Quest Journals
Journal of Research in Humanities and Social Science
Volume 11 ~ Issue 2 (2023) pp: 154-163
ISSN(Online):2321-9467
www.questjournals.org

Research Paper

Spatial and Temporal Patterns of Total Fertility Rate: A Case Study of India

[1.] Naveen Kumar [2.] Ramana Devi and [3.]Anghat Singh
1. Lecturer, Department of Geography, Bhaderwah Campus, University of Jammu
2. Lecturer, Department of Geography, Bhaderwah Campus, University of Jammu
3. Student M.A/M.Sc 4th semester, Department of Geography, Bhaderwah Campus, University of Jammu

Abstract
The present study is a generous attempt to find out the spatio-temporal pattern of total fertility rate (TFR) and total fertility rate (TFR)among different educational levels in India. For the said paper the spatial as well as temporal data has been used from The National Family Health Survey-5 (NFHS-5) 2019-21 and Sample Registration System (SRS).The unit of analysis is different states and union territories of India. It is found that maximum total fertility rate Among the states and union territories has been observed in Bihar i.e. 3.0 children per women followed by Meghalaya (2.9), Utter Pradesh (2.4), Jharkhand (2.3), Manipur (2.2) and Madhya Pradesh (2.0) etc. Whereas Sikkim has the lowest of 1.1 per female followed by Ladakh (1.3), Andaman and Nicobar (1.3), Goa (1.3), Lakshadweep (1.4), and Jammu and Kashmir (1.4).The Total fertility rate of India is showing declining trend as per the data collected from 1991 to 2021. There are many reasons which are responsible for decreasing TFR in India such as women empowerment, use of contraceptive, reversible spacing, etc. Besides, various government initiatives are being taken to control the rapid growth population and TFR. Some of them are Mission Parivar Vikas, National Family Planning Indemnity Scheme (NFPIS), and Compensation Scheme for Sterilization Acceptors, etc.

KEYWORDS: *Total Fertility Rate (TFR), Spatio-Temporal Pattern, The National Family Health Survey-5 (NFHS-5), Sample Registration System (SRS), Declining Trend, Government Initiatives.*

Received 05 Feb., 2023; Revised 13 Feb., 2023; Accepted 15 Feb., 2023 © The author(s) 2023.
Published with open access at www.questjournals.org

1.1. Introduction

One of the most significant indices of population growth is fertility, or the number of births each year. Total fertility rate (TFR) is one of the most crucial indicators for predicting fertility since it is unaffected by variations or shifts in age-sex composition and offers an intelligible signal of fictitious completed fertility.TFR exclusively counts live births. It was specified as the typical number of children's each woman would have during her fertile life.TFR represents the average number of children that would be born to a woman till the end of her childbearing capability if she was to pass through all her reproductive years conforming to the age specific fertility rates (ASFR) of given year.

1.2. Study Area

India is a vast country, India is located entirely in the northern hemisphere, especially in the south-central part of the continent of Asia, the mainland extends between latitudes 8°4'N and 37°6'N and longitude 68°7'E and 97°25'E, area of the world. As the 7th largest country in the world, stands apart from the rest of Asia, marked off as it is by mountains and the sea, which gives the country q distinct geographical entity. India has a land boundary of a about 15,200 km and the total length of the coastline of the mainland, including Andaman and Nicobar and Lakshadweep, is 7,516.6 km. India is bounded by the young fold mountains in the northwest, north, and northeast. South of about 22° north latitude, it begins to taper and extends towards the Indian Ocean, dividing it into two seas, the Arabian Sea on the west and the Bay of Bengal on its east. The southernmost point of the country is the Pygmalion Point or Indira Point is located at 6° 45′ N latitude. The north-south extent from Indira Col in Kashmir to Kanyakumari is 3,214 km. East-west width from the Rann of Kachchh to Arunachal Pradesh is 2,933 km. With an area of 32, 87,263 sq. km, India is the seventh-

largest country in the world. India accounts for about 2.4 percent of the total surface area of the world. The Tropic of Cancer passes through the middle of the country dividing it into two latitudinal halves.

1.3 METHODOLOGY

The present study is based on the secondary sources of data collected from Sample Registration System for the year 1991, 2009, 2017 and 2021 and National Family Health Survey-5 (2019-2021).After getting data from Sample Registration System and National Family Health Survey-5 we find a need to analyse the data. Simple percentage method is used throughout study for the assessment of the collected data. Maps are prepared on Arc GIS 10.5 software by geo-referencing and digitization of whole India into its various states and union territories and an outline boundary is prepared and then the data is plotted into it through join and relate and maps are prepared.

