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Unequal Effect of Parents' Education on Child Health and Health Care

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Abstract

Parents have tremendous influence on growth and development of children. At the initial period of life, it is believed that mother is more important because there are some physical needs of children e.g., breastfeeding, which can only be done by mother. Both the parents should have emotional touch with the child. Apart from breastfeeding, it is generally believed that mother plays more vital role than father on the life of her child. Are there scientific evidences to support the belief that mother has more influence on child? We have not yet come across any such investigations other than taking opinion surveys. While we do not go against these opinions, we emphasize on the need of judging it scientifically. The paper carries out a systematic way of finding the effects of education of parents and their relative importance on the life of a child so far as Birth Weight, BCG, DPT, Polio and Measles Vaccination and Status of Anaemia are concerned using unit level data of the latest round of National Family Health Survey (NFHS IV, 2015-16) of India. State wise secondary data are also used to see the effect of literacy of parents on the Sex Ratio at Birth of Children. Apart from preparing two-way tables, statistical tools like correlation, partial correlation and regression techniques are used for this purpose. Results of our analysis suggest that there is really unequal effect of mother and father and it is the mother, who counts more.

Keywords: Educational Levels of Parents, NFHS, Birth Weight, Sex Ratio at Birth, Vaccination, Status of Anaemia.

AMS Classification: 62P25, 62Q05, 62H17, 62H20, 62J05, 62J12

1. Introduction

"A bench of Justice Vikramajit Sen and C Nagappan recently came up with a new rule in which custody of a child below five years will be given to a mother unless for a strong reason to rule otherwise." (http://www.merinews.com/article/is-mother-more-important-than-father-supreme-court-rules-so-citizens-debate/15904788.shtml#sthash.XZJAz071.dpuf)

One may have reservations against this verdict, but there is no controversy on the fact that both parents are important in a child's life. In the beginning of life mother plays more important roles, but as a child grows father's affection and love are important in determining the development of personality of the child. (Rohner, 1998 and 2016; Veneziano, 2003; Gežová, 2015).[1] In particular, the tie is more pronounced in cases of 'the personality and psychological adjustment problems' (Ahmed et al., 2012; Khaleque & Rohner, 2011a; Stagner, 1933); children's social competence and school performance (Putnick et al., 2014). Children may suffer from insecurity or become hostile and aggressive if they lack father's presence and affection (Khaleque & Rohner, 2011). However, there may be differential effects between sons and daughters.

There is a famous "object-relations theory" which says that the behaviour of people to others in their adult lives is shaped by family experiences during infancy and naturally mothers play an important role in it (Klein, 1952; Zgourides, 2000).

Allen and Daly (2007) compiled more than 150 research studies to summarize the impact of father's involvement on children's developmental outcomes. It was not clear whether the effects of father's involvement were disentangled from other effects. E.g., if the words "father" and "mother" are interchanged in the report then there is a possibility that most of the results stand true. On the other hand, Finley et al. (2008) found that mothers were rated as heavily involved in nearly all domains. Mothers have generally been found to be more involved than fathers in most studies (e.g., Craig, 2006).

Flouri and Buchanan's (2003) study on 2722 British adolescents aged 14-18 years clearly points out that both father's and mother's involvements are significant, but father's involvement has a stronger effect on offspring happyness.

[1] "… while the mother certainly has the most important role in children's lives in the prenatal period, later on the fathers and the mother's roles gradually balance." Gežová (2015).

The question whether different components of parental background are stable across time and across countries were rejected for most of the European countries (Meraviglia & Buis, 2015).

Using data from the Netherlands, West Germany, and the USA, Korupp et al. (2002) saw that general conclusions on trends in educational reproduction did not change by adding the mother's influence to that of the father's. But the children's educational attainment is substantively influenced by the mother's education and occupational status. Behrman and Rosenzweig (2002), however, saw that if one controls women's earnings, child rearing ability endowments, and schooling of their husbands, then this effect becomes marginally negative. In contrast with Behrman and Rosenzweig's (2002) result, Amin et al. (2011) showed that mother's schooling is at least as much important as father's schooling so far as children's schooling is concerned.

