

A Comparative Study of measures of human fertility behavior due to different socio-economic determinants in Aligarh district

Danish Qadeer

Department of Geography, Aligarh Muslim University, Aligarh

***Corresponding Author:**

Danish Qadeer

Email: dqi2002@gmail.com

Abstract: This is a study of measures of human fertility behavior due to different socio-economic determinants of phenomenon, based on a comprehensive field survey, conducted in Aligarh district of Uttar Pradesh, India during about two year period (June 2011- July 2013) and can be called Aligarh District Fertility Survey (ADFS) for simplicity. For the purpose of survey stratified random sampling was applied. Two sampling frames rural and urban were designed to get a truly representative sample. The data was further categorized by the well known determinants of fertility differentials namely education, religion, income and residence. Hindus and Muslim are two dominating religions of the district, so the fertility differential according to religious beliefs was also tested on the basis of average number of children per Hindu and Muslim families. The standard normal probability distribution was used to conduct Z-test for testing the significance of difference in means of the two populations. Subsequently a comprehensive statistical analysis of the data was carried out and the results were compared with the results of National Family Health Survey-1998-99 (NFHS-II).

Keywords: Education, Human fertility, Income, Residence, Sample Design, Test of significance

INTRODUCTION

During the last two decades a lot of work has been done human fertility problems on global, continental and national scale by geographers. However, micro level regional studies are relatively few and it is now realized that small scale comprehensive are the need of the hour. In fact for better understanding of the nature and magnitude of human fertility problems facing the world, micro regional studies are immensely important. In view of the above facts Aligarh district was chosen as the study area. The district falls in a politically and economically important area of North India.

The religion of a person seems to play a prominent role in governing his attitude towards the size of his family. Of late, almost all prominent religions of the world have been assisting governments in dealing with the menace of population growth. Among them Islam has been found to exercise opposition to the concept of deliberate attempt to control population growth. Kingslay Davis [1] observed that birth rates of Muslims are significantly higher than their neighbors Hindus. Similarly, in the west, the fertility of Roman Catholics has been found to be higher than Protestants. Van Hack [2] and Day [3] have observed that minority groups tend to increase their family size to be equal in numbers to the majority. Such ideas have been at work in India also [4].

Place of residence have been found to be an important factor in differential fertility factors. The different ways of life associated with residence in different kinds of areas affect family size [5]. Farmers reside in the open country and rural areas, and college students are drawn to towns and cities. Because of these relationships urban areas have great impact on rural areas, significant differences would be expected in couples living in cities, towns and villages in all aspect of social life including fertility. Various studies have been made to estimate the urban influence on fertility in rural areas [6].

Education is a planned process which is devised to give certain information and develop certain skills. For an effective control of fast growing population size, appropriate education among female is absolutely essential. Many studies have shown that success in controlling fertility rate is very difficult to achieve without female literacy, studies have shown that education is the single most important variable which accounts for a large reduction in fertility, in those countries which already experienced fertility decline. Bogue also found education, the single most important variable in explaining fertility decline in selected countries[7].

Income is one of the important variables for measuring the level of economic growth of a nation. The higher the income level the better is expected to be

the welfare status of the society. With the increase in income, parents opt for higher quality children rather than the numbers, devoting more of their time and income to their health and education [8].

The major objective of this study, based on sample survey, is to estimate fertility levels, differentials and fertility trends in Aligarh district. The estimates in this chapter are based on the complete birth histories of ever-married women aged 14-49 as provided by them. To facilitate the complete and accurate reporting of births several procedures were followed. Some basic points are taken into account while selecting the social factors of fertility differentials in the region of our selection, the Aligarh district. First point is that apart from availability and suitability of data, factors should be brief and effective. Secondly, they should be of current significance and indicative of current trends and attributes of social processes. Thus the present analysis is concerned with the selected social factors of fertility differentials, such as religion, education, economy and residence.

METHODOLOGY

For conducting the survey, help of fellow research students was sought. Intensive questioning and probing was done for extracting accurate information from the respondents. In addition any available documents such as immunization card, ration card etc. were checked, that may provide important information. Finally for any interval of four or more years between births, reasons were recorded, for long interval to help in identifying any live births that might have been omitted during the time period.

