

Maternal Height and Fertility Outcomes: A Poisson Regression Analysis

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INTRODUCTION

Human fertility is very complex process which is determined by a number of sociocultural, psychological, economic, demographic, and anthropometric factors. These factors affect the volume of fertility in a society. It is evident from the past studies that the fertility or more precisely the number of children born to a female is interdependent on the survival of her children and the survival of children is somehow connected with the height of the female. Therefore, a curious intuition has emerged about the association of fertility with the maternal stature. At first, an exploratory study has been done to establish maternal height as a fertility differential in the context of Indian society. Females who were surveyed during NFHS-II, NFHS-III, and NFHS-IV are differently classified on the basis of their height. Then, the authors have attempted to link fertility with the height of female by using some descriptive and inferential statistics.

METHODS

The sociodemographic and anthropometric information of married females has been obtained from the three phases of National Family Health Survey (NFHS) dataset conducted in 1998-99, 2005-06, and 2015-16. For the descriptive study, the females residing in the major states of India are taken as study population. The females of Uttar Pradesh from NFHS-IV (2015-16) are considered as a target population for the inferential study due to vastness and social variability within the state. While applying inferential statistics, the number of children ever born to a female is considered as a fertility indicator which ranges between 0 and 15 for the selected females of Uttar Pradesh. Hence, Poisson regression model is the best suited regression model for the study instead of logistic regression model which would lose some information of children ever born in the present case.

RESULTS

The estimates of fertility indicators i.e. children ever born, survival ratio of children, and the proportion of females at higher birth order for Indian females is given in table 1 and table 2. Table 1 represents first classification of females based on height where it is found that the mean number of children ever born is reducing as the increment in maternal height observed for all of the three NFHSs. While, the survival ratio of children is relatively high among the tall females compared to short females. The females of shorter height proceed for higher birth order with a greater proportion compared to short females. Similar results have been observed in table 2 also, where the females are classified into two height groups. Shorter females have higher number of children ever born with lower survival ratio among children. They also have a tendency to go for higher birth order. As the literature review indicates that few selected socio-economic and demographic characteristics of females may affect the number of children ever born to a female. Table 3 displays the percentage distribution of females on the selected socio-demographic indicators along with the summary of number of children ever born.

Table 4 shows the results of Poisson regression model representing the impact of various socio-demographic variables on the number of children ever born (CEB). It is known that the place of residence plays a significant role in population decline which reflects from the table that the urban females are at 8 percent lower risk of having more CEB compared to rural females. The religion-wise analysis shows that the Hindu females are 21 percent less likely to have high number of children in comparison of Muslim females. The family size is also

influenced by the caste or ethnicity of household. Hence, it is observed that the females belonging to backward castes (OBC) have 4 percent lower risk of getting high CEB compared to the females belonging to SC/ST community. Among the females of other castes, the risk of having high CEB is around 13 percent less than SC/ST females. The impact of wealth index of household on the number of children ever born can be stated as that both shares a negative association. The risk of getting high CEB is slightly reduced as the level of wealth index increases. Comparing with the females of poorest households, the poorer females have 8 percent less risk, the middle class females have 15 percent lower risk, the females of richer households have 20 percent lower risk, and the richest females are at 32 percent less risk of getting high number of children ever born. Educational attainment has a great impact on the number of children ever born. Though it is clear from the table 3 that higher educated females have 55 percent lower risk of getting high number of CEB in comparison of illiterate females. Similarly, primarily educated and secondarily educated females are at 21 percent and 39 percent less risk of getting high CEB compared to uneducated females. The females who live in nuclear family, are 19 percent less likely to get high number of children in comparison of the females who live in joint family. Marriage is considered as the initiation of reproductive span of a female. Hence, age at first marriage holds a significant impact on number of children ever born. The females who have married after the age of 18 years have 23 lower risk of getting high number of children compared to the females who married before the age of 18 years. By considering anthropometric measure i.e. height of female in the study, it is observed that the females having height more than 150 cm are at 5 percent lower risk of getting high number of CEB in comparison of the females having height less than 150 cm.

CONCLUSIONS

Since, it is known that the maternal height plays a significant role in the survival of children and the fertility of females is influenced by the survival of their children. Therefore, on the basis of descriptive study, it can be concluded that the proposed predictor i.e. maternal height works a differential of human fertility also. However, fertility and anthropometrics are two distinct phenomenon which interdependent upon various biological, genetic, and geographical factors, but the study depicts a significant impact of maternal height on human fertility process. Hence, the maternal height may be used as a predictor variable for further fertility research. Fertility of India is approaching to the replacement level in coming years that indicates that the previously discovered sociodemographic factors of fertility have already started to achieve feasible state. Hence, a shift towards the anthropometric approach will improve the fertility studies.