Baxter (2002) fitted a multinomial logistic regression model where the dependent variable was the level of education of sons and daughters at the age 25. The level of education had three categories – low, medium and high. It is seen that the influence of mother's and father's education is significant but different for sons and daughters.

There are many evidences showing that the mother's education is more important than father's education towards child's educational attainment but the margin is not significant (Haveman & Wolfe, 1995; Behrman, 1997), (Cited in Jerrim and Micklewright, 2011). Some studies found mother's (father's) education to have more impact on daughter (son) (Baxter, 2002; Heineck & Riphahn, 2007).

This paper examines if the educational qualification of mother is more important than that of father in the maintenance of health and healthcare status of children in the family.

2. The Data and the Methodology

We have obtained the relevant data from mainly two sources – the Census data of India collected during 2011, which is known in brief as "Census 2011" data and the data obtained from the Demographic and Health Surveys (DHS) Program, which is funded by the U.S. Agency for International Development (USAID) and implemented by ICF. International Institute for Population Sciences (IIPS) is the

nodal agency in India responsible for providing coordination and technical guidance for the survey.

Census 2011 data was used to get sex ratios. We were concerned with sex ratios at birth. The State wise sex ratios at birth were correlated with State wise male and female literacy rates to see if there is a relation between these two variables. To reconfirm our findings, we also took partial correlation of State wise sex ratios at birth with one of the parents' qualification after eliminating the effect of the qualification of the other parent.

For the purpose of other analysis, NFHS Round III and IV data on Child's (0-5 years) age, sex, height and weight at birth, BCG, DPT, Polio and Measles vaccination (for 2-6 years), haemoglobin, fathers' age and level of education, mothers' age and level of education etc. have been used. Bivariate frequency tables were computed, and chi square tests were performed to see if the relevant variables are independent. Our main concern was to find out the frequency and/or percentage of children of certain child parameters such as number and percentages of children with status of Anaemia, vaccination, Nutritional status through weight-for-age and height-for-age z-values, etc., corresponding to each combination of mother's and father's qualification. This was done separately for NFHS3 and NFHS4 data. This gives us a valuable insight into the differences of these values due to mother's and father's educational qualification through the comparison of off-diagonal elements. We have carried out Wilcoxon Signed Ranks test of off-diagonal elements to see whether there was any difference of effect of mother's and father's qualifications. Bivariate tables were also prepared for the mean values of birth weight and level of Anaemia and Wilcoxon Signed Ranks test of off-diagonal elements were carried out.

Again, we have run the logit regression using unit level data with the occurrence of Anaemia (anemic = 1 and not anemic = 0) as the dependent variable and status of literacy of father and mother as independent variables. Here status of literacy is taken as a binary (dummy) variable with values for literate being 1 and illiterate being 0. This will not only show whether there is a significant effect of each of the parents' status of literacy, but also compare these values to see if there is a differential effect. Similar exercises have been carried out taking status of different types of vaccination of a Child as the dependent variable and the status of literacy of parents. To test whether the coefficients of the parents' status of literacy are significantly different we have used the following trick.

The model for logistic regression is

$$y = a + bx + cz + e,$$

where y is the log odd ratio, x is the literacy status of father and z is the literacy status of mother.

We can rewrite $bx + cz$ as $bx + bz - bz + cz = b(x+z) + (c-b)z$. The first variable, instead of x, is replaced by (x+z) the sum of the two qualifications. It takes value 0, 1 and 2, since x and z are both dummy variables taking values 0 and 1 only. Though this coefficient has no meaning at all, still we run the logistic regression and concentrate on the coefficient of z only. Thus, we regress y on (x+z) and z. The coefficient of z will automatically give the difference of effects of the parents' status of literacy. The test for significance of the difference will automatically be supplied by the statistical package. We use SPSS package for statistical analysis including logistic regression.

We can achieve the same conclusion if we take $bx - cx + cx + cz = (b - c)x + c(x+z)$. Thus, along with x+z we can either take x or z. If we take x then the coefficient of x will mean "effect of father's literacy status – effect of mother's literacy status", whereas if we take z then it is just the reverse, i.e., "effect of mother's literacy status – effect of father's literacy status".

We have run two regressions – the logistic regression of y on x and z and the logistic regression of y on x and (x+z). The result is shown only for the first logistic regression along with the result of significance of (b–c) from the second logistic regression.