The respondents were separately asked about the number of daughters and sons who were still living with them, those living elsewhere and those who died. They were also asked about the year of their marriage and time taken before the first child was born. Enquires were made about their educational status, number of years spent in school, whether they were housewives or gainful workers, engaged in services or business. They were also enquired about the educational status of their husbands and children. As population size depends both on fertility and mortality, an important question about the number of children who died before reaching age 5 years, was also enquired about. Despite, all the measures undertaken to improve quality of the data, the most common deficiencies in all sample surveys, namely omission of recording some births (especially births of children, who died at a very young age) and of determining the date of birth separately, may have remained in this survey too. This problem was especially found to be acute in rural areas where female literacy rate is quite low.

Questionnaire

The questionnaire contained thirteen questions and designed to collect information from eligible

women that are ever-married women aged 14-49 years. First five questions, concerned information about age, marital status, age at marriage and year of widowhood, separation or divorce. In the next five questions, we tried to get information about married women's economic status, whether she engaged herself in any gainful employment or was just a housewife, her as well as her husband's educational status, years spent in school/college and university. The next three questions were concerned about number of ever born children, their sex, their educational status, number of children who died before age 5 and after how many years of marriage first child was born.

Sample Design, sample size and allocation

The sample design for this survey is a systematic, two stage stratified sampling for the households. The sample for the survey of Aligarh district was designed to provide statistical estimates for the district as a whole, for urban and rural areas, for Hindu-Muslim populations, for educated and illiterate. The universe in this case consisted of all rural and urban areas of the district.

The overall target sample size was set at completed interviews with eligible (14-49) married women. The target was set considering the size of the district, time and resources available for the survey and the need for separate estimates for various characteristics separately. The district was subdivided into four contiguous areas according to their geographical characteristics.

The Rural Sample: The Frame, Stratification and Selection

The list of inhabited villages in Aligarh district served as the rural sampling frame and a two stage sample design was adopted with the selection of villages in the first stage and house hold in selected villages in the next stage. The first level of stratification was geographic with the district subdivided into twelve blocks, considered different regions. The blocks are listed below:

1. Tappal
2. Chandous
3. Khair
4. Javan
5. Lodha
6. Dhanipur
7. Gaunda
8. Iglas
9. Atrauli
10. Bijoli
11. Gangiri
12. Akrabad

In the Rural Sample frame, villages five kilometers away from urban centers were considered. The villages in each block were divided into three strata according to the number of households in them.

Stratum 1: Villages with 750 or more households and more than 5kms away from urban centre.

Stratum 2: Villages with less than 750 households but more than 300 households.

Stratum 3: Villages with less than 300 households.

The next level of stratification was implicit and consisted of ordering the villages by the proportion of females to be selected. The overall sampling fraction, the probability of selecting a woman was computed as

$$f = n / N$$

Where,

n = number of women to be interviewed

N = population of eligible women in the village

Operation of listing of household was carried out in each of the selected primary sampling units four weeks prior to the data collection. This list provided the necessary frame for selecting household, at the second sampling stage. The household, to be interviewed were selected from the household lists using systematic sampling with equal probability. A random sample was selected using random number table.

The Urban Sample: The Frame, Stratification and Selection

For the urban sampling frame, the list of census enumeration blocks provided by District Population Office served as the sampling block. The Aligarh district information bureau booklet provided the details of urban centers in the district. There were thirteen urban centers in the district, the Aligarh city plus twelve block centers.

In the first level of stratification, all the urban centers were sub-divided into three strata according to direction of location. In the first strata the district

headquarter was taken and in another two strata, urban centers in northeastern and southwestern parts were clubbed. Apart from Aligarh in stratum one, the other two strata consisted of 7 and 5 urban centers respectively.

Strata 1: Aligarh city.

Strata 2: North-Eastern part of the district consisting of 7 urban centers that is Tappal, Chandaus, Khair, Jawan, Lodha, Gaundaand Iglas.

Strata 3: South-Western part of the district consisting of 5 urban centres that is Dhanipur, Atrauli, Bijoli, Gungeri and Akrabad.

