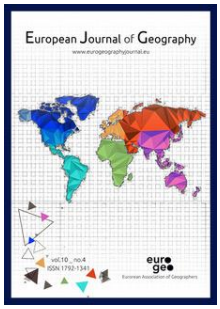

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Education, caste and occupational differentials in fertility in India

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Population fertility, Child survival ratio, MORTPAK CEBCS application, Fertility Determinants, India

Abstract

This study analyses the impact of four prominent factors (education, caste, occupation and development) on fertility in India. The study has also analysed the spatial variations of TFR in India. This spatial analysis also helps in identifying the impact of fertility on Development in India. Present study estimates fertility from census that covers all the reproductive age-women, and it does not allow any chance of sample error; this method has also adopted by UNFPA. Logistic regression analysis used to understand the impact of education, caste and occupation on fertility. Co-relation matrix and regression analysis used to determine the relation between TFR, IMR and Development. In India, West Bengal (2.41) state has the least fertility rate while Jammu and Kashmir (4.70) has highest one. Southern states have lower fertility along with Eastern states while North-east and central states have recorded high fertility. Women who have passed above secondary school of education give a prominent impact on fertility reduction in comparison to illiterate, primary and middle school passed. Marginal workers have very high fertility compare to main workers due to their feeling of insecurity in earnings and they increase number of child counted as gross family income.

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1. INTRODUCTION

Fertility is one of the most important components of population changes, while other two are migration and death. Optimum total fertility rate (TFR) is one of the important targets which help various ways to achieve sustainable development goals (SDGs) in India and some other developing countries. Population pressure which is the outcome of fertility leads to ever more land parcels to below substantive size and contribution soil degradation and to decreases the rate of development that's why study on fertility is required immediate attention (Lopez-Carr D. et al., 2017).

To estimate TFR, various methods already exist such as proximate determine model (Bongaart,1978; Bongaart and Potter,1983), and Brass P/F ratio, its advanced version used by the Hobrcraft et. al. (1982). In India, another method to estimate TFR is indirect measurement of fertility from census at district level has also used in some of the studies (Gulimoto and Rajan, 2013), they have estimated fertility from the birth-TFR ratio method. In India SRS (sample registration system) is not too strong that level because certain proportion of the population fails to register births (Gulimoto and Rajan, 2013). Owing to this, present study estimates fertility from census which covers all the reproductive age-women, and it does not allow chance of any sample error rather than birth-TFR ratio; this method has also adopted by UNFPA (Moultrie and Zaba, 2013).

This study analyses fertility differentials by education, caste, economic activity and spatial factors. Women's higher educational attainment has tended to bear the lower number of child by the way of increasing age at marriage and high probability to engage in work. Although fertility falls when level of education rises among both men and women (Pradhan, 2015). Imai and Sato (2010) strengthen the view, the proposition of the negative association between education and fertility by reducing gender bias through the level of education of women and men together, in Indian context. Education or schooling is expected to contribute to the measures of female autonomy (Basu 2002). It is believed that educated women have more freedom in decision making on a range of domestic and extra domestic matters and also have greater reproductive autonomy then uneducated women (Basu, 1992; Morgan and Niraula, 1995; Vlassoff, 1996; Jejeebhoy, 1995; Sathar 1996).

Some experts have used the role of incompatibility hypothesis to justify the relation between the women's economic activity and fertility. It is difficult to work with a number of children rearing together because when a woman does job, she does not have sufficient time for rearing number of children simultaneously. Bhargava and Saxena (1986) recorded prominent inverse relationship between working women and fertility when the women engaged in white colour jobs. Haavio-Mannila E. (1978) examined the relationship between fertility and economic activity of women in Europe where he finds out that fertility decline and the increase of non-agricultural activity of women coincide in 16 out of 23 European countries. Economic change has the greatest impact on reducing family size and thus slowing population growth, compared to other factors (Science Daily, 2013).

In India, a village study of a Haryana state confirmed that fertility was inversely related to caste and socio-economic status (Arora, 1985). A caste factor prevails to decide the number of fertility though the intensity depends on the socio-economic factor of that caste (Ramesh, 2007).

Rural and urban fertility difference have been recorded due to the lower age at marriage in rural areas (Kulkarni, 2011 and Das Gupta et al. 1955). But, Mysore population research center has proved difference between rural-urban marital fertility that clearly exists (United Nations, 1961), while a study in Maharashtra did not show clear rural-urban difference (Dandaker & Dandekar, 1953, and Sovani & Dandekar, 1955). To this end, the key objectives of this study are:

i. To analyze the status of fertility among education groups, scheduled communities (SC and ST) and economic activity group of India for 2011 census.
ii. To examine the impact of education, caste and economic activities on fertility in India.
iii. To assess an impact of fertility on development scenario of Indian.

2. METHODS METHODOLOGY AND DATA

2.1 Methods and Methodology

2.1.1 TFR and ASOFRs Calculation

The AOSFRs that are calculated using the birth in the previous year are used (F-11and F-12 table of census of India, 2011) to project forward the parity distribution that would be expected for each cohart if those rates were continue for the rest of the cohart's childbearing. This is done by calculating the order-specific equivalent of total fertility, that is the cumulated fertility rates for birth of the *i-th* order, cumulated for all age groups. This equation are follows:

(i)Derive age-order specific fertility rates: From the tabulation of births in the last year by age group (F-11 and F-12 table of census of India,2011) and parity of mother (F-3,F-4 table of census of India,2011), calculated age specific fertility rates for women in each age group 15-19, …., 45-49, by using following equation:

$$ {}_5AOSFR_x(i) = \frac{{}_5B_x(i)}{{}_5N_x} $$

Again, women of unstated parity excluded from the denominator. ${}_5B_x(i)$denotes births in the last year by mother age and parity and${}_5N_x$ has the total number of women in the age group (Moultrie and Zaba, 2013).

(ii) Derive cumulated order-specific fertility rates: Cumulated age-order specific fertility rates up to age x+5 for order I calculated by using following equation:

$$ {}_5TOFR_x(i) = 5. \sum_{j=15,5}^{x} {}_5AOSFR(i) $$

It follows that ${}_5TOFR_{45}(i)$ - ${}_5TOFR_x(i)$is a measure of the additional proportional of women expected to achieve parity -I between age x+5 and the end of the reproductive period, on the assumption that future fertility will remain the same as current fertility (Moultrie and Zaba, 2013).

