DOI Number: 10.37506/v11/i1/2020/ijphrd/193887

A Study of Relationship between Maternal Height and Fertility: Indian Concern

A. K. Tiwari[1], Shivam Mishra[2], Ravi Kant Maurya[2]

[1]Associate Professor, Department of Statistics, Institute of Science, Banaras Hindu University, Varanasi-221005

[2]Research Scholar, Department of Statistics, Institute of Science, Banaras Hindu University, Varanasi-221005

Abstract

Demographers, as well as public health professionals, have been quite interested to study the relationship between maternal body size and fertility. In this paper, the relationship between mother height, number of surviving children and parity is investigated for India and its major states. The mean number of children ever born is high in shorter mother and mean duration of first birth interval among the taller mothers is less than the shorter mothers. Taller women tend to have fewer children but more surviving children. The National Family Health Survey (NFHS) collect the information on fertility, infant and child mortality and the practice of family planning. For this study authors have used NFHS-4 data.

Key Words: *Fertility, maternal height, first birth interval, children ever born, surviving children, parity etc.*

Introduction

Human biologists are concentrated on describing the associations between fertility differentials with maternal shape and assessing the evolutionary implications of these associations.

Fertility is considered one of the most important factor in the study of population dynamics. It is determined by a complex set of biological, socio-economic, and psychological factors. So, social scientists and thinkers from different disciplines have made attempts to develop calibrate theories of fertility suited to their disciplinary approaches. For the convenience of researchers, these theories are grouped under three broad categories: biological theories, social or cultural theories and economic theories. Biological theories of fertility stimulated the concept that human growth is similar to other living beings. While, social theories tend to describe fertility in terms of a person's psychological attitude, which is determined by the prevalent culture. The socio-economic theories stress the significance of economic factors in the overall process of social change, which directs the fertility behaviour of a population. Among many biological, psychological, cultural and socio-economic factors, Davis and Blake[1](1956) had identified a set of eleven factors called intermediate variables which affect the process of reproduction either directly or indirectly. Bongaarts[2](1978) refined Davis and Blake's fertility framework and identified a smaller set of seven variables and named them proximate determinants of fertility; among them, four determinants were considered most important in terms of explaining variations in fertility levels of populations by Bongaarts[3](1982).

From the above theories, it has resulted that reproductive success is determined by numerous biological, behavioural, ecological, cultural and socioeconomic factors. Besides these factors, some studies suggest that the physical structure of a person may also affect fertility behaviour. The anthropometric measure which is used basically to measure growth, development and health status of an individual is the quantitative body measurement. Anthropometrics may be considered as a determining factor of fertility. Outside India, there have been quite a few studies which dealt with the correlation between fertility and physical structure, while in India there is a little literature in this context.

To find the impact of physical structure on fertility, early investigations were done by Davenport[4](1923) and Frassetto[5](1934); and observed that stockier couples had larger families than lean couples. Mitton[6](1975) observed significant differential fertility for height among males.

He indicated that men who were closer to mean height and weight (in some cases) had higher fertility than average. Vetta[7](1975) found significant relationships of fertility with height, weight and ponderal index.

In developed societies, some evidence about the association of large maternal size with higher fetal survival has been found by Bernard[8](1952) and Bressler[9](1962). In these studies, it is found that factors linked with tall statures such as enriched nutritional status and enhanced health care facilities, resulting in more successful pregnancies. Furusho[10] (1964) found that short couples had more live births than the tall in Japan, but there was no significant difference in the number of surviving children between tall and short. Among Peruvian urban poor, Frisancho et al.[11](1973) found that short mothers had a higher proportion of survivors per couple than tall mothers of similar age. Martorell et al.[12](1981) investigated the association between maternal stature, parity, offspring mortality and the number of surviving children. Sear et al.[13](2004) examined the relationship between height and reproductive success.

In this study, authors have made an attempt to examine the relationship between maternal stature and fertility in India.

Material and Method

The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. Starting from the first round of this survey (NFHS-1) in 1992-93, four rounds of NFHS have been conducted in India till now. The recent round of National Family Health Survey (NFHS-4)[14] has been conducted in 2015-16. In this study, data related to fertility measures and anthropometric measures are taken from NFHS-4.

In this study, females of major states of India aged between 15 to 49 years have been considered as the target population. NFHS-4 collected anthropometric data on the height and weight of women which were used to calculate nutritional status measures. Females are categorized into two groups based on their height i.e. women having height ≤145.0cm, and having height >145.0cm. Literature review suggests about a number of important fertility parameters. Among them, four fertility parameters children ever born, first birth interval, most recent close birth interval and open birth interval have been considered for the study. Descriptive statistics have been used to get the estimated mean values of selected fertility parameters. The t-independent test is also used to compare the selected fertility parameters of shorter and taller mothers. The surviving ratio has been estimated to study the relationship between surviving children and maternal stature. Parity-wise proportion of females are also given for both groups to answer the question of whether parity, the number of previous deliveries, differs by mother's height.

Findings:

Table represents estimated means of selected fertility parameters i.e. children ever born, first birth interval, most recent close birth interval and open birth interval; for Indian females who are classified into two groups on the basis of their height which are height ≤145.0cm and height >145.0cm (shown in table). As it can be seen in the table, the mean number of children ever born is high in shorter mother in compare to taller. By considering females of all the major states of India, it is observed that the mean duration of the first birth interval among the tall females is less than the short females and statistically significant (p=0.000). Short females have a higher number of children ever born in comparison of tall females and it is statistically significant i.e. p=0.041 (shown in table).

