International Journal of Enhanced Research in Educational Development (IJERED)
ISSN: 2320-8708, Vol. 10 Issue 2, Mar-Apr, 2022, Impact Factor: 7.326

Effect of female literacy on the population growth of Rohtak city

Anuradha Nandal[*1], Sudhir Malik[2]

[1*]Research Scholar, Department of Geography, Baba Mastnath University, Asthal Bohar, Rohtak– 124001
[2]Professor & Head, Department of Geography, Baba Mastnath University, Asthal Bohar, Rohtak – 124001

Corresponding Author: Anuradha Nandal, Research Scholar, Department of Geography, Baba Mastnath University, Asthal Bohar, Rohtak, anuradha.monu@gmail.com

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ABSTRACT

Rohtak is one of the fastest growing urban towns in Haryana. The population of the city has increased from 166767 in 1981 to 374292 in 2011 and projected to increase to 541552 in 2021 census. Though there is a sharp increase in the total population, the crude birth rate as well as total fertility rate which are better indicators of sustainable population is declining significantly and reaching a stable value. This positive development is driven by several factors such as lower child mortality, lower death rate but main reason is an increase in literacy among female population. The data from 2011 census clearly shows a sharp decrease in total fertility rate from 2.6 among illiterate population to 1.7 in literate females. Further classification shows that fertility decreases drastically with education level and drops to 1.5 for female population with education above secondary i.e. 12th.

INTRODUCTION

The word 'demography' is derived from Greek where demo in Greek means 'the people' and graphy means 'picture or measurements'. The demography comprises concepts and techniques for statistical study of human populations over space and time. Demographers analyses spread, size and structure of whole society or groups based on education, nationality, caste, religion, ethnicity etc. and has been very useful to policy makers as well businesses in predicting social-economic changes related to population.

Though demographic studies were conducted in ancient history but in the modern history the first comprehensive demographic studies were conducted in 16th century by John Graunt from United Kingdom where he recorded mortality rates of population as well as baptism [1]. This helped him to successfully estimate total number of families, population of region as well as number of women of childbearing age. The study and statistics of mortality rates grew in 18th century due to growing interests of population to take life insurance where life insurance agents needed to determine the insurance rates based on the mortality rate. Until 19th century the demographers mostly studies mortality rates typically driven by life insurance companies until the community noted a significant decrease in fertility mostly in industrialized countries and produce an equal interest in fertility with mortality. In fact, fertility rates depend on many factors such as culture, child mortality, religion and financial condition of families including employment. In conclusion, the population can vary through three factors: mortality, fertility, and migration which are contributor to variations in population.

Mass education and literacy are most important indicators of development of a town, city (urban) or village. Every country invests in education attainment of its population through various initiatives. In fact, international organization such as United Nations had a goal to attain universal primary education by 2015[2]. Similarly, developing country like India has achieved a very tough goal and literacy rate has increased from roughly 18 % in 1951 to 74 % in 2011 census [3]. This steep rise after independence could happen due to several government initiatives and opening of the primary schools in almost every village especially in states like Haryana, Punjab, Delhi, and Kerala. In 2002 government made it compulsory through right to education up to the age of 14 and also included as Directive Principle in the Constitution. Literacy rate varies from state to state according to state-dependent policies. Literacy rate or education level is one of the key factors affecting demographic changes through several factors such as birth rate, fertility, infant mortality and migration [4,5]. In fact, an increase in education level brings health consciousness in the population which leads to higher life expectancy. The key factors in low literacy rate are unavailability of schools and un-awareness about usefulness of education.

Most of the geographers study female literacy due to the fact female education is less prevalent than its male counterpart. Also, in Indian society husband is more educated than women, this is usual in most of the cases since in arrange marriages girl's parents chose more educated groom. Thus, female literacy is studied with great interest and affects several indicator of population growth [6, 7]. An old African proverb put it in right prospective 'If you educate a man you educate an individual, if you educate a woman you educate a family'. The crude birth rate as well as child mortality rate decreases with literacy [6, 7, 8].