2.1.2. Infant Mortality Rate

To estimate the infant mortality rate of various states of India, this study used mean age at childbearing, children ever born and child surviving and then used the life table by the MORTPAK software with CEBCS application (Population Division, U.N. 2013).

2.1.3 Logistic regression

The logistic regression analysis used to understand the impact of education on fertility. For this analysis TFR has converted in dichotomous variables, where less than 3 TFR assigned as 1 and more than3 TFR assigned as two. 3 as used referenced because country's average TFR is 2.99. For the analysis of impact of education on the fertility, countries population is divided into six educational categories. Illiterate has considered as a reference category. In this study, two types of caste categories are considered and scheduled tribe has considered as a reference category.

On the other hand, the occupation has classified in the six categories i.e. non-worker, marginal worker, main cultivators, main agricultural labourer, main household industry worker and main others worker (Job holder). This classification is based on the census of India, 2011.

2.1.4. Multiple Regression analysis

Co-relation matrix and regression analysis used to determine the impact of development (Infant mortality rate, per capita income, below poverty line, female literacy rate, and urbanization) on population fertility in India.

2.1.5. Diagrams and Thematic Mapping

For prompt representation of the regional variation among the states of India various thematic maps and graphs are prepared.

2.2 Data and Tabulation:

i. Worked out parity progression ratios (Parity by age group of women aged 15-49 or more) the data from Census Fertility Table, 2011 (F-3) have been used.
ii. Worked out Projected Parity Progression ratios-
    a. Parity by age group of women (aged 15-49 or less) from census fertility table, 2011 (F-3).
    b. Number of children born during the preceding census, classified by mother's age (in five year groups) and number of children ever born from 2011 census (F-11).
iii. Estimated the infant mortality rate, for this we used F-03 table for child ever born and F-05 table used for child survival.

3. RESULTS AND DISCUSSION

3.1 Spatial pattern of fertility

Among northern states, Jammu and Kashmir has the highest TFR (4.7), while Himachal Pradesh has the lowest TFR (2.811) in 2011.On the other hand, during 2001 census, the scenario of TFR was different in these states. Uttarakhand(3.81) was on the top and Punjab (2.59) was at the lowest. It is interesting to mention that Jammu & Kashmir and Punjab TFR have increased during 2001-11. IncreasedTFRin Jammu & Kashmir may be due to inappropriate quality data in the state during Kargil war.

In rural areas of northern states, Jammu & Kashmir has the highest TFR, while Himachal Pradesh has the lowest TFR. The similar situation is also recorded in urban centers of these states. The highest rural-urban difference in TFR is also recorded in Jammu & Kashmir (1.264) because of high disparity in the development between two regions, while the lowest in Punjab (0.28) may be the outcome of less disparity in the development (Figure-4). Jammu and Kashmir urban area developed while rural area least developed due to international conflict and terrorist activity.

Highest scheduled caste fertility recorded in the state of Haryana while Himachal Pradesh has lowest. In five northern states, Punjab and Haryana has no scheduled population. Jammu & Kashmir has the highest scheduled tribe fertility while Himachal Pradesh has the lowest. Scheduled caste fertility in all the northern states is above 3 and while in the context of scheduled tribe only one state has above 3.

Central region includes three empowered action group of states (Chhattisgarh, Madhya Pradesh and Uttar Pradesh). Chhattisgarh has the highest (3.84) TFR in this region and all the states have higher than 3.6 TFR in 2001. In 2011, Madhya Pradesh has the highest TFR in this region and all the states have higher than 3.3TFR.

Madhya Pradesh state has the highest TFR (3.62) in rural areas while Chhattisgarh state (3.08) has the highest TFR in urban areas. Rural-urban TFR differentialis highest in the state of Uttar Pradesh (0.81). Scheduled caste fertility is highest in the state of Chhattisgarh (3.747) and scheduled tribe fertility is highest in Madhya Pradesh (4.185). In the state of Madhya Pradesh scheduled tribe fertility is higher than scheduled caste fertility, while other two states have higher scheduled caste fertility than scheduled tribe.

Among states of western region (Rajasthan, Gujarat, Goa and Maharashtra), Rajasthan (an EAG state) has very high TFR (4.218 in 2001) and (3.405 in 2011). Goa is a developed state which has lowest TFR in this region during last two decades (i.e.2.857 in 2001 and2.466 in 2011). During 2001-2011, Rajasthan state has recorded fastest decline in fertility (diff.=0.813) while Gujarat state has recorded slowest decline in fertility (diff.=0.109).

In rural context, Rajasthan has the highest TFR (3.56) and Goa (2.42) the lowest in 2011. On the other hand, in urban centers, Rajasthan is on the highest and Gujarat is on the lowest. Rural-urban TFR difference is highest in the state of Gujarat (0.65), while in Goa rural fertility is lower than urban fertility. It may be the outcome of least disparity in the state. Scheduledcaste (3.646) and scheduled tribe (3.922) fertility is highest in the states of Rajasthan and lowest in Gujarat (2.369 in SC& 2.379 in ST). Gujarat has recorded the highest SC and ST fertility difference while Goa has the lowest.

Southern region includes four highly educated and developed states i.e. Karnataka, Andhra Pradesh, Kerala and Tamil Nadu. Kerala has the highest TFR (2.988) in 2001 and (2.789) 2011 in this region. Tamil Nadu, a developed state, has lowest TFR in this region during last two decades (2.419 &2.429 respectively). In this region, pace of fertility rate is decreasing at a slow rate and in Tamil Nadu fertility rate has slightly increased (0.071 only) in last decade. Rural-urban TFR difference is very low in this region (Figure-4). In rural areas, Kerala has the highest TFR (Rural 2.823, Urban 2.747) and Andhra Pradesh (Rural 2.469, Urban 2.324) has the lowest TFR in both the areas in 2011. Scheduled caste (2.712) and scheduled tribe (2.719) fertility is the highest in the states of Karnataka. Lowest SC TFR and lowest ST TFR have also recorded in Andhra Pradesh (2.487) and in Tamil Nadu (2.369). Kerala and Tamil Nadu states have higher SC fertility than ST while in other two states condition is reversed.