1.4. OBJECTIVES

1) To study the spatial distribution of total fertility rate in the study area.
2) To study the temporal distribution of total fertility rate in the study area.
3) To study the distribution of total fertility rate among the different educational level

Table 1: Current status of Total Fertility Rate in India, 2021

S.NO.	State/UT	Urban Total Fertility Rate	Rural Total Fertility Rate	Total Fertility Rate
1	Andhra Pradesh	1.5	1.8	1.7
2	Arunachal Pradesh	1.4	1.9	1.8
3	Assam	1.5	1.9	1.9
4	Bihar	2.4	3.1	3
5	Chhattisgarh	1.4	1.9	1.8
6	Goa	1.3	1.4	1.3
7	Gujarat	1.7	2	1.9
8	Haryana	1.7	2	1.9
9	Himachal Pradesh	1.4	1.7	1.7
10	Jharkhand	1.6	2.5	2.3
11	Karnataka	1.5	1.8	1.7
12	Kerala	1.8	1.8	1.8
13	Madhya Pradesh	1.8	2.1	2
14	Maharashtra	1.5	1.9	1.7
15	Manipur	1.8	2.4	2.2
16	Meghalaya	1.6	3.3	2.9
17	Mizoram	1.6	2.2	1.9
18	Nagaland	1.2	2	1.7
19	Odisha	1.5	1.9	1.8
20	Punjab	1.6	1.7	1.6
21	Rajasthan	1.7	2.1	2
22	Sikkim	0.7	1.3	1.1
23	Tamil Nadu	1.6	1.9	1.8
24	Telangana	1.8	1.7	1.8
25	Tripura	1.4	1.8	1.7
26	Utter Pradesh	1.9	2.5	2.4
27	Uttarakhand	1.8	1.9	1.9
28	West Bengal	1.4	1.7	1.6
29	Andaman and Nicobar Island	1.4	1.2	1.3
30	Chandigarh	1.4	N.A.	1.4
31	Dadar And Nagger Haveli and Daman and Diu	1.7	1.9	1.8
32	NCT Delhi	1.6	2.5	1.6
33	Jammu and Kashmir	1.2	1.5	1.4
34	Ladakh	1.4	1.3	1.3
35	Lakshadweep	1.4	1.5	1.4
36	Puducherry	1.6	1.2	1.5