2. Parents Levels of Education Vs. Sex Ratios

Sex Ratio is usually defined as the ratio of female population to male population known as Female-Male Ratio (FMR).[2]. The ideal sex-ratio, as one may think, is '1', if, given similar health care and nutrition, the male and female mortality rates were equal. But, surprisingly, it is not so. The women have lower age specific

[2] The sex ratio is certainly linked with the mortality rates of males and females and thus it may be measured at various stages of life. The primary sex ratio is the ratio at the time of conception, secondary sex ratio is the ratio at time of birth, and tertiary sex ratio is the ratio of mature organisms.

mortality rates than men have. The FMR in the Scandinavian countries and some European countries is close to 1.05. However, the FMR in this world is less than 1. It is believed that in developed countries, women get more or less equal treatment as compared to men. It is argued that more enlightened regions have higher FMR values than those of less developed regions. Thus, FMR value is regarded as an indicator of development.

Though the sex of a new-born is determined by biological factor, there are tendencies across societies to prefer male child especially among the low educated middleclass parents (who consider girls as liability) for which sex determination and killing of female foetus takes place, though illegally. This at macro level may distort the sex ratio in favour of male which is however expected to happen in lesser proportion with highly educated parents, especially with wise mothers.

According to Sen, women's gainful employment and literacy play a significant role in improving FMR. Kerala is one example which stands for literacy. Female life expectancy of Kerala is also very high. Kerala has other features also which may influence FMR values. The Nairs of Kerala and Khasis in Meghalaya have the custom of Female ownership of property. Moreover, about 20% of population in Kerala is Christian.

Relationship between the age of mother or father to the birth sex ratio has been examined in a number of studies. It was found that overall maternal age has no statistically significant relation with human birth sex ratio. But it was reported that significantly more male babies were born per 1000 female babies to younger fathers as compared to older fathers. It indicates that father's age has significant role in sex of human children. It therefore suggests that social factors like early marriage of male may play a role in birth sex ratios favouring male in certain societies. However, it is not clear whether the authors tackled the confounding effects, especially maternal age, birth order and external agents including drugs and chemicals (Macmahon & Pugh, 1953; Jarrell, 2002; Jacobsen et al. 1999; Ruder, 1985; Ein-Mor et al. 2010; James, 1987).

With education, age at marriage and age of parents at the time of bearing first child also increase. Hence age of both parents at the birth of first child and the sex of child is linked to establish the impact of age of father and mother on the sex of child, which may be partly due to indirect effect of education of parents.

In this paper, we start by examining the relation of educational attainments of parents with the sex ratios, namely Human Sex Ratio, Sex Ratio at Birth and Child Sex Ratio. In doing so, we shall compare between the educational levels of father

and mother. The following table shows the sex ratio along with the literacy rates of adult males and females across states.

Table 1: State-wise Literacy Rate, Child Sex Ratio, Sex Ratio at Birth and Overall Sex Ratio (No. of Females per 1000 Males) in India as per 2011 Census Report

State	Literacy Rate	Male Lit 2011	FemaleLit 2011	Child Sex Ratio 2011	Sex Ratio at Birth	Sex Ratio
Andhra Pradesh	67.02	74.88	59.15	939	914	993
Arunachal Pradesh	65.38	72.55	57.70	972	897*	938
Assam	72.19	77.85	66.27	962	922	958
Bihar	61.80	71.20	51.50	935	909	918
Chhattisgarh	70.28	80.27	60.24	969	979	991
Delhi	86.21	90.94	80.76	871	884	868
Gujarat	78.03	85.75	69.68	890	909	919
Haryana	75.55	84.06	65.94	834	857	879
Himachal Pradesh	82.80	89.53	75.93	909	939	972
Jammu and Kashmir	67.16	76.75	56.43	862	895	889
Jharkhand	66.41	76.84	55.42	948	918	948
Karnataka	75.36	82.47	68.08	948	950	973
Kerala	94.00	96.11	92.07	964	966	1084
Madhya Pradesh	69.32	78.73	59.24	918	921	931
Maharashtra	82.34	88.38	75.87	894	896	929
Manipur	76.94	83.58	70.26	936	816*	985
Meghalaya	74.43	75.95	72.89	970	942*	989
Mizoram	91.33	93.35	89.27	970	872*	976
Nagaland	79.55	82.75	76.11	943	873*	931
Orissa	72.87	81.59	64.01	941	849	979
Punjab	75.84	80.44	70.73	846	863	895
Rajasthan	66.11	79.19	52.12	888	893	928
Sikkim	81.42	86.55	75.61	957	947*	890
Tamil Nadu	80.09	86.77	73.44	943	928	996
Tripura	87.22	91.53	82.73	957	982*	960
Uttarakhand	78.82	87.40	70.01	890	869*	963
Uttar Pradesh	67.68	77.28	57.18	902	874	912
West Bengal	76.26	81.69	70.54	956	944	950
India	**74.04**	**82.14**	**65.46**	**919**	**908**	**940**

