight	Between Groups	142.617	4	35.654	148.425	.000
	Within Groups	5417.133	22551	.240		
	Total	5559.750	22555			
Severely Underweight	Between Groups	52.180	4	13.045	101.710	.000
	Within Groups	2892.299	22551	.128		
	Total	2944.479	22555			
Wasted	Between Groups	7.752	4	1.938	11.621	.000
	Within Groups	3761.013	22551	.167		
	Total	3768.765	22555			
severely wasted	Between Groups	1.681	4	.420	6.205	.000
	Within Groups	1527.619	22551	.068		
	Total	1529.300	22555			

Source: Author's calculation

Table 10: Multiple Comparison Indicators of Malnutrition using Dunnet T3 statistics, Factor Family Income

Dependent Variable	(I) Wealth index within state	(J) Wealth index within state	Mean Difference (I-J)	Std. Error	Sig.
Stunted	Poorest	Poorer	.02859(*)	0.010	0.042
		Middle	.07557(*)	0.010	0.000
		Richer	.14775(*)	0.010	0.001
		Richest	.27800(*)	0.011	0.001
	Poorer	Middle	.04697(*)	0.010	0.000
		Richer	.11916(*)	0.010	0.001
		Richest	.24940(*)	0.011	0.001
	Middle	Richer	.07218(*)	0.010	0.001
		Richest	.20243(*)	0.011	0.001
	Richer	Richest	.13025(*)	0.011	0.001
Severely Stunted	Poorest	Poorer	.03936(*)	0.009	0.001
		Middle	.07196(*)	0.009	0.000
		Richer	.13381(*)	0.009	0.001
		Richest	.20806(*)	0.008	0.001
	Poorer	Middle	.03260(*)	0.009	0.003
		Richer	.09445(*)	0.009	0.001
		Richest	.16870(*)	0.008	0.001
	Middle	Richer	.06185(*)	0.008	0.001
		Richest	.13610(*)	0.008	0.001
	Richer	Richest	.07425(*)	0.008	0.001
Underweight	Poorest	Middle	.06473(*)	0.010	0.000
		Richer	.12213(*)	0.010	0.001
		Richest	.23284(*)	0.011	0.001
	Poorer	Middle	.05148(*)	0.010	0.000
		Richer	.10888(*)	0.010	0.001
		Richest	.21958(*)	0.010	0.001
	Middle	Richer	.05740(*)	0.010	0.001
		Richest	.16811(*)	0.011	0.001
	Richer	Richest	.11071(*)	0.011	0.001
Severely Underweight	Poorest	Poorer	.02357(*)	0.008	0.035

		Middle	.05881(*)	0.008	0.000
		Richer	.09824(*)	0.008	0.001
		Richest	.13899(*)	0.007	0.001
	Poorer	Middle	.03524(*)	0.008	0.000
		Richer	.07467(*)	0.007	0.001
		Richest	.11543(*)	0.007	0.001
	Middle	Richer	.03943(*)	0.007	0.001
		Richest	.08019(*)	0.007	0.001
	Richer	Richest	.04075(*)	0.007	0.001
Wasted	Poorest	Richer	.03744(*)	0.008	0.001
		Richest	.04465(*)	0.009	0.001
	Poorer	Richer	.03960(*)	0.008	0.001
		Richest	.04681(*)	0.009	0.001
	Middle	Richest	.02521(*)	0.009	0.045
severely wasted	Poorest	Middle	.01537(*)	0.005	0.044
		Richer	.01566(*)	0.005	0.043
		Richest	.02504(*)	0.006	0.001
	Poorer	Richest	.02074(*)	0.006	0.003

Source: Author's calculation

* The mean difference is significant at the .05 level.