Source: *National Family Health Survey-5 (2019-2021)*

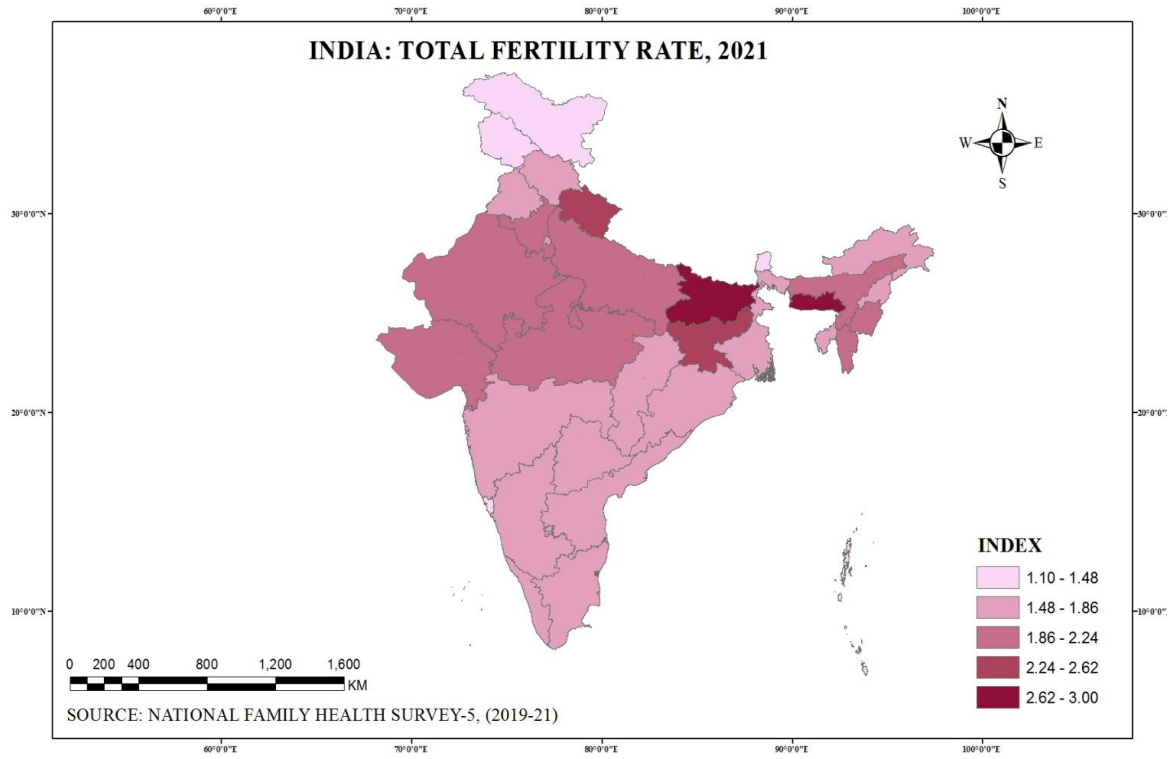


Plate No.1: Total fertility rate in India, 2021

Interpretation

From the above data collected from NFHS-5 (2019-2021) it has been inferred that in 2021 the total fertility rate of India was 2.0 children per women. Among the states and union territories, Bihar has the highest fertility rate of 3.0 children per women followed by Meghalaya (2.9), Utter Pradesh (2.4), Jharkhand (2.3), Manipur (2.2) and Madhya Pradesh (2.0). The states and union territories having average TFR include Assam (1.9), Gujarat (1.9), Haryana (1.9), Uttarakhand (1.9), Mizoram, Chhattisgarh (1.8), Arunachal Pradesh (1.8), Tamil Nadu (1.8), Dadar and Nagger Haveli and Daman and Diu (1.8) and Telangana (1.8). Whereas Sikkim has the lowest of 1.1 per female followed by Ladakh (1.3), Andaman and Nicobar (1.3), Goa (1.3), Lakshadweep (1.4), and Jammu and Kashmir (1.4)

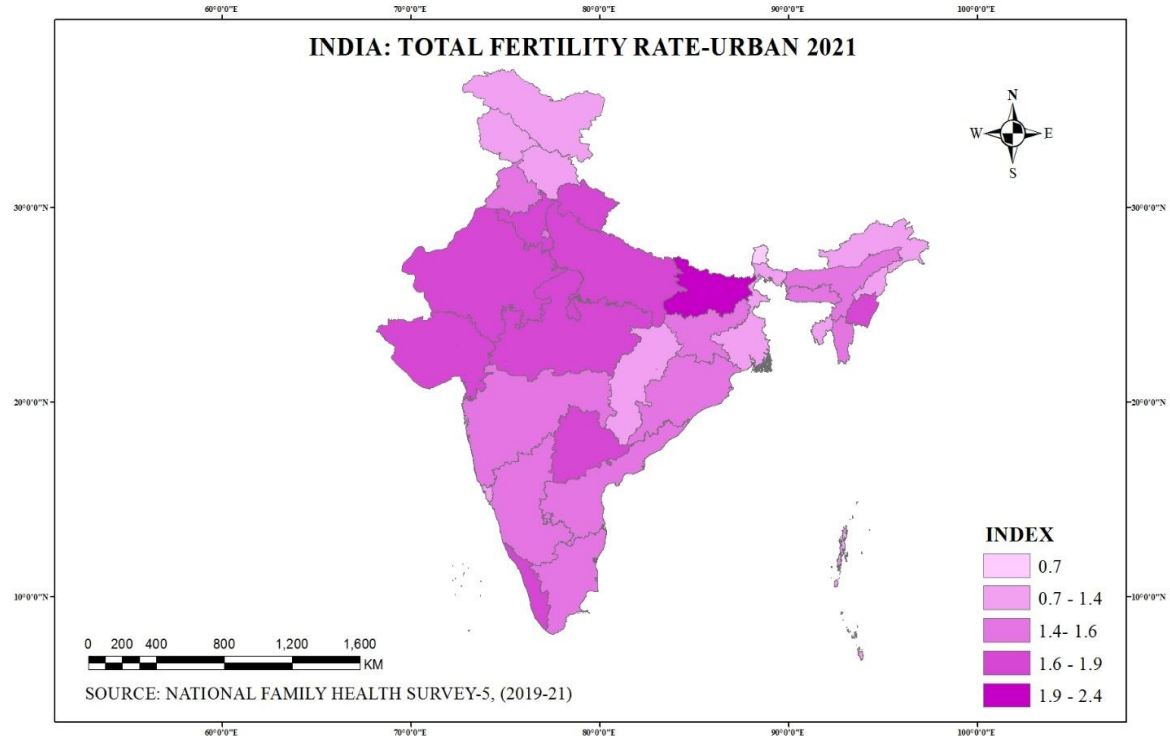


Plate No. 2: Average urban total fertility rate in India, 2021

Interpretation

From the data collected from the NFHS-5, 2019-21 and as shown in the map, it has been confirmed that in the year 2021, the average urban TFR of India is 1.6 children per women which is very low than the national average TFR of 2.0 children per women in 2021 and even from the Rural average TFR of 2.1 children per woman. Among the states and union territories, the highest average urban total fertility rate has been found in Bihar with one woman bearing 2.4 children followed by Utter Pradesh (1.9), Kerala (1.8), Madhya Pradesh (1.8), Manipur (1.8), Telangana (1.8), and Uttarakhand. The medium urban TFR has been found in Gujarat (1.7), Haryana (1.7), Madhya Pradesh Rajasthan (1.7) and Dadar and Nagar Haveli and Daman and Diu (1.7) whereas the lowest urban total fertility rate has been recorded in Sikkim with one woman bearing 0.7 children followed by Nagaland (1.2), Jammu and Kashmir (1.2), Nagaland (1.2) and Goa (1.3)