North-Eastern states include Sikkim, Tripura, Arunachal Pradesh, Assam, Nagaland, Mizoram, Manipur and Meghalaya. Among these eight north-eastern states, Tripura (2.921) has the lowest fertility and Meghalaya (5.43) has the highest in 2001. Sikkim, Arunachal Pradesh and Mizoram states have recorded fertility from 4 to 5; and Assam, Nagaland and Manipur have fertility between 3 and 4. According to 2001 census, this is the region with very high TFR (Table 1). In 2011census, Sikkim (2.446) has lowest TFR, while Meghalaya (5.186) has highest in this region. Sikkim (1.888) and Arunachal Pradesh (1.094) are the two very fast decreasing states but in contrary Nagaland (0.081) has only state in this region where fertility has increased from previous census (2001).

In rural areas, Meghalaya is the highest TFR (5.551) state and Sikkim (2.543) is the lowest in 2011. On the other hand, Mizoram (4.165) is on the highest position and Sikkim (2.164) has the lowest urban TFR. Meghalaya (2.376) and Assam (0.916) has strong Rural-urban TFR disparity in this region. Manipur has the highest scheduled caste TFR state, while scheduled tribe fertility is highest in the state of Meghalaya (5.475) and lowest ST TFR in Sikkim (2.573).

Eastern region includes four states i.e. Jharkhand, Bihar, Odisha and West Bengal. In 2001 census, low fertility has recorded in state of West Bengal (TFR-2.981), while Jharkhand has the highest fertility (TFR-3.585) among eastern region. While in 2011 census, West Bengal (2.412) has emerge India's lowest fertility state as well as lowest in this region and Bihar (3.516) has highest fertility among these states. Bihar has recorded slightly increasing in the fertility in last decade, while west Bengal has fastest decreasing states among these states.

Both in urban and rural areas, Bihar has the highest TFR state and West Bengal has the lowest in 2011 (Table 2). Jharkhand (0.638) has strong Rural-urban TFR disparity in this region. Bihar (3.909) has the highest scheduled caste TFR and lowest SC TFR in West Bengal (2.365). Scheduled tribe fertility is highest in the state of Jharkhand (3.697) and lowest ST TFR in West Bengal (2.627). In Bihar SC fertility is higher than the ST while in other states the condition is reversed. Five major states (Jammu and Kashmir, Bihar, Tamil Nadu, Punjab and Nagaland) have recorded an increase in their total fertility rate in last decade, while all other states have recorded a reduction in the TFR (Figure-2). This fertility reduction ranges from 0.041 (Karnataka) to 1.89 (Sikkim).

Table 1: State wise fertility scenario of India, 2001 and 2011

State	TFR			TFR (2011)			TFR (2011)		
	2001	2011	Difference	Rural	Urban	Difference	SC	ST	Difference
India	3.213	2.988	0.225	3.164	2.579	0.585	3.115	3.481	0.366
North									
Jammu & Kashmir	3.323	4.700	-1.377	5.006	3.742	1.264	3.357	4.947	1.590
Uttarakhand	3.810	3.175	0.635	3.310	2.803	0.507	3.532	2.998	-0.534
Haryana	3.357	3.278	0.079	3.456	2.868	0.588	3.635	---	---
Himachal Pradesh	3.167	2.811	0.356	2.862	2.228	0.634	3.058	2.675	-0.383
Punjab	2.589	2.863	-0.274	2.964	2.680	0.284	3.273	---	---
Central									
Madhya Pradesh	3.773	3.450	0.323	3.621	2.939	0.682	3.570	4.185	0.615
Chhattisgarh	3.838	3.482	0.356	3.596	3.083	0.513	3.747	3.572	-0.175
Uttar Pradesh	3.679	3.322	0.357	3.500	2.689	0.811	3.657	3.514	-0.143
West									
Rajasthan	4.218	3.405	0.813	3.564	2.927	0.637	3.646	3.922	0.276
Gujarat	2.882	2.773	0.109	3.004	2.357	0.647	2.591	3.417	0.826
Goa	2.857	2.466	0.391	2.418	2.488	-0.070	2.369	2.379	0.010
Maharashtra	3.019	2.768	0.251	2.913	2.542	0.371	2.787	3.112	0.325
South									
Karnataka	2.630	2.589	0.041	2.706	2.390	0.316	2.712	2.719	0.007
Andhra Pradesh	2.610	2.429	0.181	2.469	2.324	0.145	2.487	2.569	0.082
Kerala	2.988	2.789	0.199	2.823	2.747	0.076	2.627	2.514	-0.113
Tamil Nadu	2.419	2.490	-0.071	2.536	2.426	0.110	2.527	2.369	-0.158
North East									
Sikkim	4.384	2.496	1.888	2.593	2.164	0.429	2.695	2.573	-0.122
Tripura	2.921	2.623	0.298	2.752	2.241	0.511	2.523	2.989	0.466
Arunachal Pradesh	4.406	3.312	1.094	3.474	2.807	0.667	---	3.399	----
Assam	3.541	3.088	0.453	3.211	2.295	0.916	2.828	2.903	0.075
Nagaland	3.720	3.801	-0.081	4.007	3.338	0.669	---	3.911	----
Mizoram	4.624	4.536	0.088	4.898	4.165	0.733	1.401	4.564	3.163
Manipur	3.512	3.413	0.099	3.397	3.452	-0.055	3.435	3.175	-0.260
Meghalaya	5.430	5.186	0.244	5.551	3.175	2.376	2.929	5.475	2.546
East									
West Bengal	2.981	2.412	0.569	2.514	2.109	0.405	2.365	2.627	0.262
Odisha	3.391	2.999	0.392	3.075	2.614	0.461	3.097	3.442	0.345
Jharkhand	3.585	3.448	0.137	3.464	2.826	0.638	3.587	3.697	0.110
Bihar	3.420	3.516	-0.096	3.584	2.988	0.596	3.909	3.341	-0.568

Source: Computed by authors on the basis of the Census of India, 2001and 2011

3.2 Spatial pattern of educational fertility

Though education and TFR has inter-relationship but this relationship is not clearly seen in every states of India. More than 64 percent states are under high TFR group (TFR, 3.01 to 4.0) among the illiterate population of India. This trend is nearly similar when respondents achieved below primary and primary level of education; but when the respondents have achieved the middle school level of education then more than 53 percent states belong to the category of moderate TFR group (TFR- 2.11 to 3.0). (figures 1 & 2)