In the case of mother's level of education, the Levene's test of homogeneity is given in table 11. The result of One-Way ANOVA is given in table 12 and multiple comparisons are given in table 13. As clearly indicated in the table 1, Levene's test is significant rejecting the hypothesis of homogeneity of variance. Therefore, the multiple comparison using posthoc analysis is based on Dunnet T3 test which assumes heterogeneity of variance. The table 12 of ANOVA indicates that there is significant difference in the prevalence of different types of indicators of malnutrition among children when mother's education level varies. The detailed descriptive statistics and multiple comparisons are given in annexure II. The descriptive statistics indicates that in the case of stunting, average rate of prevalence among children whose mother is not educated, primary level educated, secondary level educated and highly educated are 0.55, 0.49, 0.36 and 0.25 respectively. In the case of severity of stunting, the average prevalence rate among children where the mother is not educated, has primary level of education, secondary level of education and higher education are 0.28, 0.21, 0.15 and 0.08 respectively. The results of multiple comparison among only those categories for which statistics has shown significant difference of prevalence rate are given in table 3. The result for all categories is given at annexure II. In the case of stunting, average prevalence rate is significantly higher among children whose mothers are not educated as compared to those whose mothers are either educated at primary level, secondary level or higher level. Similar is the case of children whose mothers are educated at primary and secondary level when it is compared with children whose mother belong to other categories of level of education. It can be observed that the prevalence rate of stunting among children whose mothers have attained higher level of education is significantly lower than those categories of children whose mothers have lower levels of education. This shows that the prevalence of stunting reduces as the education of mother increases. The case of severely stunting is similar to that of the findings of stunting. The table 13 suggests similar pattern in the case of other two indicators of malnutrition. As the mother's level of education increases, the rate of prevalence of underweight with its severity and wasting with its severity decreases. However, the case of wasting and its severity suggests that there is significant difference in the average prevalence rate of wasting between children whose mothers have no education compared to children whose mothers have different levels of education. However, prevalence of wasting is not significantly different in the case of children whose mothers have any level of education. The case of severity of wasting is also similar.

As per the descriptive statistics, average rate of prevalence of underweight among children whose mother are not educated, primary level educated, secondary level educated and highly educated are 0.50, 0.44, 0.35 and 0.23 respectively. The average rate of prevalence of severity of underweight among children whose mother are not educated, primary level educated, secondary level educated and highly educated is 0.12, 0.14, 0.97 and 0.07 respectively. The prevalence rate of wasting among children whose mothers are not educated, primary level educated, secondary level educated and highly educated are 0.23, 0.20, 0.20 and 0.19 respectively. The case of severity of this suggests that average rate of prevalence among children whose mothers are not educated, primary level educated, secondary level educated and highly educated are 0.08, 0.06, 0.65 and 0.07 respectively.

Table 11. Test of Homogeneity of Variances of Indicators of Malnutrition: Factor Mother's Education

Indicators of Malnutrition	Levene Statistic	df1	df2	Sig.
Stunted	734.453	3	22552	.000
Severely Stunted	998.419	3	22552	.000
Underweight	960.927	3	22552	.000
Severely Underweight	528.784	3	22552	.000
Wasted	37.018	3	22552	.000
severely wasted	26.526	3	22552	.000

Source: Author's calculation

Table 12. Multiple Comparison Indicators of Malnutrition using Dunnet T3 statistics, Factor Mother's Level of Education

Indicators of Malnutrition		Sum of Squares	df	Mean Square	F	Sig.
Stunted	Between Groups	184.519	3	61.506	254.808	.000
	Within Groups	5443.662	22552	.241		
	Total	5628.181	22555			
Severely Stunted	Between Groups	102.897	3	34.299	199.445	.000
	Within Groups	3878.308	22552	.172		
	Total	3981.205	22555			
Underweight	Between Groups	139.789	3	46.596	193.884	.000
	Within Groups	5419.961	22552	.240		
	Total	5559.750	22555			
Severely Underweight	Between Groups	45.241	3	15.080	117.305	.000
	Within Groups	2899.238	22552	.129		
	Total	2944.479	22555			
Wasted	Between Groups	4.549	3	1.516	9.084	.000
	Within Groups	3764.216	22552	.167		
	Total	3768.765	22555			
Severely Wasted	Between Groups	1.335	3	.445	6.570	.000
	Within Groups	1527.965	22552	.068		
	Total	1529.300	22555			