* Corresponding Author: Naveen Kumar

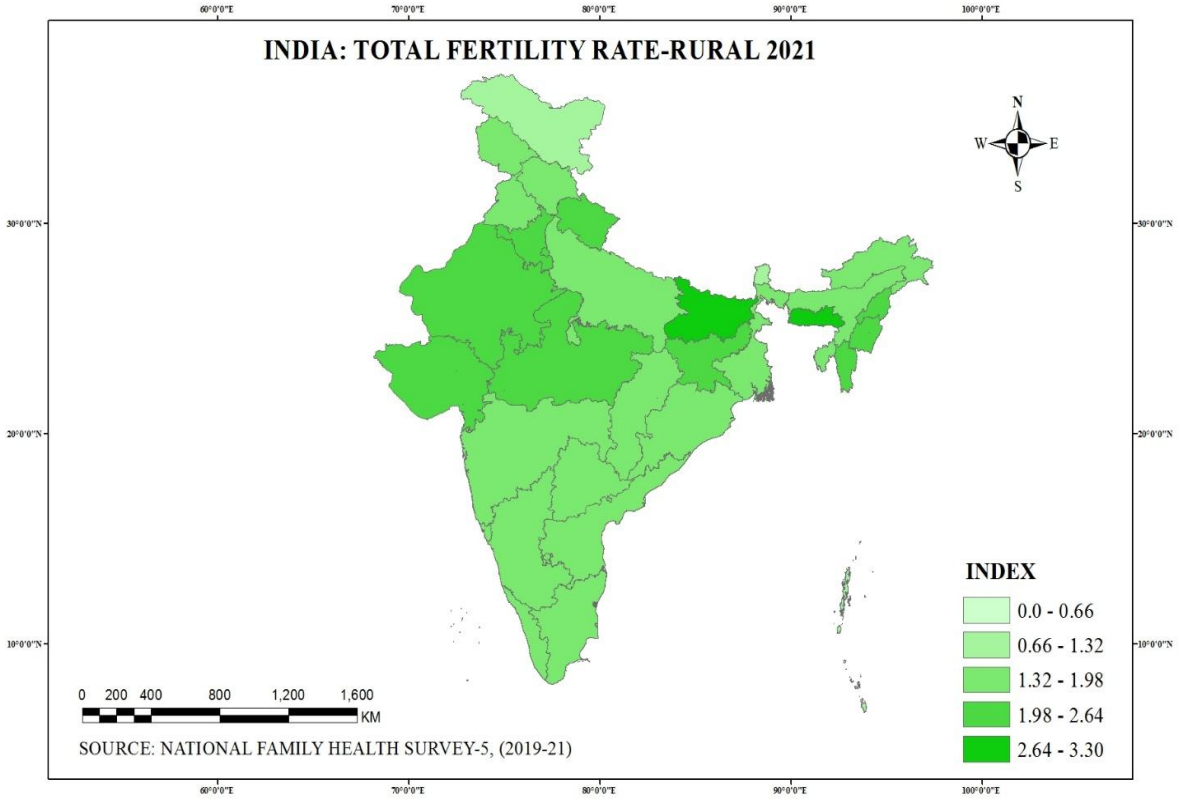


Plate No. 3: Average Rural Total Fertility Rate In India, 2021

Interpretation

From the data collected from the NFHS-5 (2019-2021) and as shown in the map it has been confirmed that the average rural TFR of India in 2021 is 2.1 children per woman which is higher than the average urban TFR (1.6) and equal to the replacement level of fertility of 2.1 children per woman.