Source: http://mospi.nic.in/Mospi_New/upload/man_and_women/Chapter%203.pdf

*: Found from sample registration system data. See the web link: http://mospi.nic.in/sites/default/files/reports_and_publication/statistical_publication/social_statistics/WM17Chapter1.pdf

In 2010, the global sex ratio was 986 females per 1,000 males and trended to reduce to 984 in 2011. As per UN there were 983 females per 1000 males in the world in 2015 (http://statisticstimes.com/population/countries-by-sex-ratio.php). Table 1 describes the state level literacy rate for male and female along with variation in child sex ratio, sex ratio at birth and overall sex ratio. It shows that the

Sex Ratio as per 2011 Census in India is 940, which is far below the global Sex Ratio. Given the State wise scenario it is pertinent to find out the relation of the male and female rates with the Sex Ratios.

Table 2A: Pearson Correlations of Male-Female Literacy Rate with Child Sex Ratio, Sex Ratio at Birth and Overall Sex Ratio

	Child Sex Ratio 2011	**Sex Ratio at Birth**	**Overall Sex Ratio**
Male Literacy 2011	-0.040	0.115	0.248
Female Literacy 2011	0.179	0.162	0.329

Note: Figures represent correlation based on data as given in Table 1.

Karl Pearson's correlation between male and female literacy and sex ratio is presented in Table 2A. Though the correlations are not significant, the result clearly reveals higher positive correlation of female literacy with sex ratio at birth and overall sex ratio than that of male literacy rate with sex ratio at birth or overall sex ratio. The partial correlation coefficients (Table 2B) further confirm it. After eliminating the effect of female literacy, male literacy rate has negative relation with child sex ratio and virtually no correlation with overall sex ratio and sex ratio at birth. However, when we eliminate the effect of male literacy, female literacy rate is found to be positively correlated with child sex ratio, sex ratio at birth and overall sex ratio and the correlation with child sex ratio is significant.

Table 2B: Partial Correlations of Male-Female Literacy Rate with Child Sex Ratio, Sex Ratio at Birth and Overall Sex Ratio

	Child Sex Ratio 2011	**Sex Ratio at Birth**	**Sex Ratio**
Male Literacy 2011 taking Control Variable Female Literacy 2011	-.426*	-.059	-.093
Female Literacy 2011 taking Control Variable Male Literacy 2011	.454*	.129	.240

*: Significant at 5% level.

3. Parents Levels of Education and Birth Weight of Babies

Using NFHS III data, mean weight of child at birth corresponding to each combination of educational level of mother and father is computed and presented in the following tables 3A and 3B.

Table 3A: Mean Birth Weight (Kilogram) of Children Corresponding to Various Levels of Education of Father and Mother: 2005-06 (NFHS3)

Education of Mother	**Education of Father**					Growth Rate (No Edu. to Higher Edu.)
	No education	Primary	Secondary	Higher	All	
	Birth Wt.	Birth Wt.	Birth Wt.	Birth Wt.	Birth Wt.	
No education	2.782 (1236)	2.792 (747)	2.783 (1256)	2.639 (65)	2.782 (3304)	-5.14
Primary	2.784 (401)	2.773 (653)	2.822 (1416)	3.001 (89)	2.810 (2559)	7.79
Secondary	2.791 (453)	2.820 (940)	2.840 (8162)	2.894 (1930)	2.845 (11485)	3.69
Higher	2.919 (8)	3.014 (14)	2.902 (864)	2.932 (2553)	2.924 (3439)	0.45
All	2.785 (2098)	2.799 (2354)	2.836 (11698)	2.913 (4637)	2844 (20787)	4.60
Growth Rate (No Edu. to Higher Edu.)	4.92	7.95	4.28	11.10	5.10	---

Note: Values in parentheses show sample size.