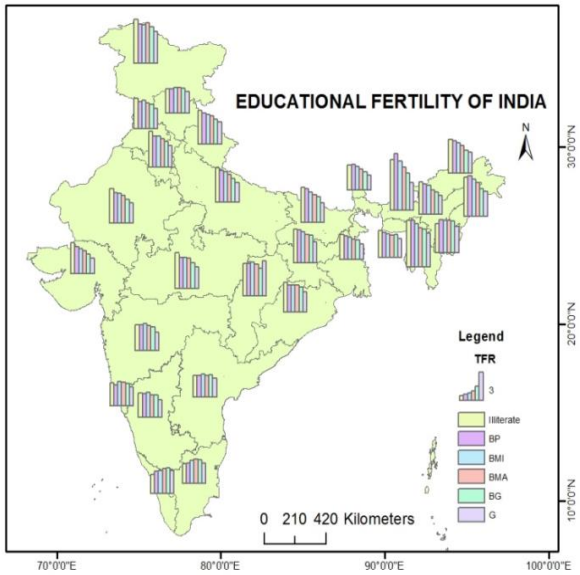

Figure 1. Educational Fertility in India, 2011

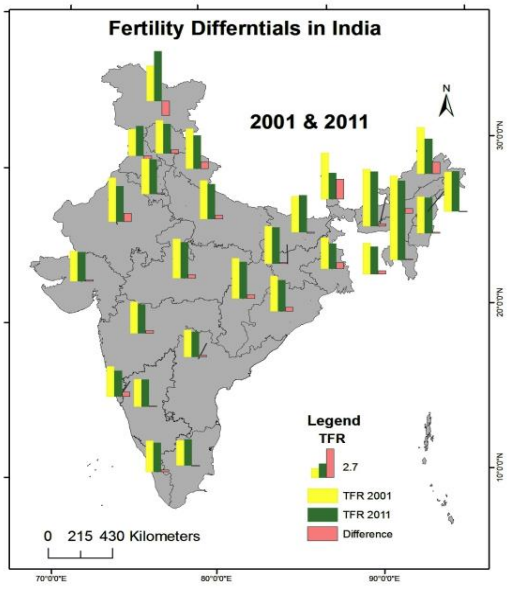

Figure 2. Fertility Differentials in India, 2001-11

There is strong difference of respondents who have matric education and below the level for achieving the level of fertility, same opinion that only after reaching a certain minimum level of education has greater impact on fertility (Jaffe, 1959; Coachrane, 1979, 1983; Encarnacion, 1974; Stycos, 1965). Among the graduate level of education and above, 32 percent states recorded below replacement level of fertility and no one states have fertility among vary high TFR (TFR, above 4.01) group (Table 2). It is interesting to mention that in India only 6.69 percent women in reproductive age have graduate and higher level of education (Table 2).

Table 2. Educational fertility scenario of India, 2011

Count (TFR)	Educational Level					
	Graduate and Above	Matric or secondary but below graduate	Middle but below matric or secondary	Primary but below middle	Literate but below primary	Illiterate
<2.1	9 (32.14%)	2 (7.14%)	0	0	0	1 (3.57%)
2.11-3.00	16 (57.14%)	21 (75%)	15 (53.57%)	13 (46.43%)	13 (46.43%)	9 (32.14%)
3.01-4.00	3 (10.72%)	4 (14.29%)	10 (35.71%)	12 (42.86%)	11 (39.28%)	14 (50%)
>4.01	0	1 (3.57%)	3 (10.72%)	3 (10.72%)	4 (14.29%)	4 (14.29%)
Total no of States	28	28	28	28	28	28

Source: Computed by the authors on the basis of the Census of India, 2011. Note: Figures in parentheses indicate percentage distribution of the educational group.

3.3 Spatial pattern of scheduled caste and tribal fertility

After independence government of India has introduced several welfare schemes to uplift these communities (Kulkarni, 2002) and therefore situation improved but the gap is still prevailed.

Among the twenty-eight states, two states (Arunachal Pradesh and Nagaland) have no schedule caste population. Only one state has below replacement level of fertility while 13 (50 %) states have 3+ TFRin case of SCs population. No state has four plus fertility among SC background in India.

Scheduletribesare settled in the area of forest and hilly land far from the major settlement areas. Among the twenty-eight states, two states (Punjab and Haryana) have no schedule tribe population. No other state has reached below replacement level in case of STs population. More than 57 percent states have 3+ TFR in case of STs population while 43 percent of state ST population fertility between 2.11 to 3.00. Differentials among schedule castes and tribes are higher in Mizoram and Jammu & Kashmir. Schedule tribe fertility is higher in most of the states than schedule caste fertility expect nine states (Figure 3 & 4).

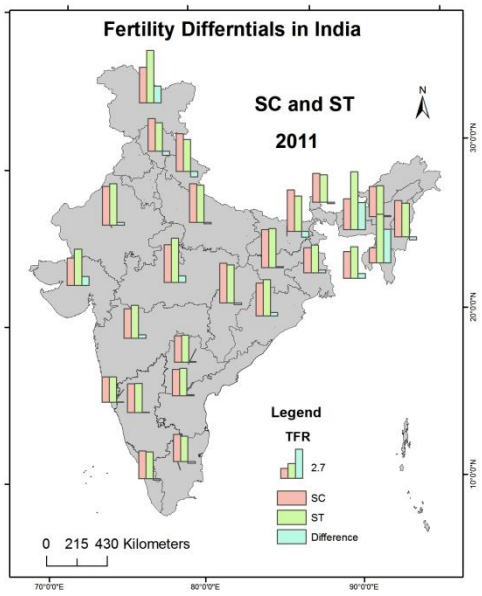

Figure 3.SC and ST Fertility Differential in India, 2011

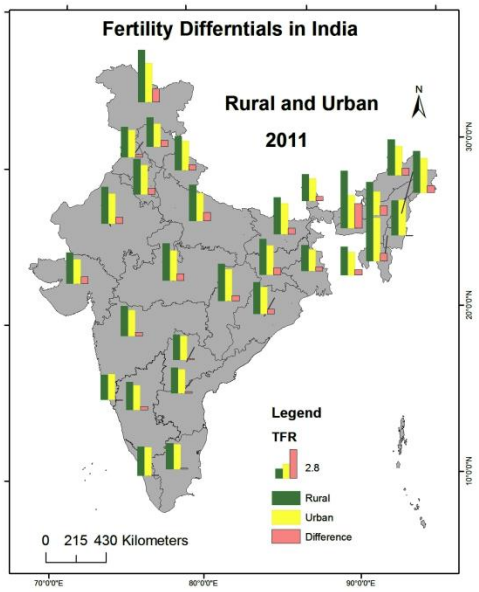

Figure 4.Rural-Urban Fertility Differential in India, 2011

Table 3. Caste wise fertility scenario of India, 2011

Count (TFR)	Caste		Total
	SC	ST	
<2.1	1(3.85%)	0	1
2.11-3.00	12 (46.15%)	11 (42.31%)	23
3.01-4.00	13 (50%)	11(42.31%)	24
>4.01	0	4 (15.38%)	4
Total	26	26	52