In Aligarh city, two localities one predominantly Muslim (Jamalpur) and other predominantly Hindu (Vishnupuri) were selected randomly. A random sample of 50 household in each locality was selected for interview. Exhaustive questionnaire was presented to married woman and filled in presence of the male members in the family.

Similarly from stratum 2 and 3, one urban centre was randomly selected. From stratum 2 Jawan was selected and from stratum 3 Akrabad was selected. In second stage of sampling, primary sampling units, the household were again randomly selected.

The listing of households in selected places was done awarding them serial numbers. A random sample of 547 households was selected from urban frame, using random number tables. A total of 1422 sampling units were selected including 875 households from rural sample frame. It turned out that in the selected samples the religion wise breakup was 912 Hindus and 510 Muslims. The literacy breakup of the sample turned out to be that, it included 320 illiterates, 328 having education below High School and 774 above High School. The following table gives the sample breakup with regard to different characteristics.

Table 1: Sample Sizes

Income	Sample Size	Religion/ Residence	Sample Size	Education	Sample Size
A. <1000	400	Hindu	912	Illiterate	320
B. 1000-2000	300	Muslim	510	< High School	328
C. 2000-5000	500	Rural	875	>High School	774
D. >5000	222	Urban	547	-	-
Total	1422				1422

Prominent Characteristics

Before presenting the findings with respect to fertility and related aspects, a brief examination is necessary of the socio-economic background of the household and ever-married women. Apart from socio-economic characteristics of the household, the survey collected data on minimum educational levels considered necessary for children as well as nature of financial support expected from children.

In rural area, cultivation and agricultural labour were the major source of livelihood, as one would expect. Cultivation was the main source of income for about 65 percent of households. The rest received salary/wage income, or were engaged in cottage industries, livestock, trade/business. Most of the households were engaged in more than one economic activity.

More than 35% of the households did not own any agricultural land. The proportion of landless household was relatively high in north-eastern part than the south-western part. It was found that the amount of land owned has not changed significantly during the last ten year. However as a result of buying and selling and land reforms, about 10 percent of landless households gained land, while as much 5 percent of households land holdings decreased.

About 58% of the households in the sample had a per-capita monthly income of less than rupees fifteen hundred. A large number of households from 70 to 80 percent in rural areas earned income from cultivation or from agricultural labour or both.

FERTILITY DIFFERENTIALS

By Religion

Followers of all prominent religions are present in Aligarh district. Hindu constitute overwhelmingly 84.9% of the total population of the district. Muslims stand at second place with 14.63%, Christians are at 0.09%, Sikhs at 0.16%, Budhists at 0.10%), Jains at 0.12% of the total population. It would be of great interest to analyze fertility measures between the two major communities, Hindus and Muslims in the district on the basis of average number of children per family.

In the country as a whole, the fertility differentials by religion are quite significant. According to NFHS-I (1992-93) [9], the TFR is 3.3 among Hindu women, 4.4 among Muslim women and 2.7 among women of the all other religions combined (Christian, Sikhs, Buddhist, Jains and others). Unlike the differentials by other factors, fertility [10]. differentials by religion do not show a systematic pattern of variation from high fertility states to low fertility states. Although Muslims have higher fertility than Hindus in all states, the Hindu-Muslim differential is comparatively small in Rajasthan, Madhya Pradesh, Uttar Pradesh, Goa, Gujarat, Andhra Pradesh and Tamil Nadu. It is comparatively large in Delhi, Haryana, Himachal Pradesh, Punjab, Bihar, Orissa, West Bengal, Assam, Maharashtra, Karnataka and Kerala. The fertility of women of other religions is lower than the fertility of either Hindu women or Muslim in all states except Himachal Pradesh and Assam. It is possible that religious differentials in fertility may be explained to some extent by socio-economic characteristics of interviewed individuals. Table 2 shows the average number of children/family by religion for India, U.P. and Aligarh district, according to different surveys.