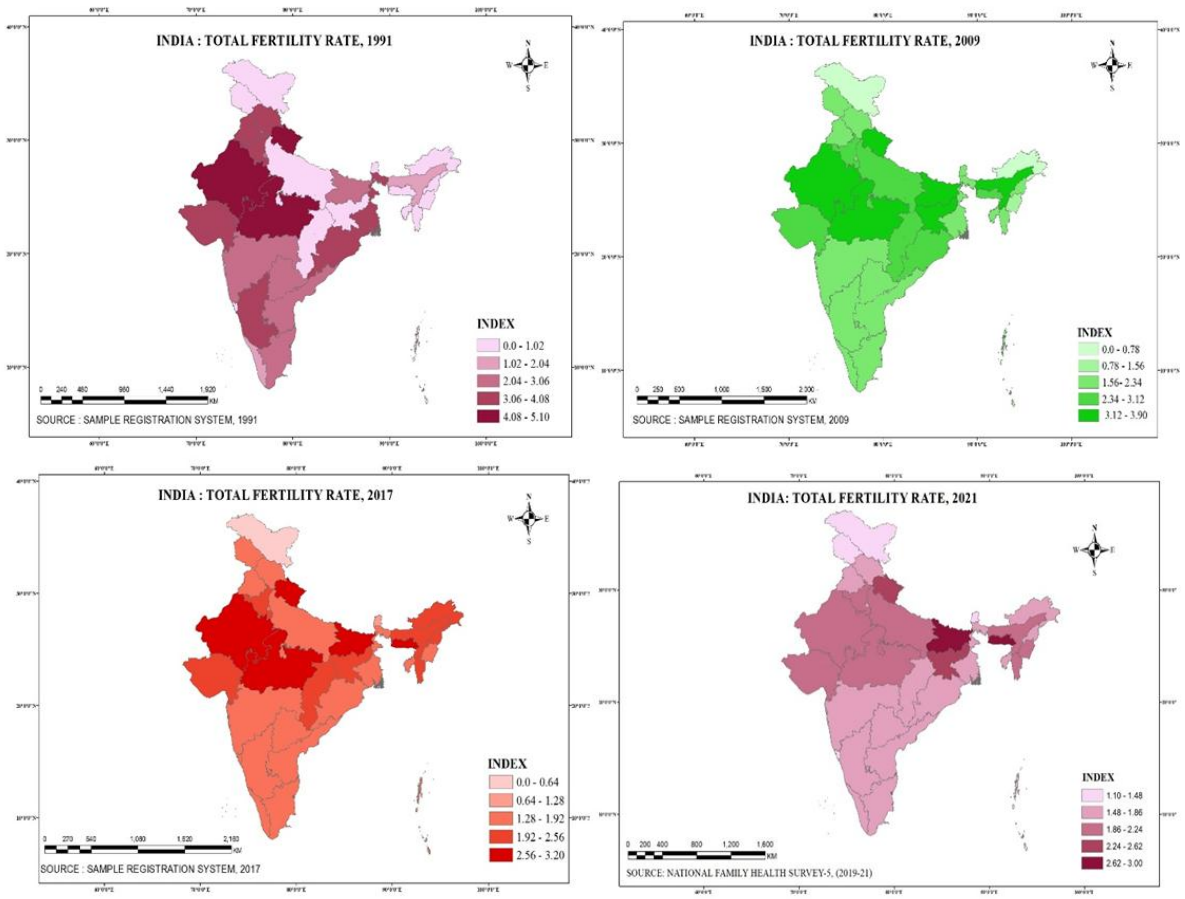
Replacement level fertility represents the level at which a population exactly replaces itself from one generation to the next, thus leading to zero population growth if the level sustained over a sufficiently long period. This rate is roughly 2.1 children per woman for most countries, although it may modestly vary with mortality rates. Among states and union territories, Meghalaya has the highest TFR in rural areas with 3.3 children per woman followed by Bihar (3.1), Utter Pradesh (2.5) and NCRT Delhi (2.5). The average rural TFR has been recorded in Manipur with 2.4 children per women followed by Mizoram (2.2), Madhya Pradesh (2.1), Rajasthan (2.1) and Gujarat (2), whereas the rural TFR has been recorded at Pondicherry (1.2), Andaman and Nicobar (1.2), Sikkim (1.3), Ladakh (1.3), Jammu and Kashmir (1.5) and Lakshadweep (1.5)

Table 2: Temporal distribution of total fertility rate in India

S.NO.	State/UT	1991	2009	2017	2021
1	Andhra Pradesh	3	1.8	1.8	1.7
2	Arunachal Pradesh	N.A.	N.A.	2.1	N.A.
3	Assam	1.9	3.5	2.3	1.9
4	Bihar	3	3.9	3.2	3
5	Chhattisgarh	N.A.	3	2.4	1.8
6	Goa	1	1.8	1.3	1.3
7	Gujarat	3.1	2.5	2.2	1.9
8	Haryana	4	2.5	2.2	1.9
9	Himachal Pradesh	3.1	2	1.9	1.7
10	Jharkhand	N.A.	3.2	2.5	2.3

11	Karnataka	3.1	1.9	1.7	1.7
12	Kerala	2	1.8	1.6	1.8
13	Madhya Pradesh	4.6	3.3	2.7	2
14	Maharashtra	3	1.9	1.7	1.7
15	Manipur	N.A.	1.5	1.4	N.A.
16	Meghalaya	N.A.	3.1	2.9	N.A.
17	Mizoram	N.A.	2	2.3	N.A.
18	Nagaland	N.A.	2	2.5	N.A.
19	Odisha	3.3	2.4	1.9	1.8
20	Punjab	3.1	1.9	1.7	1.6
21	Rajasthan	4.6	3.3	2.7	2
22	Sikkim	N.A.	2.1	1.2	1.1
23	Tamil Nadu	2.2	1.7	1.6	1.8
24	Telangana	3	1.8	1.7	1.8
25	Tripura	N.A.	1.7	1.7	N.A.
26	Utter Pradesh	5.1	3.7	2.7	2.4
27	Uttarakhand	N.A.	2.6	1.9	1.9
28	West Bengal	3.2	1.9	1.8	1.6
29	Andaman and Nicobar Island	N.A.	1.5	1.5	N.A.
30	Chandigarh	N.A.	1.8	1.8	N.A.
31	Dadar And Nagger Haveli and Daman and Diu	N.A.	2.1	2	N.A.
32	NCT Delhi	2.1	1.9	1.57	1.6
33	Jammu and Kashmir	N.A.	1.9	1.8	1.4
34	Ladakh	N.A.	N.A.	N.A.	N.A.
35	Lakshadweep	4.8	2.6	1.9	N.A.
36	Puducherry	N.A.	3.3	2.3	N.A.