The study shows that the mean number of surviving children of shorter females is lower than taller females in maximum states. It also indicates that taller mothers had a higher proportion of survivors (Mean number of surviving children/Mean number of children) when compared to shorter mothers. The analysis answers the question of whether one of the most meaningful measures of fertility, the number of surviving children varies with mother height. The table explains the proportion of females on each order of births and the analysis shows that the proportion of females at the first and second order is greater in taller and it starts decreasing after second order births. On another side, the proportion of females is more at high parity and it is less in the beginning orders.

Conclusion & Discussion

Over the decades, many public health professionals and demographers have tested the relationship between height and fertility. Many researchers found that mortality was significantly more for children of shorter women and they also observed a tendency for shorter women to have higher parities. Some researchers found no relationship between maternal stature and fertility

and few researchers found shorter females to have higher fertility.

In our study firstly, we studied the fertility parameters of shorter and taller mothers and found short females have more children ever born than tall females as well as longer duration of first birth interval. Secondly, we studied the mean number of surviving children and calculated survival ratio of children for major states of India and it has been observed that survival of children is low among short females in comparison of tall females. Earlier works by researchers on different populations show that mortality is greater in children of short mothers (Furusho[10],1964; Lechtig et al.[15,16]1975,1976). Last, it is observed that there is a tendency to have higher parities among short females. Survival of children may be caused due to deliberate efforts by short females to have more children to recompense for their child losses. Besides this, it is also known that after the death of a baby, the cessation of breastfeeding accelerates the return of the menstrual cycle which shortens the intervals between births (Martorell et al.[12],1981). This leads short females to achieve higher parities.

On the basis of the above analyses, we must conclude that there is a relationship of mother's height with fertility parameters, the number of surviving children is a function of height and mother height is related to the proportion of females at different parities. The taller mother tends to have fewer children but more surviving children, the survival of children is lower in shorter mothers. The study can be looked in light of the concern of public health professionals.

Table: Estimates of Fertility Parameters for Indian Females

Fertility Indicators	**Females having a height**	
	≤145.0cm	**>145.0cm**
Children ever born	2.00	1.87
	(t=1.841, p=0.041*)	
First birth interval (in months)	30.95	28.01
	(t=7.626, p=0.000**)	
Most recent close birth interval (in months)	37.77	37.73
	(t=-1.225, p=0.117)	
Open birth interval (in months)	99.84	104.00
	(t=1.155, p=0.131)	
Children survived	1.87	1.75
Proportion of children survived	0.91	0.94
Proportion of females on each birth order		
1	0.182	0.198
2	0.285	0.336
3	0.227	0.224
4	0.140	0.122
5	0.079	0.061
6	0.044	0.031
7	0.023	0.015
8	0.021	0.012
Note: t-test is applied by considering all the major states of India.		
* p-value is significant at α = 0.05 level of significance.		
** p-value is significant at α = 0.01 level of significance.		

Conflict of Interest: Nil.

Source of Funding: Datasets access is granted by DHS Program for research work.

Ethical Clearance: Not required as data source is mentioned above.

References

1. Davis K, Blake J. Social Structure and fertility: An analytic framework. Econ Dev Cult Change. 1956;4(3):211-35.

2. Bongaarts J. A framework for analyzing the proximate determinants of fertility. Popul Dev Rev. 1978;4(1):105-32.

3. Bongaarts J. The fertility-inhibiting effects of the intermediate fertility variables. Stud Family Plann. 1982;13(6/7):179-89.

4. Davenport CB. Body build and its inheritance. Washington, DC: Cambridge Institution Press; 1923.

5. Frassetto F. I principali caratteri anthropologici e constitutionalistici studiate i 1450 genitore prolocici della regione Emiliana. In: Giri C, editors. Proceedings of the International Congress for Studies on Population; 1934; Rome, Italy. Rome: Rome University Press; 1934. p. 145-220.

6. Mitton JB. Fertility differentials in modern societies resulting in normalizing selection for height. Hum Biol. 1975;49:189-200.

7. Vetta A. Fertility, physique and intensity of selection. Hum Biol. 1975;47:283-293.

8. Bernard RM. The shape and size of the female pelvis. Edin Med J (Trans Edin Obstet Soc). 1952;59:2-16.

9. Bressler JB. Maternal height and the prevalence of stillbirths. Am J Phys Anthrop. 1962;20:515-7.

10. Furusho T. Relationship between the stature of parents and the mortality of their children. Japanese J Hum Genet. 1964;9:18-34.

11. Frisancho AR, Sanchez J, Pallardel D, Yanez L. Adaptive significance of small body size under poor socio-economic conditions in Southern Peru. Am J Phys Anthrop. 1973;39:255-61.

12. Martorell R, Delgado HL, Delgado H, Valverde V, Klein RE. Maternal stature, fertility and infant mortality. Hum Biol. 1981;53(3):303-12.

13. Sear R, Allal N, McGregor IA, Mace R. Height, marriage and reproductive success in Gambian women. Res Econ An. 2004;23:203-24.

14. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), 2015-16. Mumbai: IIPS; 2017.

15. Lechtig A, Delgado H, Lasky R, Yarbrough C, Martorell R, Habicht JP, et al. Effect of improved nutrition during pregnancy and lactation on development retardation and infant mortality. In: White PL, Selvey N, editors. Proceedings of the Western Hemisphere Nutrition Congress IV; 1974; Bal Harbour, Florida. Acton, Massachusetts: Publishing Sciences Group; 1975.

16. Lechtig A, Delgado H, Yarbrough C, Habicht JP, Martorell R, Klein RE. A simple assessment of the risk of low birth weight to select women for nutritional intervention. Am J Obstet & Gynecol. 1976;125:25-34.