METHODS

As of today, the demographer analyze the census data provided publicly by government through census and other registration agencies which record birth, marriage, divorce, death and migration. The registration system is more accurate method to determine number of births and deaths whereas census is not very accurate method since census is mostly carried out once in 10 years due to requirement of large work force and misses out children death within that time period. Census however counts families, religion, age, sex, literacy, language, religion, employment condition, migration and geographical location and provide vibrant data sets for statistical analysis based on several parameters. The updated registration system of birth, death and migration is needed for sustainable development, planning and development of newly growing urban areas. An accurate registration system is also required for implementation of various programs such as child vaccination etc. by the government. Thus, government has made it mandatory to register birth and death through various incentives. The process has been simplified enabling the registration system easier which has resulted in almost 90 % registration of number of births and deaths in India. The data is provided online at https://crsorgi.gov.in/ [9]. As a matter of fact in Haryana almost 100 % registration of birth and death is being recorded. However, there is slight mismatch between the data reported over different years but that is within acceptable error bars. Crude birth rate and crude death rate which determines number of children born and number of deaths per 1000 population are defined as follows:

$$Crude\ birth\ rate\ (CBR) = \frac{number\ \ of\ live\ births\ during\ \ a\ year}{mid\ year\ population} * 1000$$

$$Crude\ death\ rate\ (CDR) = \frac{number\ \ of\ deaths\ during\ \ a\ year}{mid\ year\ population} * 1000$$

Fertility is a measure to determine actual birth of children and measures the rate at which population adds to itself by giving birth to offspring. Fertility remains one of major factor in demography and it is assessed based on different criterion.

Total Fertility rate (TFR): This is measure of average number of children a woman can have over her lifetime of reproduction with a condition that woman survive the reproductive age. This can be further specified to total marital fertility rate where average number of births are recorded to a married woman. TFR (TMFR) is calculated by summing ASFR (ASMFR).

Census is conducted every 10 years in India due to whatsoever reasons and thus makes it really difficult of even crudely estimate birth, death or fertility. However, since beginning of 2000 civil registration system has been kept in place where it is mandatory to register birth and death. Though the process has been slow in the starting years but starts picking up since 2007 and after 2011 the data is quite reliable at district level and freely available on government websites. For example, Mid-year projected population of Haryana in 2011 = 25,580,000 and Population in 2011 census = 25,351,462, thus projected population has only ~0.9 % over estimation of total number of people. This yearly data from registration system is better since it is available yearly. The projected or estimated mid-year population is given in the documents available on https://crsorgi.gov.in/.

DISCUSSION

Literacy

A person who can both read and write in any one language is considered literate. In census up to 1981, the literacy rate was calculated with respect to total population and no age-wise breakup is reported in census. Note that a person without formal education who can read write is also considered literate. Also, in 1981 census and before, a child less than age 5 was considered illiterate but this age bar was increased to 7 based on the advice of experts who advocated that ability to both read and write in usual cases is not attained until 7 years of age. The data for literacy presented in

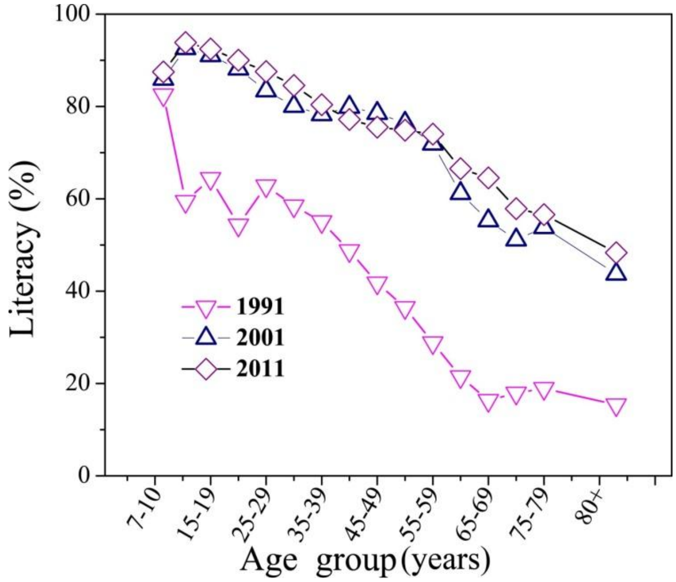

Figure 1: ***Age-wise literacy % in different age groups in 1991, 2001 and 2011 census.***
Source:https://censusindia.gov.in/

Figure 1 is for 1991, 2001, 2011 for age group 7 and above where same criterion is retained (Figure 2 (1991 census), Figure 3 (2001 census), Figure 4 (2011 census)). Thus literacy rate with respect to total population is defined as crude literacy rate and with respect to total population above 7 years is defined as effective literacy rate.