Source: Computed on the basis of the Census of India, 2011. Note: Figures in parentheses indicate percentage distribution of the caste group

3.4 Spatial pattern of economic activity wise fertility

Higher proportion of employment among women is considered to be a positive indicator to curb fertility (Mandelbaum, 1974; United Nations, 1961) than non-earning women. Fertility behavior is affected by the nature of the work done by women; normally

employed women have low fertility than the non-earning women (Jaffe and Azumi, 1968; Stycos, 1965; Whelpton et. al. 1966; Goldstein 1972; Devanzo, 1972, Weller, 1977, Germain, 1975).

In India, among main workers, cultivators have the highest TFR in 2011 due to increasing demand of labour force from household. Main agriculture labourershave TFR 2.816 in 2001. Other workers have very low fertility due to majority of eligible married women in this group has engaged in a government job with sufficient income or have income security. Average fertility (TFR-2.735) of the main worker group in India in 2011 is lower than the marginal (TFR-3.235) and non-worker fertility (TFR-3.033).

Northern region including the state of Jammu and Kashmir, Himachal Pradesh, Punjab, Uttarakhand and Haryana and have 82.98 million populations which is 6.86 % of the country. Marginal worker fertility has higher than the main and non-worker in northern states, except Punjab. Marginal worker feel insecurity regarding income and they produce more number of childrentoincrease their income by way of wage earner. Among the main worker, others worker have lowest fertility because they are mainly permanent wage earner and have a job security.Fertility among cultivators in Punjab (TFR 2.303) is low due to their economic prosperity than other states. Agricultural labourers have lowest fertility (TFR 2.951) in Himachal Pradesh. Three states viz. Himachal Pradesh, Uttarakhand and Haryana are richin household industry (silk, woodwork and handicraft), and, therefore, TFR is lower than cultivators and labourers in these states.

Central region includes three empowered action group of states (Chhattisgarh, Madhya Pradesh and Uttar Pradesh) and have 297.72 million population which is 24.6 % of the country. In this state, fertility is higher in the marginal workersthan main and non-workers. Among the main workers, other group has only less than TFR 3, whilefertility in all other group has recorded less differential.

Western region includes four statesviz. Rajasthan, Gujarat, Goa and Maharashtra; they have 242.83 million populations, which is 20.07 % of the country.Marginal workers have fertility higher than that of the main and non-workers (expect Goa).Cultivators have highest fertility in Gujarat (TFR 2.937) and Maharashtra (2.997). Agricultural Labour has highest fertility in the state of Rajasthan (3.594). Goa has very high difference between the non-workers fertility and main & marginal workers fertility. Maharashtra and Rajasthan have minimum difference across the economic groups. In this region,fertility in others group has reached below replacement level, except Rajasthan.

Southern region includes four highly educated and developed states viz. Karnataka, Andhra Pradesh, Kerala and Tamil Naduand they have 216.33 million populations, which is 17.88 % of the country. In southern states, impact of economic activity has clearly observed, and this trend moves from main and marginalworkers towards non workers. Among the main workersfertility among different economic groups has nearer to Karnataka and Andhra Pradesh and below replacement level in Kerala and Tamil Nadu. Non workers have high fertility among all the southern states (2.646) when comparison made with other states of the country. Andhra Pradesh has the minimum fertility difference across the economic activities group.

North-Eastern states include Sikkim, Tripura, Arunachal Pradesh, Assam, Nagaland, Mizoram, Manipur and Meghalayaand have 42.86 million populations, which is 3.54 % of the country. Nagaland and Arunachal Pradesh have the highest fertility among main

workers than marginal and non-worker. Manipur (2.256) has the lowest fertility in main worker group. Tripura (2.256), Sikkim (2.388) and Assam (2.702) have the fertility below three in the main workers group, while Nagaland (4.364) and Meghalaya (5.234) have extremely high fertility among main workers; this figure was seen earlier in 19's century in India. It is interesting to mention here that Manipur has the highest fertility in the other main workers group which is not normally seen in other states.

Table 4: Economical activity wise fertility in India States, 2011

State	Main Worker					Marginal Worker	Non worker
	Cultivators	Agricultural Labourers	Household industry worker	Others	Average		
India	3.150	2.816	2.830	2.162	2.735	3.235	3.033
Northern states							
Jammu & Kashmir	4.180	4.478	4.609	3.976	4.168	5.312	4.571
Himachal Pradesh	2.967	2.951	2.318	2.251	2.830	2.963	2.742
Punjab	2.303	2.987	2.642	2.373	2.487	2.833	2.916
Uttarakhand	3.316	3.259	2.922	2.380	3.142	3.196	3.214
Haryana	3.156	3.565	3.020	2.663	3.012	3.454	3.319
Central states							
Uttar Pradesh	3.078	3.372	3.278	2.754	3.067	3.427	3.343
Chhattisgarh	3.626	3.514	3.218	2.509	3.414	3.626	3.448
Madhya Pradesh	3.598	3.616	3.703	2.678	3.466	3.709	3.312
Western states							
Rajasthan	3.584	3.594	3.400	2.861	3.431	3.758	3.157
Gujarat	2.937	2.854	2.263	2.152	2.591	3.232	2.652
Goa	2.231	1.335	2.010	1.632	1.663	1.573	2.751
Maharashtra	2.997	2.863	2.437	1.992	2.737	2.809	2.818
Southern states							
Karnataka	2.187	2.578	2.374	1.705	2.295	2.587	2.773
Kerala	2.352	1.581	1.934	1.762	1.785	2.004	2.978
Tamil Nadu	2.370	2.075	2.288	1.458	1.930	2.104	2.830
Andhra Pradesh	2.453	2.220	2.297	1.873	2.208	2.306	2.646
North Eastern states							
Nagaland	4.665	4.097	3.174	3.354	4.364	3.768	3.211
Arunachal Pradesh	3.957	3.922	3.407	3.066	3.723	3.507	2.872
Manipur	1.679	1.613	1.917	3.015	1.697	3.446	3.584
Mizoram	4.048	3.480	3.577	3.326	3.842	4.846	5.041
Tripura	2.658	2.323	2.239	2.001	2.256	2.668	2.673
Meghalaya	5.888	5.423	5.834	3.938	5.234	5.457	5.052
Assam	3.012	2.839	2.827	2.474	2.702	3.106	3.184
Sikkim	2.763	2.948	2.253	1.475	2.388	2.597	2.572
Eastern states							
West Bengal	2.168	2.159	2.946	1.803	2.218	2.462	2.431
Jharkhand	3.719	3.487	4.123	2.988	3.446	3.698	3.270
Odisha	3.024	2.855	2.828	2.308	2.700	3.116	2.998
Bihar	3.166	3.594	3.282	2.899	3.345	3.689	3.497