Table 3B: Mean Birth Weight (Kilogram) of Children Corresponding to Various Levels of Education of Father and Mother: 2015-16 (NFHS4)

Education of Mother	**Education of Father**					Growth Rate (No Edu. to Higher Edu.)
	No education	Primary	Secondary	Higher	All	
	Birth Wt.	Birth Wt.	Birth Wt.	Birth Wt.	Birth Wt.	
No education	2.756 (3152)	2.770 (1504)	2.790 (2854)	2.956 (158)	2.776 (7668)	7.26
Primary	2.768 (696)	2.781 (1259)	2.793 (2459)	2.856 (150)	2.788 (4564)	3.18
Secondary	2.775 (788)	2.836 (1771)	2.832 (12749)	2.874 (2347)	2.836 (17655)	3.57
Higher	2.949 (20)	2.804 (54)	2.910 (1558)	2.910 (2608)	2.909 (4240)	-1.32
All	2.762 (4656)	2.799 (4588)	2.827 (19620)	2.894 (5263)	2.825 (34127)	4.78
Growth Rate (No Edu. to Higher Edu.)	7.00	1.23	4.30	-1.56	4.79	---

Note: Values in parentheses show sample size.

Coefficients of last but one column in table 3A and 3B reveal that for all fathers with rising education of mother, average birth weight of children increased from 2.782 kg to 2.925 kg. Similarly, the last but one row shows that for all mothers

with rising education of father average birth weight of children increased from 2.785 kg to 2.913 kg. Thus, it appears to have more or less same impact of father's and mother's education. Again, if we look at the row corresponding to higher educated mother, with them when education of father increases, average weight of new-born babies does not increase much (marginally from 2.919 kg to 2.932 i.e., by 0.445 per cent). whereas, with higher educated father, when education of mother increases, average weight of baby at birth increases significantly from 2.639 kg to 2.932 kg i.e., by 11.10 per cent. It is surprising. The first element of this column (2.639) seems to be an outlying observation, because all other elements in this column are around 3. If we ignore this element, the average birth weight does not increase at all with increasing levels of father's education.[3] Mean birth weight of babies remains more or less same for all other columns as we go down and rows as we go right. We may conclude that Parents education does not have much impact on the birth weight of babies.

NFHS4 data show similar results as NFHS3 data. We can, however, observe a striking behavior here. When one of the parent's education is at the higher level, mean birth weight has negative growth as the level of education of the other parent increases from 'No education' to higher education. This change is, however, not very prominent. Thus, again, it shows that parents' education does not have much influence on baby's birth weight.

4. Parents Levels of Education and Level of Anaemia of Children

Table 4A shows, from NFHS3 data, the distribution of anemic children corresponding to educational levels of mother and father. It clearly indicates conspicuous continuous reductions in the percentage of anemic babies as one of the parent's education increases keeping the level of education of the other parent fixed. But if we look more closely, we can observe that influence of mother's education is more, since the reduction in the percentage of anemic children is more due to increase in the level of education of mother. NFHS4 data confirms the same (Table 4B).

[3]This outlying observation makes the growth rates of the birth weight for this row/column unusually different from other rows/columns.