Source: Author's calculation

Table 13. Multiple Comparison Indicators of Malnutrition using Dunnet T3 statistics, Factor Family Income

Dependent Variable	(I) Highest educational level	(J) Highest educational level	Mean Difference (I-J)	Std. Error	Sig.
Stunted	No education	Primary	.05180(*)	.01043	.000
		Secondary	.17772(*)	.00756	.000
		Higher	.30100(*)	.01475	.000
	Primary	Secondary	.12593(*)	.01125	.000
		Higher	.24920(*)	.01695	.000
	Secondary	Higher	.12327(*)	.01535	.000
Severely Stunted	No education	Primary	.07075(*)	.00872	.000
		Secondary	.13879(*)	.00601	.000
		Higher	.20301(*)	.00980	.000
	Primary	Secondary	.06804(*)	.00894	.000
		Higher	.13226(*)	.01183	.000
	Secondary	Higher	.06422(*)	.01000	.000
Underweight	No education	Primary	.06166(*)	.01038	.000
		Secondary	.15273(*)	.00751	.000
		Higher	.26950(*)	.01451	.000
	Primary	Secondary	.09107(*)	.01116	.000
		Higher	.20784(*)	.01669	.000
	Secondary	Higher	.11677(*)	.01508	.000
	No education	Primary	.05216(*)	.00743	.000

Severely Underweight		Secondary	.09426(*)	.00515	.000
		Higher	.12346(*)	.00898	.000
	Primary	Secondary	.04210(*)	.00755	.000
		Higher	.07130(*)	.01054	.000
	Secondary	Higher	.02920(*)	.00908	.008
Wasted	No education	Primary	.02843(*)	.00837	.004
		Secondary	.02663(*)	.00628	.000
		Higher	.03841(*)	.01327	.023
Severely Wasted	No education	Primary	.01818(*)	.00514	.002
		Secondary	.01460(*)	.00396	.000

Source: Author's calculation

* The mean difference is significant at the .05 level.

Conclusion

The current paper uses data on malnutrition based on NFHS 4 for the year 2015-16 in order to identify factors that lead to the rise in different indicators of malnutrition. The paper uses analysis of variance as statistical method for doing the same. Based on the analysis and results, it is construed that malnutrition is high among female children as compared to the male children. Therefore, it is important for the government to focus on female children with specific policies and programmes. The second important factor is better sanitation measured by toilet facilities. It is observed that children living in families having toilet facilities has lower level of the prevalence compared to those children living in the families with no toilet facilities. The government has taken up policies and programmes dealing with this. However, special attention is needed in providing toilet facilities to every family so that the chances of bacterial infection to mothers can be reduced. It is also observed that malnutrition is high in rural areas compared to urban areas. Rural centric policies are required to deal with such disparities. The government is also implementing food security programmes in rural areas. However, specific nutritional programme is needed for children below 5 years of age to reduce prevalence of malnutrition among them. Besides, mother's education remains key challenge. It is observed that as the education level of mothers increases, the prevalence of malnutrition decreases among children. Education among female students is a key focus of the government of Bihar. Several scholarship programmes are being implemented which has potential impact on mother's level of education. Finally, family income is also a factor that influence prevalence of malnutrition in Bihar. This needs to be addressed comprehensively. As the family income rises, malnutrition decreases. In this context, government needs to implement programmes to augment it through employment programmes and also through minimum guarantee of income. The paper has limitation that it uses data for the survey year 2015-16. The next round of survey was conducted in 2019-21 which was the period of Covid-19. Therefore, the result of this study suggests the situation better as it deals with normal time period rather an extraordinary time period in which implementation of policies and programmes were difficult. The paper is significant in the context of its method of examination and also in the context of findings.