Table 2: Average number of children per family by religion

	Total	Hindu	Muslim	Others
India	4.84	4.7	5.83	4.07

Uttar Pradesh	5.97	5.93	6.43	4.41
Aligarh	4.54	4.24	4.84	NA

(Source: NFHS-II, 1998-99, and ADFS-2013)

The figures for Uttar Pradesh and India are taken from exhaustive study on Fertility in India based on NFHS-II (1998-99)[11] and Aligarh District figures are based on ADFS. It is quite evident that average for the India (4.7) is much less than average for Uttar Pradesh (5.93) in Hindu families. Aligarh district figure, as obtained in our survey for the same category is (4.24) further lower than overall figure (5.93) for the entire state.

The all India average number of children per Muslim family (5.83) is less than the state average, which stands at 6.43. This average for the Aligarh district for Muslim families is quite lower (4.84) than the state average, which stands at 6.43. The apparent reason for this differential seems to be that Aligarh is centre of higher learning because of existence of a central university and other degree colleges and institutions. Apart from the fact that almost 12 years have been passed at the time of ADFS as compared to NFHS-II which was conducted during 1998-99. The figure 1 shows bar diagram for average number of children per family religion wise, according to table no. 3.

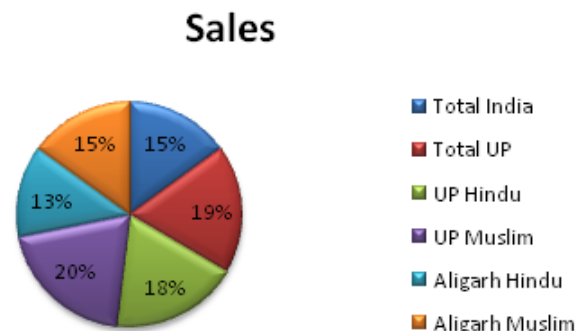


Fig. 1: Average number of children/family

The big difference in U.P. and Aligarh district may also be explained by overall decrease in fertility in the last decade. The decadal (2001-2011) growth rate has declined by eight points as compared to previous decade (1991-2001) in the district.

Test of significance of difference of Means

Testing of the significance of the apparent difference in means of two populations is quite important. It tells us whether the apparent difference is real one or just due to sampling fluctuations. The sampling or standard error plays a very important part in reaching the conclusion that whether the difference is due to real causes. It is obvious that difference between the average number of children per Hindu family (4.24) and average number of children per Muslim family (4.84) is quite apparent and it shows that fertility differential due to religion is quite significant factor.

The test can establish quite satisfactorily and mathematically whether the difference is really caused by religious approach of people and whether Hindu and Muslim religions bear an impact on the fertility differential.

We set up the null hypothesis that there is no significant difference in the average number of children per Hindu and pre Muslim family and the samples do not come from altogether different populations as far as fertility is concerned. The alternative hypothesis states that the difference is quite significant and can be attributed to the religions which people follow. Statistically it is written as,

$$\text{To test } H_0 = M_1 = M_2$$

against

$$H_1 = M_1 \neq M_2$$

where, M_1 & M_2 being the population averages of Hindus and Muslims respectively.

The test statistic is

$$Z = \frac{|\bar{X}_1 - \bar{X}_2|}{SE(\bar{X}_1 - \bar{X}_2)} \sim N(0, 1)$$

Z follows the standard normal distribution

S.E. stands for standard error

$$SE(\bar{X}_1 - \bar{X}_2) = \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$$

\bar{X}_1 denotes the mean number of children/Hindu family as obtained in the sample

\bar{X}_2 denotes the mean number of children/Muslim family as obtained in the sample

S_1 standard deviation for Hindu families

S_2 standard deviation for Muslim families

After calculations, we get

$$S_1 = 1.4 \text{ and } S_2 = 1.9$$

$$Z = \frac{|\bar{X}_1 - \bar{X}_2|}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} = \frac{|4.214 - 4.844|}{\sqrt{\frac{1.4^2}{900} + \frac{1.9^2}{600}}}$$

$$Z = \frac{0.63}{0.083} = 7.59$$

Theoretical value of Z-statistic is 1.96 at 5% level of significance. Since the tabulated value of Z (1.96) is much less than the calculated value of Z (7.59), the null hypothesis is rejected at 5% level of significance, implying that barring 5% error in the result owing to sampling fluctuations, the result is 95% correct. The rejection of null hypothesis implies the

acceptance of the alternative hypothesis. The acceptance implies that there is real difference in fertility owing to religious beliefs of the people. We conclude that being follower of Islam has direct bearing on higher fertility than the belief in Hinduism and that Hindu religion suppresses fertility than Islam.