Table 4A: Number of Anemic Children and their Percentages Corresponding to Various Levels of Education of Father and Mother: 2005-06 (NFHS3)

	No education	Primary	Secondary	Higher	Row Total
No education	5021 (73.9)	1927 (70.2)	3258 (69.6)	147 (66.5)	10353 (71.7)
Primary	670 (68.9)	885 (66.2)	1744 (65.1)	102 (61.4)	3401 (66.0)
Secondary	482 (70.1)	763 (63.1)	5528 (59.3)	1111 (54.9)	7884 (59.5)
Higher	4 (57.1)	7 (58.3)	393 (53.5)	887 (48.1)	1291 (49.7)
Column Total	6177 (73.0)	3582 (67.5)	10923 (62.7)	2247 (52.8)	22929 (64.7)
Note: p-values of Wilcoxon Signed Ranks test of off-diagonal elements = 0.046					

Table 4B: Number of Anemic Children and their Percentages Corresponding to Various Levels of Education of Father and Mother: 2015-16 (NFHS5)

	No education	Primary	Secondary	Higher	Row Total
No education	3157 (65.6)	1360 (63.7)	2425 (63.7)	95 (54.6)	7037 (64.4)
Primary	529 (60.7)	847 (58.0)	1586 (59.0)	84 (58.3)	3046 (59.0)
Secondary	495 (58.4)	988 (57.9)	6573 (54.5)	1128 (53.7)	9184 (54.9)
Higher	10 (52.6)	24 (51.1)	673 (50.6)	1084 (50.1)	1791 (50.3)
Column Total	4191 (64.0)	3219 (60.2)	11257 (56.6)	2391 (52.2)	21058 (57.9)
Note: p-values of Wilcoxon Signed Ranks test of off-diagonal elements = 0.028					

The logit model estimation from unit level data with the incidence of Anaemia (anemic = 1 and not anemic = 0) as the dependent variable and educational level of father and mother as independent variables shows negative impact of educational attainment of both mother and father (Table 4C). Further, the

coefficient of mother's education is negative and more in the absolute value than the coefficient of level of education of father, indicating that mother's education reduces the incidence of Anaemia more than that of father's education. The findings of NFHS 4 data (Table 4D) are similar.

Table 4C: Logit Model Estimation of Incidence of Anaemia of a Child on the education of Father and Mother**: 2005-06 (NFHS3)**

	B	S.E.	Wald	Sig.	Exp(B)
Literacy of Mother	-.421	.026	265.73	.000	.657
Literacy of Father	-.282	.031	84.90	.000	.754
Constant	1.083	.025	1840.86	.000	2.953
Note: p-value for the difference between the two coefficients = 0.004					

Dependent Variable: Non-Anemic = 0, Anemic = 1;
Independent Variables: Literate = 1, Illiterate =0.

Table 4D: Logit Model Estimation of Incidence of Anaemia of a Child on the education of Father and Mother**: 2015-16 (NFHS4)**

	B	S.E.	Wald	Sig.	Exp(B)
Literacy of Mother	-.338	.026	166.11	.000	.713
Literacy of Father	-.132	.031	17.49	.000	.877
Constant	.666	.027	615.98	.000	1.946
Note: p-value for the difference between the two coefficients = 0.061					

Dependent Variable: Non-Anemic = 0, Anemic = 1.
Independent Variables: Literate = 1, Illiterate =0.

5. Parents Levels of Education and Vaccination

The results obtained from various statistical analyses are depicted in table 5. The p-values (Table 5) reveal that mothers play much better role in administering vaccinations to children in their family. The effect becomes more prominent if the

level of education of mother is increased as compared to the increase of level of education of father.

Table 5: Logit Model Estimation of Different Vaccination of a Child on the Education of Father and Mother: 2005-06 (NFHS3) and 2015-16 (NFHS4)

Vaccination	Literacy of Parents	Coefficient	Wald	p-value of the difference	Coefficient	Wald	p-value of the difference
		NFHS3			NFHS4		
BCG	Literacy of Mother	1.200	2232.57	0.000	.661	346.500	0.000
	Literacy of Father	.552	434.43		.437	123.303	
DPT1	Literacy of Mother	1.150	2255.95	0.000	.572	338.416	0.000
	Literacy of Father	.587	516.80		.370	109.985	
Polio1	Literacy of Mother	.568	306.56	0.028	.514	254.147	0.003
	Literacy of Father	.443	170.18		.340	86.178	
DPT2	Literacy of Mother	1.097	2393.87	0.000	.533	364.493	0.000
	Literacy of Father	.555	492.86		.319	97.986	
Polio2	Literacy of Mother	.476	295.78	0.035	.494	308.639	0.000
	Literacy of Father	.372	155.59		.277	72.513	
DPT3	Literacy of Mother	1.061	2402.87	0.000	.510	402.558	0.000
	Literacy of Father	.527	440.59		.331	124.071	
Polio3	Literacy of Mother	.300	164.01	0.778	.402	269.513	0.005
	Literacy of Father	.312	142.89		.275	90.748	
Measles	Literacy of Mother	.910	1766.56	0.000	.336	178.137	0.013
	Literacy of Father	.467	345.16		.221	55.460	
Polio0	Literacy of Mother	1.063	2362.92	0.000	.510	392.432	0.000
	Literacy of Father	.395	234.41		.337	126.247	
Ever Had Vaccination	Literacy of Mother	.446	133.08	0.365	.375	74.156	0.402
	Literacy of Father	.386	97.01		.310	41.792	