Source: *Sample Registration System (1991, 2009, 2017 and 2021)*



Interpretation

From the data collected from the Sample Registration System (1991, 2009, 2017 and 2021) and as shown in the maps it has been inferred that in 1991, the total fertility rate of India was 3.6 children per woman. Among State and Union territories, Utter Pradesh has the highest total fertility rate of 5.1 children per women followed by Lakshadweep (4.8), Madhya Pradesh (4.6), Rajasthan (4.6) and Haryana whereas the lowest fertility rate has been recorded in Goa i.e. 1 birth per women followed by Assam (1.9), Kerala (2.0), and Delhi (2.1). Whereas in 2009 the TFR was 2.6 children per woman. By comparing the TFR of 1991 and 2009, a 20% decline in TFR has been found in 2009 than 1991. Among state and union territories, Bihar ranks first in the TFR with 3.9 children per woman in 2009 followed by Utter Pradesh (3.7), Assam (3.5), Madhya Pradesh (3.3) and Puducherry (3.3). Whereas the lowest TFR has been recorded in Manipur (1.5), Andaman and Nicobar Island (1.5), Tripura (1.7), Tamil Nadu (1.7), and Goa (1.8). In 2017, the TFR in India was 2.2 children per woman, a 30% decline than 1990 and 10% decline than 2009. Among the state and the union territories, Bihar recorded the highest TFR with 3.2 children per woman followed by Meghalaya (2.9,) Uttar Pradesh (2.7), Rajasthan (2.7), and Madhya Pradesh (2.7). Whereas the lowest TFR has been observed in Sikkim with I.2 children per woman followed by Goa (1.3), Manipur (1.4), Andaman and Nicobar (1.5) and NCT Delhi (1.5). In 2021, the TFR recorded in India was 2.1 births per woman, a 40% decline than 1991, 10% decline than 2009 and 4% decline than 2017. Among state and union territories, Bihar have the highest TFR (3.0) followed by Utter Pradesh (2.4), Jharkhand (2.3), Gujarat (1.9), and Haryana (1.9) and Uttarakhand (1.9). Whereas the lowest TFR has been observed in Sikkim (1.1), followed by Goa (1.3), Jammu and Kashmir (1.5) and Punjab (1.6).

Table 3 : Temporal Distribution of Total Fertility Rate at various educational level in India

S.No	Level of Education	2010	2015	2017
1	Illiterate	3.4	3.7	2.9
2	Literate without formal education	3.6	2.6	2.4
3	Below Primary	3	2.8	3.1