By Education

Education has been considered to be the most effective tool of controlling fertility and thereby expansion of population. To find out the role of education on fertility behaviour in Aligarh district, sampling units were asked about their educational level. Three categories were devised to stratify the respondents according to their education. The first category was of illiterate, in the second category people with equal to or less than high school educated were placed in (middle) category and respondents educated more than high school level were placed in the third category.

As stated in the beginning of the chapter, out of the total sample of 1422 respondents, selected after two stage sampling, 320 were illiterates, 328 belonged to second group with less than high school education and 774 belonged to third group with more than high school education. The following table provides average number of children ever born to married women in these categories. Third row of the table gives the average as obtained in the ADFS. The first and second rows give the corresponding figures for India and U.P. state as recorded by NFHS-II conducted in 1998-99.

Table 3: Average number of children/married woman

	Total	I Category	II Category	III Category
India	4.84	5.26	4.50	3.13
U.P.	5.97	6.24	5.38	4.08
Aligarh	4.92	5.90	4.85	4.02

(Source: NFHS-II, 1998-99, ADFS-2013)

It can be easily seen that at all India level, the difference in the average number of children/family is quite significant between illiterate and third category while the corresponding difference is not that large between these categories in Uttar Pradesh. This difference is still smaller in the Aligarh survey which shows that illiterate people in the district are quite aware of the concept of family planning and thus fertility has gone down in all categories of people. Even the illiterates are quite aware of dangers of higher fertility in the district, as compared to State and National levels. Fig. 2 shows the data given in table 3, in the form of bar diagrams, which make the differential more visible and easy to comprehend.

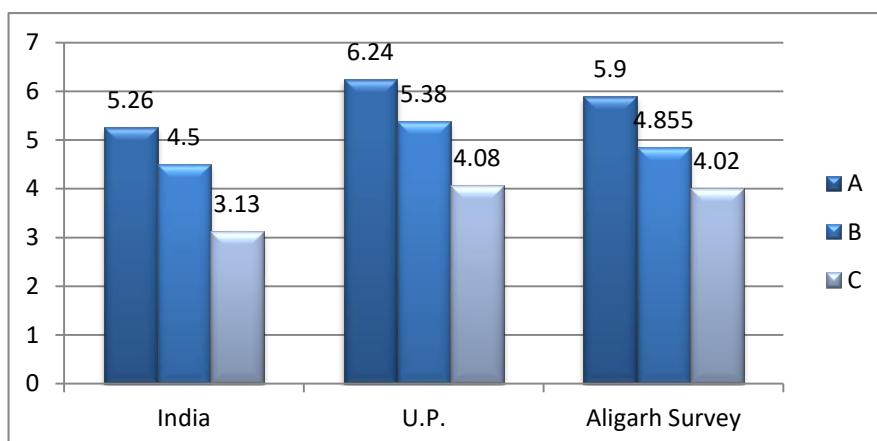


Fig. 2: Average Fertility Differential by Education

The basic cause of lower fertility in Aligarh district as compared to India and U.P. state is that the fertility has fallen more rapidly during the last ten years when NFHS-II was conducted in 1998-99. Further, more people have been adopting family planning methods to control fertility in recent years.

By Residence

Fertility differential by residence is a matter of great interest around the world. In the Indian subcontinent, there are great socioeconomic differences between the people living in Rural areas and the Urban areas. Since educational facilities in urban areas are much higher than in rural areas, where educational apparatus is almost non-existent, there is a great difference in educational level between rural and urban residents. The same is true of economic differential between them. Since the rural economy is almost totally dependent on agriculture, most of rural people work as agriculture labourers, except for a handful of people who are land owners. Their per capita income is much lower than their urban counterparts. The people in urban areas have far more access to government jobs than rural people. In addition, most of the industries are located in cities and towns and thus urban people have far greater channels and opening in jobs as well as in business, than the rural populace.