For non-literate mothers the percentage of no vaccination of children decreases from 21.2% to 12.8% as the education level of fathers increase from no education to higher education, whereas for non-literate fathers the percentage of no vaccination of children decreases from 21.2% to 8.7% as the education level of mothers increase from no education to higher education. The decrease is more for increase of education of mothers compared to that of increase in education of fathers. This is also uniformly true for all specific vaccinations namely BCG, DPT, Polio and Measles (Tables not shown). Thus, the body of the matrix reveals that mother's contribution towards monitoring vaccination is high as compared to that of father. It is clear because the percentages of the lower triangle of the matrix are less than those of upper triangle of the matrix after ignoring the marginal percentages. This is also true for all other vaccinations.

6. Parents Levels of Education and Status of Health of Children: 2015-16 (NFHS4)

Table 6A: Weight for Age Percentile: 2015-16 (NFHS4)

		Father's educational level				
		No	Primary	Secondary	Higher	Total
Mother's educational level other	No	9.66	9.51	10.94	13.94	10.18
	Primary	11.29	10.77	12.55	13.31	11.72
	Secondary	12.72	12.73	16.50	19.36	15.95
	Higher	16.65	13.38	22.97	24.56	22.92
	Total	10.30	10.93	15.37	21.41	14.18
Note: p-value of paired T-test of off-diagonal elements = 0.031						

The p-value of paired T-test of off-diagonal elements is .031, which is significant. The p-value of Wilcoxon Signed Ranks Test of off-diagonal elements is 0.027, which is also significant. The difference between lower and upper diagonal elements is nonnegative for all cases.

Table 6B: The Result of Paired T-test and Wilcoxon Signed Ranks Test of Off-diagonal Elements for Height for Age, Weight for Age and Weight for Height of Children on the education of Father and Mother: 2015-16 (NFHS4)

Status of Health	p-Value of Paired T-test	p-Value of Wilcoxon Signed Ranks Test
Height for Age Percentile	0.565	0.600
Height for Age percent ref. median	0.285	0.249
Weight for Age Percentile	0.031	0.027
Weight/Age percent ref. median	0.014	0.027
Weight for Height Percentile	0.044	0.028
Weight for Height percent ref. median	0.161	0.116

7. Discussions

Smith and Byron (2011) made a comparative study of girl and boy and showed that parent's educations have significant effect on height-for-age z-scores, mother's education having higher t-values in most of the cases.

Table 7A: Determinants of child height-for-age z-scores in South Asia: girl-boy differences

	Girls		**Boys**	
Variable	**coefficient**	***t*-stat**	**coefficient**	***t*-stat**
Women's relative				
decision making power	0.018***	7.45***	0.012	5.30
Mother's education: primary	0.154***	4.76***	0.160	5.11
Mother's education: secondary	0.275***	6.22***	0.358	8.71
Father's education: primary	0.108***	3.34***	0.151	4.72
Father's education: secondary	0.264***	7.19***	0.269	7.95

Source: Smith and Byron (2011)
Note: here *** indicates that the coefficient is significant at 1% level of significance by two tailed test.
Our results are like that of Smith and Byron.

In another investigation by taking hospital data of the State of Madhya Pradesh in India, Som et al. (2004) found decreasing trend of percentage of low birth weight babies as the level of education of mothers increases (Table 7B). We, however, did not find any striking change in the trend of the mean birth weight as the parents' levels of education increase.