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Annexure I

Test of Multiple Comparison using Dunnet T3 Test: Factor Wealth Index

Dependent Variable	(I) Wealth index within state	(J) Wealth index within state	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Stunted	Poorest	Poorer	.02859(*)	0.010	0.042	0.001	0.057
		Middle	.07557(*)	0.010	0.000	0.047	0.104
		Richer	.14775(*)	0.010	0.001	0.119	0.176
		Richest	.27800(*)	0.011	0.001	0.249	0.308
	Poorer	Poorest	-.02859(*)	0.010	0.042	-0.057	-0.001
		Middle	.04697(*)	0.010	0.000	0.019	0.075
		Richer	.11916(*)	0.010	0.001	0.091	0.148
		Richest	.24940(*)	0.011	0.001	0.220	0.279
	Middle	Poorest	-.07557(*)	0.010	0.000	-0.104	-0.047
		Poorer	-.04697(*)	0.010	0.000	-0.075	-0.019
		Richer	.07218(*)	0.010	0.001	0.043	0.101
		Richest	.20243(*)	0.011	0.001	0.173	0.232
	Richer	Poorest	-.14775(*)	0.010	0.001	-0.176	-0.119
		Poorer	-.11916(*)	0.010	0.001	-0.148	-0.091
		Middle	-.07218(*)	0.010	0.001	-0.101	-0.043
		Richest	.13025(*)	0.011	0.001	0.100	0.160
	Richest	Poorest	-.27800(*)	0.011	0.001	-0.308	-0.249
		Poorer	-.24940(*)	0.011	0.001	-0.279	-0.220
		Middle	-.20243(*)	0.011	0.001	-0.232	-0.173
		Richer	-.13025(*)	0.011	0.001	-0.160	-0.100
Severely Stunted	Poorest	Poorer	.03936(*)	0.009	0.001	0.014	0.065
		Middle	.07196(*)	0.009	0.000	0.047	0.097
		Richer	.13381(*)	0.009	0.001	0.109	0.158
		Richest	.20806(*)	0.008	0.001	0.185	0.232
	Poorer	Poorest	-.03936(*)	0.009	0.001	-0.065	-0.014
		Middle	.03260(*)	0.009	0.003	0.008	0.057