4	Primary	2.5	2.6	2.7
5	Metric	1.9	2	2.4
6	Class 12th	1.6	1.7	1.8
7	Graduate	1.8	1.6	N.A.

Source: Sample Registration System 2010, 2015 and 2017

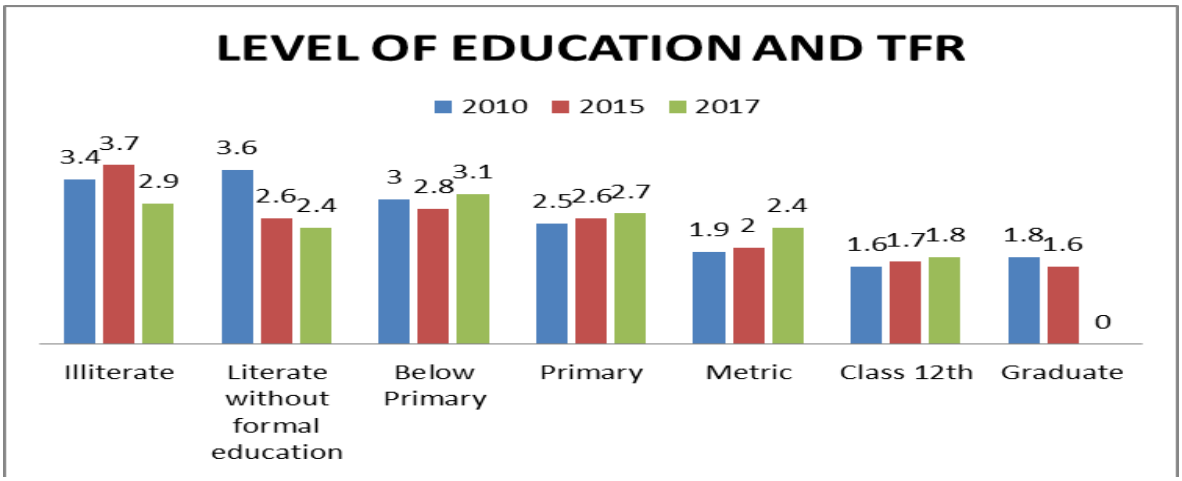


Figure 1: Level of Education and TFR in India for the year 2010, 2015 and 2017

- **TFR** = Total Fertility Rate

Interpretation

We have also tried to compute temporal distribution of TFR at various educational levels. From the table 4 it has been interpreted that in 2010 the TFR among the literates was 3.4 children per woman, in 2015 TFR among literates was 3.7 children per woman whereas in 2017 it was 2.9 children per women. By comparing TFR from 2010 to 2015, we have found that in 2015 TFR has increased about 0.3 children per women than 2010 level but in 2017 TFR has decreased about 0.5 children per women than 2010 level and 0.8 children per women than 2015 level. Among literates with formal education, the TFR in 2010 was 3.6 children per women, whereas in 2015 and 2017 it was 2.6 and 2.4 children per women respectively. By comparing the data of from 2010 to 2017 we have found in 2015 TFR has decreased about 1.0 children per women than 2010 level and in 2017 the TFR has decreased about 1.2 children per women than 2010 level and 0.2 than 2015 level. Similarly among those, whose education qualification is below primary, the TFR in 2010 was 3.0 children per women, as in 2015 it was 2.8 and in 2017 it was 3.1. In 2015 the TFR among below primary has shown decreasing trend of about 0.2 in comparison to 2010 level but in 2017 it has increased to about 0.1 than 2010 level and 0.3 than 2015 level. Among those with primary level qualification, the TFR in 2010 was 2.5, in 2015 it was 2.6 and in 2017 it was 2.7. In 2015 the TFR among primary has increased to about 1.0 than 2010 level and in 2017 it has increased to about 0.2 than 2010 level and 0.1 than 2015 level. Among metric the total fertility rate in 2010 was 1.9, in 2015 it was 2.0 and in 2017 it was 2.4. In 2015 it has increased to 0.1 than 2010 level and in 2017 it has increased to 0.4 than 2015 level and 0.5 than 2015 level. Among 12^{th} class the TFR in 2010 was 1.6, in 2015 the TFR was 1.7 and in 2017 the TFR was 1.8. By comparing data of the year 2010, 2015 and 2017 we have found that the TFR among in 2015 the Total Fertility Rate has increased to 0.1 than 2010 level, whereas in 2017 it has increased to 0.2 than 2010 level and 0.1 than 2015 level. Among graduates, the TFR in 2010 was 1.8, in 2015 it was 1.6 children per women but data is not available for 2017. TFR has decreased about 0.2 in 2015 than 2010 level among graduates.

Conclusion

Concluding, in this report we analyse that the TFR of India has been declining as in 1991 the total fertility rate of India was 3.6 children per woman, in 2009 the total fertility rate was 2.6 children per woman which shows about 20% decline in TFR than 1991. Again in 2017 the total fertility rate was 2.2 children per woman which further shows a decline of 30% than 1901 and 10% than 2015. In 2021 the TFR of India was 2.0 children per woman which again show a decline of 40% than 1991, 10% than 2015 and 4% than 2017. It indicates that the majority of females has accepted the various family planning policies of the government and restricts their family size up to two children. The progression of females is also influenced by their socio-

economic and educational status. There are many reasons which are responsible for decreasing TFR in India such as women empowerment, use of contraceptive, reversible spacing, etc. Besides, various initiatives are being taken by the government to control the rapid growth population and TFR. Some of them are Mission Parivar Vikas, National Family Planning Indemnity Scheme (NFPIS), and Compensation Scheme for Sterilization Acceptors.

Among state and union territories, the following trends have been observed with regard to the TFR.