Table 1 Mean estimates of fertility indicators for the Indian females (classification 1)

Fertility Indicators	NFHS-II (1998-99)				NFHS-III (2005-06)				NFHS-IV (2015-16)			
	Females having height				Females having height				Females having height			
	≤ 4'10"	4'10"- 5'00"	5'00"- 5'02"	> 5'02"	≤ 4'10"	4'10"- 5'00"	5'00"- 5'02"	> 5'02"	≤ 4'10"	4'10"- 5'00"	5'00"- 5'02"	> 5'02"
Children ever born	3.44	3.35	3.28	3.09	3.18	3.08	2.98	2.79	2.97	2.82	2.69	2.51
Survival ratio of children	0.880	0.898	0.911	0.924	0.899	0.921	0.932	0.943	0.927	0.945	0.954	0.962
Proportion	0.619	0.604	0.589	0.547	0.565	0.546	0.520	0.463	0.533	0.490	0.453	0.395

of females with 3+ birth order			
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Table 2 Mean estimates of fertility indicators for the Indian females (classification 2)

Fertility Indicators	NFHS-II (1998-99)		NFHS-III (2005-06)		NFHS-IV (2015-16)	
	Females having height		Females having height		Females having height	
	≤ 150.0 cm	> 150.0 cm	≤ 150.0 cm	> 150.0 cm	≤ 150.0 cm	> 150.0 cm
Children ever born	3.42	3.24	3.15	2.95	2.91	2.67
Survival ratio of children	0.886	0.912	0.908	0.933	0.934	0.954
Proportion of females with 3+ birth order	0.615	0.581	0.560	0.509	0.517	0.446

Table 3 Percentage distribution of females and summary of number of children ever born by some socio demographic characteristics

Socio-demographic Characteristics		Percent	Number of Children ever born	
			Mean	Standard Deviation
Place of residence	Rural	69.8	2.91	1.93
	Urban	30.2	2.67	1.82
Religion	Hindu	80.1	2.70	1.77
	Muslim	19.9	3.41	2.29
Caste	SC/ST	22.4	2.99	1.96
	OBC	54.2	2.87	1.93
	Others	23.4	2.61	1.76
Wealth index	Poorest	22.3	3.31	2.13
	Poorer	21.4	3.06	2.00
	Middle	18.6	2.83	1.90
	Richer	17.5	2.67	1.78
	Richest	20.3	2.25	1.40
Educational level	Illiterate	40.7	3.67	2.14
	Primary	13.0	2.90	1.77
	Secondary	33.5	2.26	1.39
	Higher	12.8	1.64	0.97
Family structure	Nuclear	50.6	2.54	1.69

	Joint	49.4	3.13	2.05
Age at first marriage	≤ 18 years	52.4	3.19	1.98
	> 18 years	47.6	2.45	1.73
Maternal height	≤ 150.0 cm	42.9	2.93	1.98
	> 150.0 cm	57.1	2.77	1.85
Total		100.0	2.84	1.90

Table 4 Poisson regression analysis for impact of socio demographic variables on number of children ever born

Socio-demographic Characteristics	Incident Rate Ratio	p-value	95 Percent Confidence Interval	
			Lower	Upper
Place of residence ¹				
Urban	0.916	0.000	0.905	0.928
Religion ²				
Hindu	0.792	0.000	0.781	0.803
Caste ³				
OBC	0.961	0.000	0.948	0.976
Others	0.874	0.000	0.859	0.889
Wealth index ⁴				
Poorer	0.925	0.000	0.910	0.941
Middle	0.856	0.000	0.841	0.871
Richer	0.806	0.000	0.792	0.821
Richest	0.679	0.000	0.667	0.692
Educational level ⁵				
Primary	0.788	0.000	0.774	0.802
Secondary	0.614	0.000	0.606	0.623
Higher	0.448	0.000	0.438	0.458
Family structure ⁶				
Nuclear	0.813	0.000	0.803	0.822
Age at first marriage ⁷				
>18 years	0.767	0.000	0.758	0.777
Maternal height ⁸				
>150.0 cm	0.946	0.000	0.935	0.957

Reference category- 1: Rural, 2: Muslim, 3: SC/ST, 4: Poorest, 5: Illiterate, 6: Joint, 7: ≤18 years, 8: ≤ 150.0 cm