Source: Computed on the basis of the Census of India, 2011

3.5 Comparison of TFR in EAG and Non-EAG states

The EAG states comprise 45.9 percent of the country's population, as consequence of this; India's population future lies on by the condition of these states. In EAG states TFR is recorded 3.35 in last census (Census of India, 2011) while, developed states (Table-5) have only 2.63 TFR.

Table 5.EAG and Non EAG states TFR Comparision

Region	States	Mean TFR
EAG	Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Uttarakhand, Rajasthan, Odisha	3.35
Non EAG	Other than EAG States	3.14
Developed	West Bengal, Tamil Nadu, Kerala, Goa, Punjab, Maharashtra	2.63

Source: Computed on the basis of the Census of India, 2011

In recent years, theses states have experienced improvements in various socio-economic indicators; therefore, they have reached to the stage that was recorded in southern states like Kerala and Tamil Nadu 30 years ago (SRS 1980-2010). However, policy and programmes focusing on family planning need higher attention in EAG states (Srivastava et al, 2012).

3.6 Age – Specific fertility rate

3.6.1 EAG and Non- EAG comparison of ASFR

Chhattisgarh state has very high fertility of lower age group, while Uttar Pradesh has the least position in fertility of low age group among EAG state. This is an interesting fact that West Bengal is the least fertility state in India but it also has very high fertility in lower age group than that of the EAG states (expect Chhattisgarh) (Table-6).

Table 6.EAG and Non EAG states comparison ASFR

Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Uttar Pradesh	0.091	0.177	0.152	0.099	0.057	0.042	0.046
Madhya Pradesh	0.124	0.229	0.154	0.077	0.038	0.031	0.037
Uttarakhand	0.114	0.225	0.154	0.071	0.029	0.018	0.024
Chhattisgarh	0.144	0.238	0.156	0.076	0.034	0.023	0.025
Bihar	0.107	0.188	0.156	0.100	0.060	0.045	0.047
Jharkhand	0.136	0.197	0.145	0.087	0.049	0.036	0.039
Rajasthan	0.103	0.216	0.156	0.083	0.042	0.035	0.046
Odisha	0.126	0.189	0.139	0.073	0.033	0.019	0.022
Kerala	0.118	0.183	0.142	0.068	0.022	0.010	0.016
West Bengal	0.140	0.152	0.086	0.042	0.020	0.018	0.023

Source: Computed on the basis of the Census of India, 2011

It is evident from the facts mentioned in Table 8 that two developed states viz. West Bengal and Kerala has low fertility and it has started fast decreasing from age group of 25-29 years in West Bengal and from age group of 30-34 years in Kerala, it is an indication of more acceptance of permanent method of contraception in these age groups. On the other hand, fertility decrease through age groups is very slow in EAG

states and it is continuously high in the higher age groups, it is an indication of lower use of contraception.

3.6.2 Educational ASFR

In India, among all the educational groups of reproductive women the highest fertility has recorded in the age group of 20-24 years expect graduate and above level education. Normally, education and fertility has an inverse relationship, women do the negative association between these two variables becomes prominent (Jaffe, 1959; Coachrane, 1979, 1983; Encarnacion, 1974; Stycos, 1965). It is also recorded in this country that this association has only after certain level of education.

The age specific fertility rate shows that there is a clear distinction in the lower age between below secondary education level and above. In all the age groups the ASFR is lower in above secondary level than below secondary level. Illiterate women have very high fertility in both lower and higher age group (Figure 5).

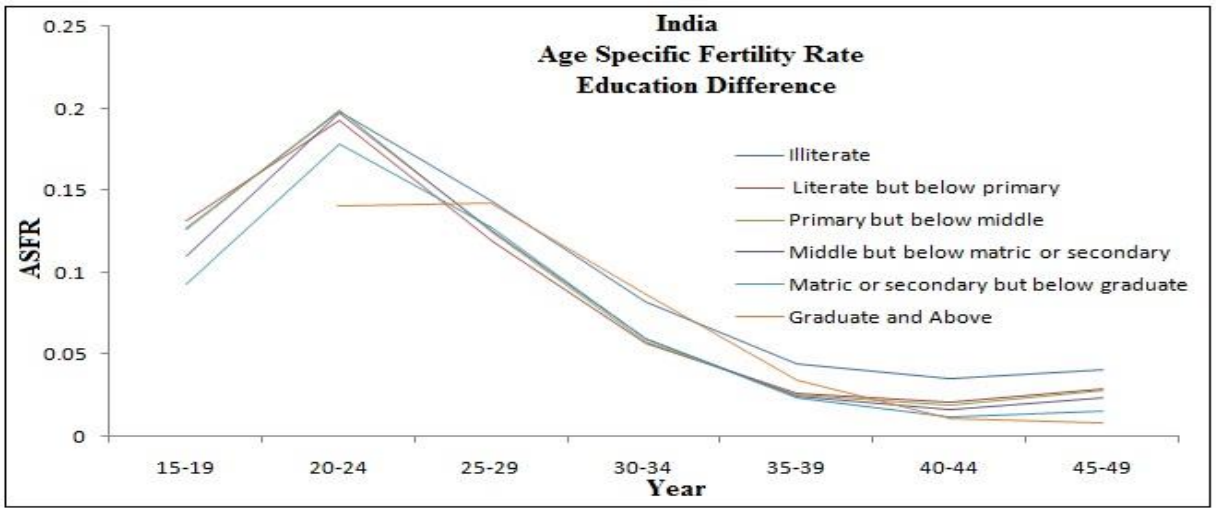

Figure 5. Educational group wise age specific fertility rate

3.6.3Caste wise ASFR

In India, among Scheduledcastes and tribes the highest fertility has recorded in the age group of 20-24 years. Scheduledcaste fertility is higher in all the age group when comparison made with Scheduled tribes. It is quite interesting to mention that in the later age SC and ST fertility is similar. Higher fertility in lower age group among scheduled tribe women is the main issues of concern in India (Figure 6).