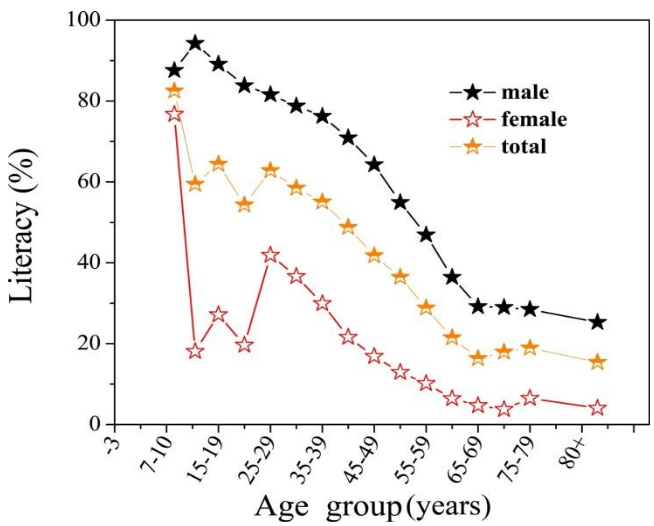

Figure 2: ***Literacy of Rohtak city census 1991.***
Source:https://censusindia.gov.in/DigitalLibrary/TablesSeries1991.aspx.

Here, we have calculated age-wise literacy rate which is basically effective literacy. The literacy in 7-10 age groups is even higher in 1991 which indicates that the children enrollment in schools was pretty high but a fast decrease in higher age group in the literacy rate can be seen in Figure 2. Interestingly, there is flattening of the curve in 60-64 age groups and even increased in 75-79. This apposite trend is possibly has its origin in government schemes such as Sarva Shiksha Abhiyan where elders were encouraged to attend evening classes which were run in almost every ward. The overall literacy rate increased roughly 20 % in just 10 years from 1919 to 2001 is a remarkable positive development.

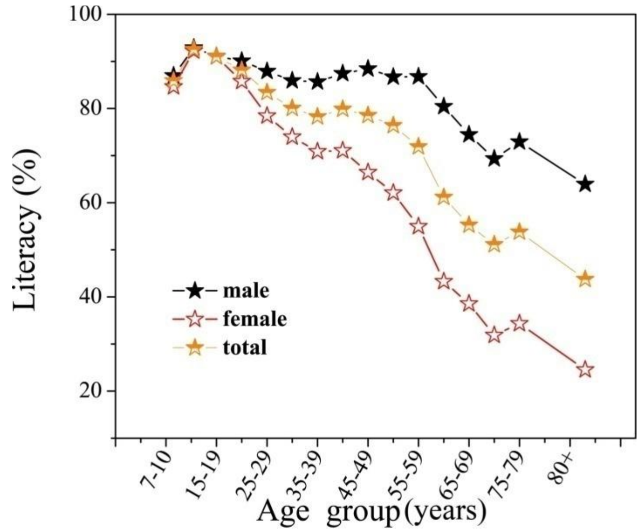

Figure 3: ***Literacy percentage of Rohtak city.***
Source:https://censusindia.gov.in/DigitalLibrary/TablesSeries2001.aspx.

The gender bias is clearly visible in literacy where female literacy is quite low in 1991. As industrialization began in India 1992 due to change in liberalization in economic policies this disparity in the gender literacy rate became phenomenal low and decreased at least in age group 7-19 to nearly zero. Almost every (male or female) child was literate due to easily available formal education. This gap increases in higher age group. The reason for this increase is possibly marriage age of girl child which is 18 years in India where after marriage due to relocation or socio-cultural limitations, female do not get a chance to educate. However, male member of society learn to read and write beyond 19 years of age but women do not.

The positive development in female or women literacy is phenomenal in comparison to 1991 where the gender gap in male was almost double in comparison to female. This gender disparity has now shrunken substantially for children. Here, we will discuss gender gap in literacy in four age groups which are placed into different categories: child (below 15), youth (15-24 years), working population (25-64) and elders (above 65 years).