		Richer	.09445(*)	0.009	0.001	0.071	0.118
		Richest	.16870(*)	0.008	0.001	0.146	0.192
	Middle	Poorest	-.07196(*)	0.009	0.000	-0.097	-0.047
		Poorer	-.03260(*)	0.009	0.003	-0.057	-0.008
		Richer	.06185(*)	0.008	0.001	0.038	0.085
		Richest	.13610(*)	0.008	0.001	0.114	0.159
	Richer	Poorest	-.13381(*)	0.009	0.001	-0.158	-0.109
		Poorer	-.09445(*)	0.009	0.001	-0.118	-0.071
		Middle	-.06185(*)	0.008	0.001	-0.085	-0.038
		Richest	.07425(*)	0.008	0.001	0.053	0.096
	Richest	Poorest	-.20806(*)	0.008	0.001	-0.232	-0.185
		Poorer	-.16870(*)	0.008	0.001	-0.192	-0.146
		Middle	-.13610(*)	0.008	0.001	-0.159	-0.114
		Richer	-.07425(*)	0.008	0.001	-0.096	-0.053
Underweight	Poorest	Poorer	0.01326	0.010	0.876	-0.015	0.042
		Middle	.06473(*)	0.010	0.000	0.036	0.093
		Richer	.12213(*)	0.010	0.001	0.094	0.151
		Richest	.23284(*)	0.011	0.001	0.203	0.262
	Poorer	Poorest	-0.01326	0.010	0.876	-0.042	0.015
		Middle	.05148(*)	0.010	0.000	0.023	0.080
		Richer	.10888(*)	0.010	0.001	0.080	0.137
		Richest	.21958(*)	0.010	0.001	0.190	0.249
	Middle	Poorest	-.06473(*)	0.010	0.000	-0.093	-0.036
		Poorer	-.05148(*)	0.010	0.000	-0.080	-0.023
		Richer	.05740(*)	0.010	0.001	0.029	0.086
		Richest	.16811(*)	0.011	0.001	0.139	0.198
	Richer	Poorest	-.12213(*)	0.010	0.001	-0.151	-0.094
		Poorer	-.10888(*)	0.010	0.001	-0.137	-0.080
		Middle	-.05740(*)	0.010	0.001	-0.086	-0.029
		Richest	.11071(*)	0.011	0.001	0.081	0.140
	Richest	Poorest	-.23284(*)	0.011	0.001	-0.262	-0.203
		Poorer	-.21958(*)	0.010	0.001	-0.249	-0.190
		Middle	-.16811(*)	0.011	0.001	-0.198	-0.139
		Richer	-.11071(*)	0.011	0.001	-0.140	-0.081
Severely Underweight	Poorest	Poorer	.02357(*)	0.008	0.035	0.001	0.046
		Middle	.05881(*)	0.008	0.000	0.037	0.081
		Richer	.09824(*)	0.008	0.001	0.077	0.119
		Richest	.13899(*)	0.007	0.001	0.118	0.160
	Poorer	Poorest	-.02357(*)	0.008	0.035	-0.046	-0.001
		Middle	.03524(*)	0.008	0.000	0.014	0.057
		Richer	.07467(*)	0.007	0.001	0.054	0.095
		Richest	.11543(*)	0.007	0.001	0.095	0.135
	Middle	Poorest	-.05881(*)	0.008	0.000	-0.081	-0.037
		Poorer	-.03524(*)	0.008	0.000	-0.057	-0.014
		Richer	.03943(*)	0.007	0.001	0.020	0.059
		Richest	.08019(*)	0.007	0.001	0.061	0.099
	Richer	Poorest	-.09824(*)	0.008	0.001	-0.119	-0.077
		Poorer	-.07467(*)	0.007	0.001	-0.095	-0.054
		Middle	-.03943(*)	0.007	0.001	-0.059	-0.020
		Richest	.04075(*)	0.007	0.001	0.023	0.059
	Richest	Poorest	-.13899(*)	0.007	0.001	-0.160	-0.118