To estimate, the fertility differential between the urban and rural areas, we conducted the survey in both the areas. Our sample consisted of 547 urban respondents and 875 rural respondents. It was quite

easy to extract information even from rural married women, as family planning and population explosions are the burning topics both in rural and urban areas these days. Since people are facing problems everywhere, in hospitals, railway and bus stations, crossroads and schools. Due to population explosion, human fertility has become a hot topic everywhere irrespective of rural/urban divide. The average number of children ever born to ever married women in age group 15-49 was obtained. Table 4 shows the average number of children born to ever married women in age group 15-49 according to characteristic Residence. Apart from Aligarh district figures which were obtained by the author, the U.P. state and India figures were recorded as obtained in NFHS-II.

Table 4: Rural-Urban Differential

	Total	Urban	Rural
India*	4.84	4.16	5.13
U.P.*	5.97	5.18	6.19
ADFS	4.92	4.01	5.84

(Source: NFHS-II, 1998-99, ADFS-2013)

The significant point to be noted here, is that average fertility in Aligarh district is quite lower than all India as well as U.P. state, both in Rural and Urban areas. Over all fertility in rural areas is higher than urban areas. In urban areas of Aligarh, it is found to be 4.0 which is 1.17 points and 0.15 point lower than U.P. and India, respectively. It is diagrammatically represented in the fig. 3.

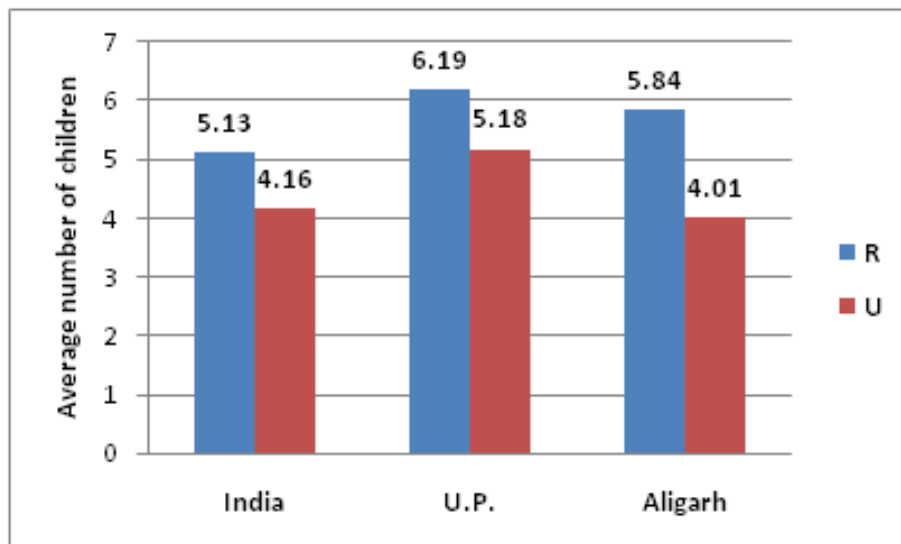


Fig. 3: Rural-Urban Differential

By Income

The economic status and fertility of families have been a subject of interest for many demographers. In the urban settings, economic status and fertility have generally been inversely related. Although class differences in the fertility of urban couples in industrialized societies seem to be demising, the basic reverse relationship Ryder and Westif [12], Johnson [13]. This negative association is also generally found in rural areas of western societies, Duncan [14], Beegle [15], Riteley and Stokel[16]. To make such a statement about rural communities in developing world is quite difficult.

A number of studies have found a positive relationship between economic status and fertility in country side. Noestein [17] found that fertility differentials by Economic class in rural China were unimportant. However to the extent they occur, they indicate a direct association between fertility and economic status. Stys [18] examining the relationship between the size of Polish peasant families and the size of householdings concludes that rich peasants have much larger families than those who are poor. Direver [19] found a direct association between landownership and fertility in his rural sample of Mysore households. Nag [20] in his study of fertility differential in a cluster of villages in West Bengal conclude that the fertility was positively related to economic status of husband.