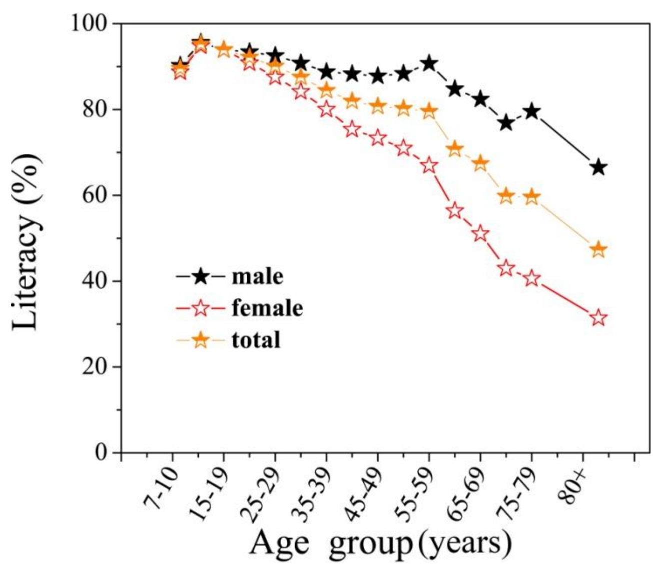

Figure 4: ***Literacy percentage of Rohtak city.***
Source:https://censusindia.gov.in/DigitalLibrary/TablesSeries2011.aspx.

Interestingly, due to compulsory and free child education, literacy rate in both genders is highest and difference in male to female literacy is minimum in census of 2001 and 2011. The change in socio-cultural attitude of population, government agencies and other organization are responsible in encouraging the female child to go to school which has resulted in almost zero literacy gaps. The literacy gap in youth in age group of 15-19 was 0 and 19-24 was 2 % and has decreased in comparison to 2001 from 0.1 to 4 %, respectively. This gap was almost 20 % in 1991. This achievement is in fact remarkable and far better than national average. The gender gap in population has also declined almost 5% in census 2001 to 2011.

However, literacy gender disparities in elder population (age above 65) is around 30 % which is higher than average gender literacy gap. This indicates that improvement in literacy skills in elders are sluggish and the situation is not improving as fast it is in lower age groups and needs more efforts. Thus to attain high literacy in elders literacy campaigns and initiative should be designed to promote literacy in elders. This should also include mitigating the stereotype socio-cultural thoughts which prevents elders to learn reading and writing. Otherwise lower literacy in older age group is masking the progress made by the younger generation and lowering average value.

Crude birth rate and Crude death rate

Birth rate in the range of 10 to 20 births per 1000 population is considered low and above 40 births per 1000 is considered higher. Both lower and higher values of birth rate grave cause of concern to the country, city or rural area. For example high birth rate may create exploitation of resources and can cause starvation. In children, this can over burden the government welfare and family program which leads malnutrition as well other diseases since achieving vaccination of 100% children might not be possible. At later stage, high birth rate can lead to overpopulation in future and lead to exploitation of natural resources causing environmental issues such as air and water quality. Additional problems can arise such as providing education, employment etc. Conversely, Low birth rates can cause decline in the population in near future which causes increasing elder population and inadequate supply or workforce.

Crude death rate or mortality rate is number of deaths in particular population or area scaled by the total population of specific area per 1000 persons per year. Crude death rate considers death from all causes in a year irrespective of pandemic.

Interestingly, crude birth for Rohtak city has decreased from 36.8 in 1981 to 31.5 in 1991 to 18.8 in 2001. CBR is estimated to decline further to 16.5 in 2020. This shows that the birth rate of Rohtak city has flipped from nearly high CBR to nearly low CBR. Low CBR could be problematic as number of young working population decreases but the population of old age dependents decreases creating unbalanced population where elders are not replaced by young population. Low CBR is mainly caused by increase in the number of unmarried young population as this does not seem to be case in Rohtak city like many cities in Japan or other developed nations. However, sex ratio of Rohtak city is considerably low and young population is forced to remain unmarried as well as concept of small family happy family has lead to decline in crude birth rate. Also, family planning as well as other government initiative prompts smaller families. There can be several other causes such as family income.