		Poorer	-.11543(*)	0.007	0.001	-0.135	-0.095
		Middle	-.08019(*)	0.007	0.001	-0.099	-0.061
		Richer	-.04075(*)	0.007	0.001	-0.059	-0.023
Wasted	Poorest	Poorer	-0.00217	0.008	1.000	-0.026	0.022
		Middle	0.01944	0.008	0.193	-0.004	0.043
		Richer	.03744(*)	0.008	0.001	0.014	0.061
		Richest	.04465(*)	0.009	0.001	0.020	0.070
	Poorer	Poorest	0.00217	0.008	1.000	-0.022	0.026
		Middle	0.0216	0.008	0.098	-0.002	0.045
		Richer	.03960(*)	0.008	0.001	0.016	0.063
		Richest	.04681(*)	0.009	0.001	0.022	0.072
	Middle	Poorest	-0.01944	0.008	0.193	-0.043	0.004
		Poorer	-0.0216	0.008	0.098	-0.045	0.002
		Richer	0.018	0.008	0.269	-0.005	0.041
		Richest	.02521(*)	0.009	0.045	0.000	0.050
	Richer	Poorest	-.03744(*)	0.008	0.001	-0.061	-0.014
		Poorer	-.03960(*)	0.008	0.001	-0.063	-0.016
		Middle	-0.018	0.008	0.269	-0.041	0.005
		Richest	0.00721	0.009	0.995	-0.018	0.032
	Richest	Poorest	-.04465(*)	0.009	0.001	-0.070	-0.020
		Poorer	-.04681(*)	0.009	0.001	-0.072	-0.022
		Middle	-.02521(*)	0.009	0.045	-0.050	0.000
		Richer	-0.00721	0.009	0.995	-0.032	0.018
Severely Wasted	Poorest	Poorer	0.0043	0.006	0.997	-0.011	0.020
		Middle	.01537(*)	0.005	0.044	0.000	0.031
		Richer	.01566(*)	0.005	0.043	0.000	0.031
		Richest	.02504(*)	0.006	0.001	0.009	0.041
	Poorer	Poorest	-0.0043	0.006	0.997	-0.020	0.011
		Middle	0.01108	0.005	0.316	-0.004	0.026
		Richer	0.01136	0.005	0.301	-0.004	0.027
		Richest	.02074(*)	0.006	0.003	0.005	0.036
	Middle	Poorest	-.01537(*)	0.005	0.044	-0.031	0.000
		Poorer	-0.01108	0.005	0.316	-0.026	0.004
		Richer	0.00029	0.005	1.000	-0.015	0.015
		Richest	0.00966	0.005	0.546	-0.006	0.025
	Richer	Poorest	-.01566(*)	0.005	0.043	-0.031	0.000
		Poorer	-0.01136	0.005	0.301	-0.027	0.004
		Middle	-0.00029	0.005	1.000	-0.015	0.015
		Richest	0.00938	0.006	0.608	-0.006	0.025
	Richest	Poorest	-.02504(*)	0.006	0.001	-0.041	-0.009
		Poorer	-.02074(*)	0.006	0.003	-0.036	-0.005
		Middle	-0.00966	0.005	0.546	-0.025	0.006
		Richer	-0.00938	0.006	0.608	-0.025	0.006

Source: Author's calculation
* The mean difference is significant at the .05 level.

Descriptive Statistics of Indicators of Malnutrition: Factor Wealth Index

Indicators of Malnutrition		**N**	**Mean**	**Std. Deviation**	**Std. Error**
Stunted	Poorest	4888	.5722	.49481	.00708
	Poorer	4963	.5436	.49814	.00707
	Middle	4774	.4966	.50004	.00724
	Richer	4488	.4245	.49432	.00738
	Richest	3443	.2942	.45576	.00777

	Total	22556	.4781	.49953	.00333
Severely Stunted	Poorest	4888	.3112	.46302	.00662
	Poorer	4963	.2718	.44494	.00632
	Middle	4774	.2392	.42665	.00617
	Richer	4488	.1774	.38202	.00570
	Richest	3443	.1031	.30414	.00518
	Total	22556	.2289	.42013	.00280
Underweight	Poorest	4888	.5172	.49976	.00715
	Poorer	4963	.5039	.50003	.00710
	Middle	4774	.4525	.49779	.00720
	Richer	4488	.3951	.48892	.00730
	Richest	3443	.2843	.45117	.00769
	Total	22556	.4407	.49649	.00331
Severely Underweight	Poorest	4888	.2128	.40931	.00585
	Poorer	4963	.1892	.39171	.00556
	Middle	4774	.1540	.36095	.00522
	Richer	4488	.1145	.31849	.00475
	Richest	3443	.0738	.26144	.00446
	Total	22556	.1544	.36131	.00241
Wasted	Poorest	4888	.2300	.42084	.00602
	Poorer	4963	.2321	.42223	.00599
	Middle	4774	.2105	.40772	.00590
	Richer	4488	.1925	.39432	.00589
	Richest	3443	.1853	.38860	.00662
	Total	22556	.2121	.40877	.00272
Severely Wasted	Poorest	4888	.0843	.27785	.00397
	Poorer	4963	.0800	.27131	.00385
	Middle	4774	.0689	.25334	.00367
	Richer	4488	.0686	.25285	.00377
	Richest	3443	.0593	.23613	.00402
	Total	22556	.0732	.26039	.00173