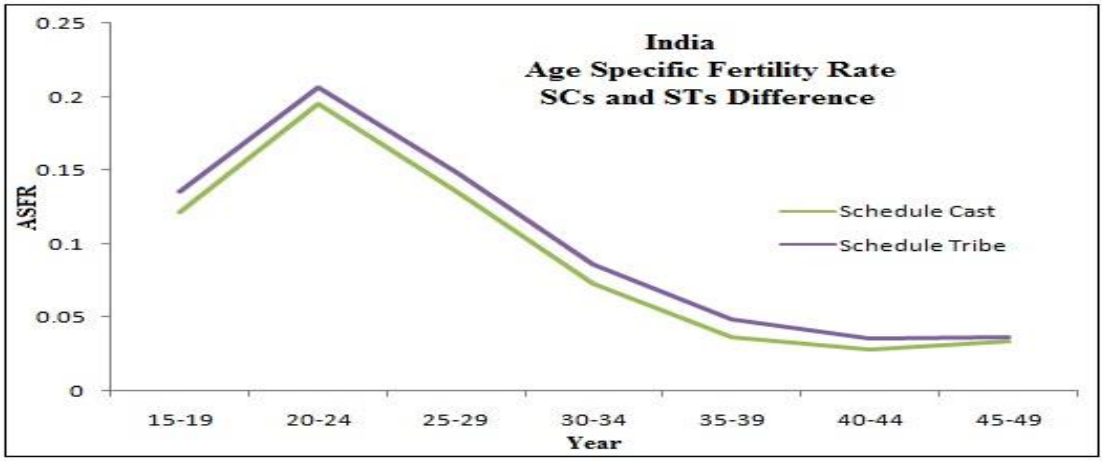

Figure 6. Caste group wise age specific fertility rate

3.6.4 Rural-Urban ASFR

In rural areas, lower age at marriage of girls is a long tradition that has clear impact on the present fertility level. Lower age specific fertility is much higher than that of the urban centers because women in urban areas have a tendency to more engagement in education and occupation (Table-7). On the other hand, in the upper age group this gap in ASFR has reduced than the lower age group.

Table 7. Rural and urban comparision of ASFR

Year	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Rural	0.119	0.198	0.138	0.075	0.038	0.029	0.035
Urban	0.099	0.165	0.120	0.062	0.026	0.018	0.026

Source: Computed on the basis of the Census of India, 2011

3.7 Impact of education, caste and occupation on fertility

The impact of education, caste and occupation is clearly found in this study. It is evident from the data presented in the table 8,9,10,11,12 and 13; it is found that educational level, caste and economic activity have their impact on the fertility.

Table 8.Model summary for education

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	198.885[a]	.153	.206

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 9. Model summary for caste

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	109.668[a]	.015	.020

a. Estimation terminated at iterationnumber 3because parameter estimates changed by lessthan .001.

Table 10. Model summary for occupation

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	221.166[a]	.059	.079

a. Estimation terminated at iteration number4 because parameter estimates changed by lessthan .001.

3.7.1 Statistical test of predictors

The statistical significance of individual regression coefficients (β) is tested using the Wald chi-square statics (Table 11, 12&13). It is evident from Table 11, that education level is significant predictor of TFR of more than 3 (Sig. <0.001). Graduate and above are significant predictors of TFR of more than 3 (Sig. <0.005) (Table 11).

Table 11. Logistic regression analysis – impact of education

Counts	β	S.E.	Wald	df	Sig.	Exp(β)
Educational status			21.417	5	.001	
Graduate and above	-2.556	.723	12.486	1	.000	.078
Matric or secondary but below graduate	-1.961	.627	9.784	1	.002	.141
Middle but below matric or secondary	-.578	.542	1.141	1	.286	.561
Primary but below middle	-.292	.542	.291	1	.590	.747
Literate but below primary	-.292	.542	.291	1	.590	.747
Constant (Illiterate)	.435	.387	1.266	1	.261	1.545

Source: Calculated by the authors by using 2011 census data.

Table 12 shows that, SC and ST population are predictor but not the significance level (<0.05). On the other hand, Table 13, clearly shows that non worker, marginal worker, main worker cultivators, main agricultural labourer and Others main workers (job) population are significant predictors of TFR of more than 3 (Sig.<0.05), while main household industry worker population is significant at the level of 0.1

Table 12. Logistic regression analysis – impact of caste

Count	*β*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(β)*
Caste			1.221	2	.543	
SC	-.620	.561	1.221	1	.269	.538
Constant (ST)	.310	.397	.610	1	.435	1.364

Source: Calculated by the authors by using 2011 census data.

Table 13. Logistic regression analysis – impact of economic activity

Count	β	S.E.	Wald	df	Sig.	Exp(β)
Economical Activity			8.958	5	.111	
Non-Worker	1.299	.596	4.756	1	.029	3.667
Marginal Worker	1.735	.602	8.315	1	.004	5.667
Main Cultivators	1.299	.596	4.756	1	.029	3.667
Main Agricultural Labourers	1.156	.596	3.758	1	.053	3.178
Main Household Industry worker	1.012	.598	2.859	1	.091	2.750

Constant (Others /Job)	-1.299	.461	7.958	1	.005	0.273

Source: Calculated by the authors by using 2011 census data.