Another significant contributor to increase in population is migration from villages to Rohtak city due to several reasons such as decreasing agriculture land holding per person in the villages, better education for their children, opportunities in the urban areas etc. A family migrated from village also rely on the agriculture land in the village which is decreasing due to division between siblings resulting in reduced extra income from agriculture land. This can also promote smaller family structure. Though a proper study for decline in CBR is lacking and needs attention. Crude death rate of Rohtak city is in between 5.5 and 7 which is low in comparison to global average death rate which is estimated to be around 7.7 per 1000 person. A decrease in death rate is affected by several factors such as development of health infrastructure. Low CDR can cause an increase in population but looking at low birth rate in Rohtak city this does not seem to increase the population in concerning way.

Population is one of governing factors in decision taken by the government and policy experts have to work with the population statistics. However, to make accurate predictions about the population or demography requires internal characteristics such as age, gender distribution along with total size of the population. Thus an important question is presentation of data which include both age and gender. Demographers represent internal distribution of age and gender of population through population pyramid where age is equally at fixed intervals mostly at 5 years interval. These group are further divided into three different groups (I) per-reproductive which contains age group of 0-14 (0-4, 5-9 and 10-14) who have not attained age to give birth, (ii) reproductive age group of 16-49 (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49), which conceive babies and (ii) post-production from 50-100 years, an age group which is usually above normal age of reproduction.

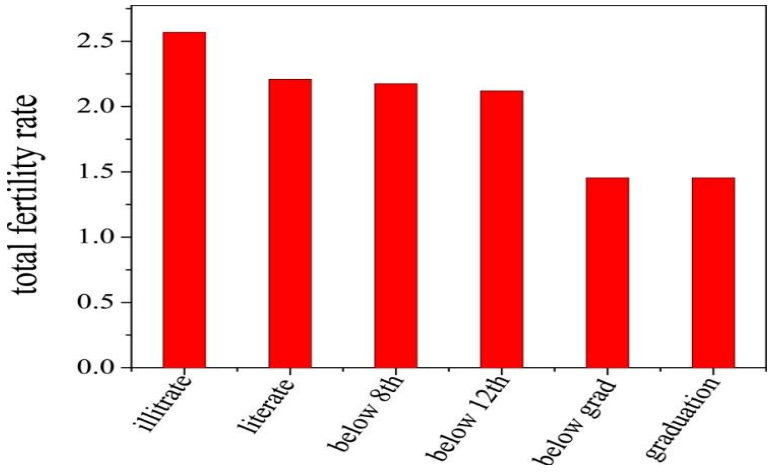

Figure 5: ***Fertility based on education level from 2011 census data. Literate refers to literate person with no formal education.***

Source:https://censusindia.gov.in/DigitalLibrary/TablesSeries2011.aspx.

Fertility

TFR is better indicator of fertility than crude birth rate due to the fact that it is independent of the age structure and accounts for child birth during her fertile age which is 15-49. It is basically measure of replacement fertility which is an estimate of new born babies needed to sustain population level. If it continues for long enough time periods each generation will replace itself and population remains almost constant. The fertility of 2.1 is considered stable and more than 4 is considered higher. A number less than 1.3 is considered low fertility rate. The fertility of Rohtak urban was 4.35 in 1991 census which was reduced for the first time to 2.05 and further decreased to 1.7 in 2011 census. A further decrease in next census could be worrisome and needs attention both from society as well government organization.

CONCLUSIONS

Education or literacy is one of the most important indicators of the progress of society. Interestingly, an increase in female literacy shows a decline in birth rate. Here using census data of birth in last year based on the education level of females which is divided into different categories: literate without any formal education, below 8^{th} standard, below 12^{th} standard, below graduation, above graduation we find that there is a sharp drop in total fertility rate of illiterate female and literate. The data from 2011 census clearly shows a sharp decrease in total fertility rate from 2.6 among illiterate population to 2.2 in literate females. There is a gradual decrease in fertility as the education level of female advances to higher classes (see Figure 5). Further classification shows that fertility decreases drastically with education level and drops to 1.5 for female population with education above secondary i.e. 12^{th}. Though, this value is concerning since it is lower than the sustainable population growth which is around 2.1.

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