Source: Author's calculation

Annexure II

Test of Multiple Comparison using Dunnet T3 Test: Factor Mother's Education

Dependent Variable	(I) Highest educational level	(J) Highest educational level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Stunted	No education	Primary	.05180(*)	.01043	.000	.0243	.0792
		Secondary	.17772(*)	.00756	.000	.1579	.1975
		Higher	.30100(*)	.01475	.000	.2621	.3399
	Primary	No education	-.05180(*)	.01043	.000	-.0792	-.0243
		Secondary	.12593(*)	.01125	.000	.0963	.1555
		Higher	.24920(*)	.01695	.000	.2046	.2938
	Secondary	No education	-.17772(*)	.00756	.000	-.1975	-.1579
		Primary	-.12593(*)	.01125	.000	-.1555	-.0963
		Higher	.12327(*)	.01535	.000	.0828	.1637
	Higher	No education	-.30100(*)	.01475	.000	-.3399	-.2621
		Primary	-.24920(*)	.01695	.000	-.2938	-.2046
		Secondary	-.12327(*)	.01535	.000	-.1637	-.0828
Severely Stunted	No education	Primary	.07075(*)	.00872	.000	.0478	.0937
		Secondary	.13879(*)	.00601	.000	.1231	.1544
		Higher	.20301(*)	.00980	.000	.1772	.2288
	Primary	No education	-.07075(*)	.00872	.000	-.0937	-.0478
		Secondary	.06804(*)	.00894	.000	.0445	.0916

		Higher	.13226(*)	.01183	.000	.1011	.1634
	Secondary	No education	-.13879(*)	.00601	.000	-.1544	-.1231
		Primary	-.06804(*)	.00894	.000	-.0916	-.0445
		Higher	.06422(*)	.01000	.000	.0379	.0906
	Higher	No education	-.20301(*)	.00980	.000	-.2288	-.1772
		Primary	-.13226(*)	.01183	.000	-.1634	-.1011
		Secondary	-.06422(*)	.01000	.000	-.0906	-.0379
Underweight	No education	Primary	.06166(*)	.01038	.000	.0343	.0890
		Secondary	.15273(*)	.00751	.000	.1331	.1724
		Higher	.26950(*)	.01451	.000	.2313	.3077
	Primary	No education	-.06166(*)	.01038	.000	-.0890	-.0343
		Secondary	.09107(*)	.01116	.000	.0617	.1204
		Higher	.20784(*)	.01669	.000	.1639	.2518
	Secondary	No education	-.15273(*)	.00751	.000	-.1724	-.1331
		Primary	-.09107(*)	.01116	.000	-.1204	-.0617
		Higher	.11677(*)	.01508	.000	.0770	.1565
	Higher	No education	-.26950(*)	.01451	.000	-.3077	-.2313
		Primary	-.20784(*)	.01669	.000	-.2518	-.1639
		Secondary	-.11677(*)	.01508	.000	-.1565	-.0770
Severely Underweight	No education	Primary	.05216(*)	.00743	.000	.0326	.0717
		Secondary	.09426(*)	.00515	.000	.0809	.1077
		Higher	.12346(*)	.00898	.000	.0998	.1471
	Primary	No education	-.05216(*)	.00743	.000	-.0717	-.0326
		Secondary	.04210(*)	.00755	.000	.0222	.0620
		Higher	.07130(*)	.01054	.000	.0435	.0991
	Secondary	No education	-.09426(*)	.00515	.000	-.1077	-.0809
		Primary	-.04210(*)	.00755	.000	-.0620	-.0222
		Higher	.02920(*)	.00908	.008	.0053	.0531
	Higher	No education	-.12346(*)	.00898	.000	-.1471	-.0998
		Primary	-.07130(*)	.01054	.000	-.0991	-.0435
		Secondary	-.02920(*)	.00908	.008	-.0531	-.0053
Wasted	No education	Primary	.02843(*)	.00837	.004	.0064	.0504
		Secondary	.02663(*)	.00628	.000	.0102	.0431
		Higher	.03841(*)	.01327	.023	.0034	.0734
	Primary	No education	-.02843(*)	.00837	.004	-.0504	-.0064
		Secondary	-.00179	.00904	1.000	-.0256	.0220
		Higher	.00998	.01478	.984	-.0289	.0489
	Secondary	No education	-.02663(*)	.00628	.000	-.0431	-.0102
		Primary	.00179	.00904	1.000	-.0220	.0256
		Higher	.01178	.01370	.948	-.0243	.0479
	Higher	No education	-.03841(*)	.01327	.023	-.0734	-.0034
		Primary	-.00998	.01478	.984	-.0489	.0289
		Secondary	-.01178	.01370	.948	-.0479	.0243
Severely Wasted	No education	Primary	.01818(*)	.00514	.002	.0046	.0317
		Secondary	.01460(*)	.00396	.000	.0043	.0249
		Higher	.01034	.00867	.796	-.0125	.0332
	Primary	No education	-.01818(*)	.00514	.002	-.0317	-.0046
		Secondary	-.00358	.00552	.987	-.0181	.0109
		Higher	-.00784	.00948	.957	-.0328	.0171
	Secondary	No education	-.01460(*)	.00396	.000	-.0249	-.0043
		Primary	.00358	.00552	.987	-.0109	.0181
		Higher	-.00426	.00889	.998	-.0277	.0192
	Higher	No education	-.01034	.00867	.796	-.0332	.0125
		Primary	.00784	.00948	.957	-.0171	.0328
		Secondary	.00426	.00889	.998	-.0192	.0277