3.7.2 Model Results:

Illiterate population has 1.545 times probability to record higher occurrence of more than 3 TFR in India. All others educational groups have inverse impact on fertility when compare with the illiterate educational group. Literate and primary educated population has 2 times and middle educated population has 3 times lower probability to occurrence more than 3 TFR as compared to the illiterate educational group in the country. On the other hand, above secondary and below graduate has 17times and above graduate has 19 times lower probability to occurrence more than 3 TFR as compared to illiterate educational group. Above mention facts proved that educational difference has highly persists between below secondary education and above (Table 11).

In case of caste, schedule caste population has 2 times lower probability to record higher 3 fertility in the country in reference to schedule tribe (Table 12). In case of occupational impact in fertility, Main other (job) worker has inverse impact on fertility with very lower probability to occurrence of more than 3 TFR. In reference to main others workers, all other categories have positive impact to higher occurrence to more than 3 TFR. Non-worker and main cultivators have similar impact while marginal worker has 5 times higher probability to occurrence more than 3 TFR (Table 13). To make income security marginal workers tend to produce more children as they will be additional hands for earnings in their family.

3.8 Inter-relationship between TFR, IMR and development

After analyzing the spatial pattern of fertility in various contexts, present study finds out the inter-relationship between total fertility rate, infant mortality rate and development. In this study, estimation of TFR (Moultrie and Zaba, 2013) and IMR (UNDP-MORTPAK, 4.3 versions) based on census (2011), while indicators of development considered are (i) per capita income, (ii) below poverty line, (iii) female literacy rate and, (iv) urbanization. A correlation analysis done in this study reveals that there is a strong relationship between TFR, IMR and development in India (Table 14).

Table-14. Co-relation matrix of TFR, IMR and development

	TFR	*IMR*	*PCI*	*BPL*	*FLR*	*URBAN*
TFR		0.597	-0.505	0.349	-0.567	-0.657
IMR	0.597		-0.701	0.644	-0.567	-0.770
PCI	-0.505	-0.701		-0.797	0.703	0.807
BPL	0.349	0.644	-0.797		-0.507	-0.689
FLR	-0.567	-0.567	0.703	-0.507		0.845
URBAN	-0.657	-0.770	0.807	-0.689	0.845	

Source: Computed on the basis of the Census of India, 2011

High fertility increases the number of infant death due to frequent pregnancy and their complications which is an outcome of lower age at first birth and low spacing of consecutive birth (Som and Mishra, 2017).

Table 15. Population fertility and infant mortality

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	12.551467	3.736604	3.359	0.00568 **
Infant Mortality Rate	0.010549	0.004096	-2.575	0.02431 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Multiple R-squared: 0.3559, Adjusted R-squared: 0.3023, p-value: 0.02431				

Source: Calculated by the authors

Fertility is also associated with high infant and child mortality. Fertility is high among people who experience high infant and child mortality (Taylor et. al., 1976; Davis, 1963; Freedman, 1964; Singh, 1986), because people continue childbearing until a desired size of children, which they rationalize for various socio-economic and cultural reasons, is obtained. Income and fertility are dependent on each other. On the other hand, per capita income inversely related to fertility and respondent which have below poverty line has a positive relation with fertility. This statement clearly supports that the child bearing is an economic aspect, where high income group produce low number of child for better care and reducing child bearing cost while poor people (BPL) produce more number of children for the consideration of more wage earners by them (Becker, 1960).

Fertility can control by the income in two ways, i.e. (i) higher per capita income has other distinct characteristics such as higher educational levels, urban livelihood that affect their fertility decisions from other. (ii) Income has simply reflected the effect on fertility decisions (Price, 2013).

Fertility and per capita income has inverse relationship as per capita income has influenced 19 percent TFR variability with 0.01significance level (Table 16). It is interesting to mention that, first assumption given above is proved in this study (Table 17 & 18).

Table 16. Population fertility and per capita income

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.486e+00	2.903e-01	12.011	4.79e-08 ***
Per capita income	-3.283e-05	1.622e-05	-2.024	0.0658 .
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Multiple R-squared: 0.2546, Adjusted R-squared: 0.1924, p-value: 0.06579				

Source: Calculated by the authors

Table 17. Per Capita income and female literacy rate

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-1450.33	5500.69	-0.264	0.79651
Female Literacy Rate	328.12	95.95	3.420	0.00508 **
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Multiple R-squared: 0.4936, Adjusted R-squared: 0.4514, p-value: 0.00508				

Source: Calculated by the authors

Table 18. Per capita income and urbanization

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2636.72	3175.33	0.830	0.422539
Female Literacy Rate	431.31	91.09	4.735	0.000485 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Multiple R-squared: 0.6513, Adjusted R-squared: 0.6223, p-value: 0.0004846

Source: Calculated by the authors

Female literacy rate also helps to curb down fertility by creating awareness among women in India. Female literacy rate has negative relationship with fertility and positive with family planning program. It is proved in this study that female literacy has inverse relation (r=-0.32) with the fertility (Table 19).

Urbanization has many faces of development such as good health facility, high level of educational facilities and higher living standard which impact to curb fertility. Many studiesproved the fact, where most recent one of them is Guo et al. (2011) observes that not only was urbanization important in China's fertility decline but that it will become the primary factor in future fertility decline, allowing China to relax its one child policy.This study proves that urbanization is a significant indicator to curb down fertility (r = - 0.43) (Table- 20).

Table 19. Population fertility and female literacy rate

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.895151	0.414304	9.402	6.95e-07 ***
Female Literacy Rate	-0.017232	0.007227	-2.384	0.0345 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Multiple R-squared: 0.3215, Adjusted R-squared: 0.2649, p-value: 0.03448				

Source: Calculated by the authors

Table 20. Population fertility and Urbanization

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.687502	0.263675	13.985	8.64e-09 ***
Urbanization	-0.022862	0.007564	-3.022	0.0106 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Multiple R-squared: 0.4322, Adjusted R-squared: 0.3849, p-value: 0.01062				

Source: Calculated by the authors

5. CONCLUSIONS

The present research aimed to examine the impact of education, caste and economic activities on fertility behaviour among women in in India. For this, the research deployed quantitative techquines —Multiple Classification Analysis, Logistic Regression Analysis and various demographic techniques by using MORTPAK softwear.The findings reveal that education, castes and economic activity does play key roles in fertility behaviour. In addition, this study reveals that there is a strong relationship between TFR, IMR and development in India. However, this research provides a strong ground for similar research to be conducted in other parts of the world.

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