Table 7B: Birth Weight vs. Mothers Education: Results from Hospital Data of Madhya Pradesh

Mother's Education	Percentage of low birth weight babies (<2500 g)	Average Birth Weight(Kg.)
Illiterate	22	2.69
Primary	20	2.74
Junior High	18	2.73
IX and above	12	2.82

Source: Som et. al (2004)

Bharati et al. (2008a) investigated the effect of parents' education on BCG, DPT, Polio and Measles vaccination of children and found similar results as can be seen in table 7C. One can see that the percentage of children getting vaccination is always more for each level of Mother's Education than that of father.

While seeing the trends in socioeconomic and nutritional status of children in India Bharati et al. (2011) again found the similar effect of Parent's education.

Table 7C: Effect of Parents' Education on BCG, DPT, Polio and Measles Vaccination of Children

Variables	Categories	Percentage of Immunized Children											
		BCG			DPT3			Polio3			Measles		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total
Place of Residence	Urban	85.9	84.0	85.0	67.0	64.2	65.7	63.6	63.1	63.4	55.9	53.4	54.7
	Rural	68.9	63.1	64.6	45.5	42.0	43.8	50.8	48.5	49.7	36.8	34.5	35.7
Mother's Education	Illiterate	55.8	53.2	54.6	34.9	31.4	33.2	42.7	40.8	41.8	28.4	26.2	27.3
	Primary	77.4	72.7	75.1	54.9	51.6	53.3	58.4	55.9	57.2	45.5	43.1	44.3
	Secondary	86.9	86.6	86.6	68.3	66.7	67.6	65.5	65.0	65.3	55.3	54.1	54.7
	Higher	94.5	95.1	94.8	79.2	77.7	78.5	73.2	73.7	73.5	66.1	64.5	65.4
Father's Education	Illiterate	52.1	50.1	51.1	32.2	30.1	31.2	40.1	39.7	39.9	25.8	24.2	25.0
	Primary	67.0	65.8	66.4	47.5	43.4	45.5	51.5	49.0	50.3	37.4	36.3	36.9
	Secondary	77.7	75.6	76.7	57.2	54.1	55.7	59.4	56.8	58.2	47.2	43.6	45.5
	Higher	87.3	83.4	85.5	67.7	64.6	66.3	64.9	64.5	64.7	56.6	55.9	56.3

Source: Bharati et al. (2008a)

Table 7D: Percentage of Malnourished Children Younger than 6 Years According to Status of Anaemia

Variables	Severely Anemic		Not Severely Anemic		χ^2 Test
	N	Malnourished	N	Malnourished	P
Gender					
Boys	21 734	55.9	82 892	48.8	341.91*
Girls	20 255	53.8	75 486	45.7	423.20*
Residential status					
Rural	31 454	56.2	115 364	49.1	493.16*
Urban	10 535	50.9	43 014	42.5	245.53*
Mother's age (years)					
15-24	16 847	54.2	54 745	49.2	124.89*
25-34	21 116	54.9	86 559	46.2	515.65*
35+	4026	57.8	17 074	47.0	151.87*
Mother's education					
Illiterate	24 310	61.0	83 052	53.4	440.20*
Literate	17 679	46.5	75 326	40.6	199.35*
Father's education					
Illiterate	12 961	60.7	44 090	53.9	187.07*
Literate	29 028	52.3	114 288	44.8	522.33*

Likewise, there are several instances that prove that gender inequality impedes development. And Mothers education is the panacea to all these impediments. Readers may look into the books by Pal et al. (2011) and Bharati and Pal (2005),

and the papers Som et al. (2007), Bharati et al. (2008) etc. for further readings in this respect.

8. Concluding Remarks

Educated parents especially mother learn to take necessary measure for baby or childcare and nurturing technique going above all the social inhibitions. But the role of mother, who has direct involvement in such activities, is more and that is reflected in the health indicators of child from her birth. Thus, education of both parents is correlated with the weight, incidence of Anaemia of child. Similarly, vaccination of children for BCG, DPT, Polio and Measles depends on the awareness of the parents and mostly monitored by mother or jointly by both the parents depending on their engagements and understanding. In many cases, due to outside engagement of father, mother takes care of such immunization programmes.

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