Source: Author's calculation

* The mean difference is significant at the .05 level.

Descriptive Statistics of Indicators of Malnutrition: Factor Mother's Education

Indicators of Malnutrition		N	Mean	Std. Deviation	Std. Error
Stunted	No education	12610	0.5459	0.49791	0.00443
	Primary	2805	0.4941	0.50005	0.00944
	Secondary	6206	0.3682	0.48235	0.00612
	Higher	935	0.2449	0.43027	0.01407
	Total	22556	0.4781	0.49953	0.00333
Severely Stunted	No education	12610	0.2843	0.4511	0.00402
	Primary	2805	0.2135	0.40988	0.00774
	Secondary	6206	0.1455	0.35264	0.00448
	Higher	935	0.0813	0.27342	0.00894
	Total	22556	0.2289	0.42013	0.0028
Underweight	No education	12610	0.5016	0.50002	0.00445
	Primary	2805	0.4399	0.49647	0.00937
	Secondary	6206	0.3489	0.47665	0.00605
	Higher	935	0.2321	0.42239	0.01381
	Total	22556	0.4407	0.49649	0.00331
Severely Underweight	No education	12610	0.1919	0.39382	0.00351
	Primary	2805	0.1398	0.34679	0.00655
	Secondary	6206	0.0976	0.29686	0.00377
	Higher	935	0.0684	0.25265	0.00826
	Total	22556	0.1544	0.36131	0.00241
Wasted	No education	12610	0.2245	0.41727	0.00372
	Primary	2805	0.1961	0.3971	0.0075
	Secondary	6206	0.1979	0.39843	0.00506
	Higher	935	0.1861	0.38939	0.01273
	Total	22556	0.2121	0.40877	0.00272
Severely Wasted	No education	12610	0.0799	0.27108	0.00241
	Primary	2805	0.0617	0.24061	0.00454
	Secondary	6206	0.0653	0.247	0.00314
	Higher	935	0.0695	0.25447	0.00832
	Total	22556	0.0732	0.26039	0.00173

Source: Author's calculation