- In 2021 India's TFR was 2.1 children per woman. Among state and union territories Bihar has the highest TFR with 3.0 children per woman followed by Meghalaya (2.9), Utter Pradesh (2.4), Jharkhand (2.3) and Manipur (2.2).
- Whereas the lowest TFR has been recorded in Sikkim with 1.1 children per woman followed by Ladakh (1.3), Andaman and Nicobar (1.3), Goa (1.3), Lakshadweep (1.4) and Jammu and Kashmir (1.4).
- The highest average urban TFR of India in 2021 was 2.1 which is higher than the average urban TFR (1.6) and equal to the replacement level of fertility of 2.1 children per woman.
- Among the states and union territories, the highest average urban total fertility rate has been found in Bihar with one woman bearing 2.4 children followed by Utter Pradesh (1.9), Kerala (1.8), Madhya Pradesh (1.8), and Manipur (1.8).
- Whereas the lowest urban total fertility rate has been recorded in Sikkim with one woman bearing 0.7 children followed by Nagaland (1.2), Jammu and Kashmir (1.2), Nagaland (1.2) and Goa (1.3).
- The average rural TFR of India in 2021 was 2.1 children per woman which is higher than the average urban TFR (1.6) and equal to the replacement level of fertility of 2.1 children per woman.
- Among states and union territories, Meghalaya has the highest average TFR in rural areas with 3.3 children per women followed by Bihar (3.1), Utter Pradesh (2.5) and NCRT Delhi (2.5).
- Whereas the lowest average rural TFR has been recorded at Puducherry (1.2), Andaman and Nicobar (1.2), Sikkim (1.3), Ladakh (1.3), Jammu and Kashmir (1.5) and Lakshadweep (1.5).
- In 2010 the TFR among the illiterates was 3.4 children per woman; in 2015 TFR among literates was 3.7 children per woman whereas in 2017 it was 2.9 children per women.
- Among literates without formal education, the TFR in 2010 was 3.6 children per women, whereas in 2015 and 2017 it was 2.6 and 2.4 children per women respectively.
- Among those having education qualification below primary, the TFR in 2010 was 3.0 children per women, as in 2015 it was 2.8 and in 2017 it was 3.1.
- Among those having primary qualification, the TFR in 2010 was 2.5, in 2015 it was 2.6 and in 2017 it was 2.7.
- Among metric the total fertility rate in 2010 was 1.9, in 2015 it was 2.0 and in 2017 it was 2.4.
- Among 12^{th} class the TFR in 2010 was 1.6, in 2015 the TFR was 1.7 and in 2017 the TFR was 1.8.
- Among graduates, the TFR in 2010 was 1.8, in 2015 it was 1.6 children per women but data is not available for 2017.

The decreasing trend of the total fertility rate is due to the following causes:

Women Empowerment: The latest data also show significant progress on several indicators related to fertility, family planning, age at marriage and women's empowerment — all of which have contributed to the decrease in TFR.

Contraceptives: Also, there has been a significant increase in current use of any modern contraceptive method. Contraceptive Prevalence Rate has increased substantially from 54% to 67% at the all-India level.

Reversible Spacing: Introduction of new reversible spacing (gaps between children) methods, wage compensation systems to undergo sterilization, and the promotion of small family norms also worked well over the years.

Government Efforts: India has for long been working on population control. In fact, India was the first country to launch a national-level family planning programme and the encouraging results that we see now are due to sustained, concerted efforts put together by the Centre, and the state governments

Related Government Initiatives

Prime Minister's Appeal: During his Independence Day Speech in 2019, the Prime Minister appealed to the country that population control was a form of patriotism.

Mission Parivar Vikas: The Government has launched Mission Parivar Vikas in 2017 for substantially increasing access to contraceptives and family planning services in146 high fertility districts with TFR of 3 and above in seven high focus states.

National Family Planning Indemnity Scheme (NFPIS): This scheme was launched in the year 2005 under this scheme clients are insured in the eventualities of death, complication and failure following sterilization.

Compensation scheme for Sterilization Acceptors: Under the scheme, the Ministry of Health and Family Welfare provides compensation for loss of wages to the beneficiary and also to the service provider (& team) for conducting sterilizations from the year 2014.

Reference

[1]. United Nations Department of Economic and Social Affairs, "Population Division," 2019.
[2]. International Programs Centre at the U.S., Census Bureau, Population Division, International Programs Centre at the U.S., 2019.
[3]. Tiwari, A.K, Mishra, S (2021) Fertility pattern in India and estimation of Total Fertility Rate. International Journal of Agriculture and Statistical Science.
[4]. Tiwari, A, Singh, B.P, Patel, V, (2020) Retrospective Study of Investigation of Possible Predictors for Total Fertility Rate in India.
[5]. Dr. Smartson, P NYONI, Tatenda. A. CHIHOHO, Tabani NYONI, (2021) Projection of Total Fertility Rate (TRF) In Romania. International Journal of Innovations in Engineering and Technology – IRJIET. Vol. 5.
[6]. Mahanta. A, (2016) Impact of Education on Fertility: Evidence from a Tribal Society in Assam, India. International Journal of Population vol. 2016,
[7]. Simpach, O, Pechrova, M, (2018) Determinants influencing total fertility rate in The Czech Republic. The 12 th International Days of Statistics and Economics At: Prague.
[8]. S.D, Attri, Tyagi, A, (2010) Climate profile of India. Environment Monitoring and Research Centre, India Meteorological Department.
[9]. Imoh, J.A, Stephen, A.A, Imoh, L, Onhu, S (2015) Contraceptive Use and Adjusted Total Fertility Rate Among Women of Reproductive Age in Northern Nigeria. Journal of Medicine. Vol. 9
[10]. Reshadat S, Zanganeh AR, Saeidi SH, Rajabi Gilan N, Bavandpour E, Ghasemi SR. Factors related to total fertility in Kermanshah city. J Kermanshah Univ Med Sci. 2014;18(11):666–73 In Persian
[11]. Bali, R. (2003). Fertility decline and social change: new trends and challenges. Can Study Population, Vol. 30(2): 297-326
[12]. United Nations, Population Division. World population prospects. United Nations: Department of Economic and Social Affairs, New York; 2007