There are other studies also, in rural communities of the developing countries which indicate either an inverse or no relationship between economic status and fertility. In a study of fertility of Muslim couples in a sample of Lebanese households the fertility did not differ by socio-economic status, instead a slight inverse relationship was found between fertility and economic status of Christian couples. In a demographic survey of some villages in rural southern Iran, an inverse association between household income and

fertility is reported, Eftekhari, et al [21]. In a similar evidence of Punjab India, it was found that high ranking Jat woman who had been married through their whole child bearing period had an average of 7.0 live births, and the low ranking scheduled caste women averaged 8.2, Potter, et al.[22], Wyon and Gordon [23].

No decision regarding an inverse or otherwise relationship between income and fertility can be made in view of conflicting reports. However, the results of our survey in the Aligarh district revealed that income is directly related with low fertility. It was found that people with monthly income more than Rs. 5,000, placed in higher group, had lesser average number of children than people in lower groups. In a sample of 1422 respondents, the income distribution was found as

Category	Monthly Income (Rs.)	No. of respondents
A	Less than 1000	400
B	Between 1000 & 2000	300
C	Between 2000 & 5000	500
D	More than 5000	222

The following table gives the average number of children per family according to income groups.

Table 5: Average Number of Children per family by income

Income Group	Average No. of Children
A	6
B	6
C	5
D	4

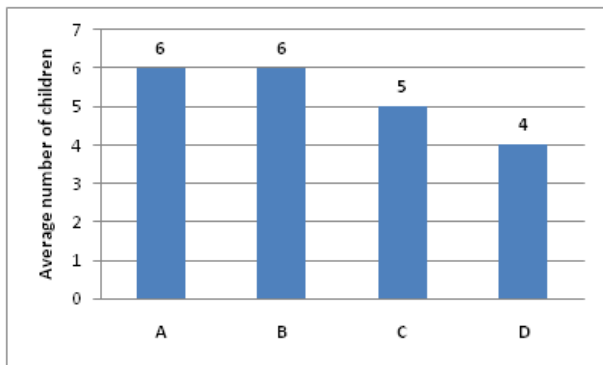


Fig. 4: Average Number of Children per family by income

DISCUSSION AND CONCLUSIONS

The fertility differentials and determinants are not merely a biological outcome of sexual relations between man and woman; it is a social phenomenon as well. The theory that fertility is just an expression of sex desire simply does not apply to human population as it applies to animals. Man is a social animal who actively creates the society in which he lives. Fertility is determined, to a large extent, by social factors, beliefs and attitudes, the structure of the family, economic and political considerations. Fertility, therefore should be treated primarily a social artifact. Taking in view the complex phenomenon, as the fertility is, a comprehensive survey of Aligarh district, both urban and rural, was designed, in consultation with the supervisor and some demographers in the University. The objective was to reach every knock and corner of the district. The whole district was divided into Rural and Urban, two stratum. Urban sample frame was again divided into three stratum, consisting of Aligarh city, the second stratum included north-eastern urban areas and the third stratum included south-western areas. Similarly the Rural sampling frame was also stratified into three strata according to population size of the villages, one with population of more than 750 households, the second with population between 350-750 households and the third with population less than 350 households. Then a random sample of 1422 households was selected, representing 547 from Urban areas and 875 households from rural areas. Further classification according to religion, education and income was done likewise.

In the first place, the average numbers of children per family by religion were compared and it was found that on the average, Muslims had higher mean number of children per family than Hindus. The result is commensurate with NFHS-2 which has also revealed that fertility among Muslim is higher than Hindus. Sometimes simple averages mislead people. It was further decided to apply statistical test, the normal test of significance for difference of means, which showed that the apparent difference in the averages is really due to the religious beliefs, and not due to sampling fluctuation only. This test established that

Islam does not suppress fertility, as compared to Hinduism. Similarly, the urban-rural differential was tested. Our result that rural fertility is higher than urban fertility in Aligarh district was in league with the results of all other surveys which claim likewise. But this difference in average number of children per family in Rural and Urban areas was again put to test, using the normal test of significance of difference of means. The test proved that there is real difference in the rural and urban fertility and not due to sampling fluctuation alone. The test proved that people in rural areas tend to promote big families due to various socio-economic causes, which do not play important role in urban settings. In both these cases the fertility in Aligarh was found to slightly lower than NFHS-II.

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