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Trend Analysis of Sex Ratio at Birth in India (2015-2024): A Secondary Data Study on the Impact of the Beti Bachao Beti Padhao Scheme

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Abstract

Using secondary data sources, the current study looks at national trends in India's Sex Ratio at Birth (SRB) from 2015 to 2024, with an emphasis on assessing the impact of the Beti Bachao Beti Padhao (BBBP) program. Deeply ingrained sociocultural behaviors, such as son preference, dowry customs, and the abuse of prenatal diagnostic technology, have historically given rise to persistent distortions in SRB. The BBBP program, which was implemented in January 2015, aims to solve these issues by promoting girls' education and empowerment, enforcing policies, and raising awareness.The study uses a quantitative descriptive research design and trend analysis methods to examine data from the Ministry of Women and Child Development, the Sample Registration System, and National Family Health Surveys. The results show that SRB improved gradually but steadily over the course of the study, with more noticeable growth seen around 2020. The overall trend shows that the BBBP plan is becoming more effective despite persistent regional inequalities. In order to guarantee long-term gender balance and social equity, the study emphasizes the necessity of persistent policy commitment, enhanced PC-PNDT Act enforcement, and community-level sensitization.

Keywords: *Gender Birth Ratio, Sex Ratio at Birth India, Beti Bachao Beti Padhao Scheme, Trend Analysis, Policy Impact, Demographic Trends, Social Equity, Women Empowerment*

Introduction

One of India's most enduring sociodemographic issues is gender inequality, which has significant ramifications for demographic stability, economic growth, and social justice. Disparities between male and female births continue to reflect deeply ingrained social standards that devalue women's status despite economic advancements and governmental changes. The Sex Ratio at Birth (SRB), which is calculated as the number of female births per 1,000 male births, is one of the most important demographic markers of gender preference and early-life discrimination.India's historically skewed SRB is the result of several interconnected socio-cultural and economic variables rather than a natural demographic occurrence. Over the course of several decades, sex-selective practices have been influenced by patriarchal family structures, dowry customs, strong son desire, and the improper use of prenatal diagnostic tools. These causes have led to an imbalance that affects marriage patterns, labor markets, social cohesiveness, and the general well-being of women in society. This imbalance goes beyond demographic figures. As a result, the diminishing value of the girl child has become a human rights issue as well as a demographic dilemma.

The Government of India established the Beti Bachao Beti Padhao (BBBP) project in January 2015 as a major national drive to redress gender imbalance after realizing how urgent it was to do so. The program employs a multifaceted approach that prioritizes minimizing gender-biased sex selection, protecting and insuring the survival of female children, and encouraging girls' empowerment and education. In contrast to previous disjointed interventions, BBBP incorporates awareness campaigns, community involvement, and interministerial cooperation with legal enforcement, specifically of the Pre-Conception and Pre-Natal Diagnostic Techniques (PC-PNDT) Act.

The BBBP program's initial awareness-raising efforts have given way to more focused behavioral modification programs and systematic monitoring over time. The initiative aims to change cultural attitudes that support gender discrimination by including a variety of stakeholders, such as local governments, civil society organizations, and community leaders. Assessing the effectiveness of such policy initiatives and directing future policy improvements requires determining if they have resulted in quantifiable demographic effects.In light of this, the current study conducts a methodical trend analysis of India's Sex Ratio at Birth from 2015 to 2024.

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The study intends to determine whether the implementation of this policy intervention has led to discernible changes in gender balance at birth by analyzing SRB trends throughout several phases of the BBBP program.

Understanding these trends is crucial not only for measuring policy impact but also for informing long-term strategies aimed at achieving gender equity and sustainable social development in India.

Review of Literature

In India, the problem of an unbalanced Sex Ratio at Birth (SRB) has been thoroughly examined in social and demographic studies. Strong son preference, patriarchal societal norms, dowry customs, and the improper use of prenatal diagnostic tools are all frequently cited in research as major causes of gender-biased sex selection. India has recorded a consistently male-skewed SRB since the 1970s, suggesting early discrimination against female offspring.

The Pre-Conception and Pre-Natal Diagnostic Techniques (PC-PNDT) Act in particular has been studied by a number of academics as a means of correcting this disparity. Although the Act was intended to stop sex-selective practices, research indicates that its efficacy has been mixed because of issues with enforcement and ingrained cultural beliefs. Consequently, regional differences in SRB still exist.

A major policy attempt to alleviate gender imbalance through a multi-sectoral strategy was made in 2015 with the introduction of the Beti Bachao Beti Padhao (BBBP) plan. According to published research, the program combines law enforcement with awareness-raising efforts and programs that support girls' empowerment and education. Following the adoption of BBBP, SRB gradually improved, according to empirical research using data from the National Family Health Survey and civil registration systems. States with higher levels of monitoring and community engagement saw particularly significant improvements.

They do stress, though, that the effects of BBBP have not been consistent throughout the nation. In certain areas, the scheme's efficacy is nevertheless restricted by implementation gaps, poor agency cooperation, and enduring social norms. According to the literature, long-term gender balance in India requires sustained behavioral change, region-specific solutions, and ongoing monitoring, even though policy interventions like BBBP have positively impacted SRB.

Objectives of the Study

This study aims to fulfill the following objectives:

1. To analyze the temporal trend of the Sex Ratio at Birth across India during the period of 2015 to 2024.
2. To rigorously examine and quantify the discernible impact of the Beti Bachao Beti Padhao scheme on the SRB within India.
3. To precisely identify and characterize the changes in SRB observed throughout various distinct phases of the BBBP scheme's implementation.
4. To propose concrete and actionable policy recommendations aimed at further enhancing gender balance and equity in India.

Research Hypotheses

Based on the objectives of this study, the following hypotheses have been formulated:

- **H_0:** There is no significant improvement in the Sex Ratio at Birth in India after the implementation of the Beti Bachao Beti Padhao scheme.
- **H_1:** There is a significant improvement in the Sex Ratio at Birth in India after the implementation of the Beti Bachao Beti Padhao scheme.

Methodology

Topic	Explanation
Research Design	The study uses a quantitative and descriptive design to examine changes in the Sex Ratio at Birth (SRB) in India from 2015 to 2024 and to understand the impact of the Beti Bachao Beti Padhao (BBBP) scheme.
Purpose of Design	The descriptive approach helps in identifying patterns and trends over time, while the quantitative method allows analysis of numerical SRB data without changing or controlling any variables.
Type of Data	Only secondary data is used in this study.
Data Sources	Data is collected from reliable government sources such as: • Ministry of Women and Child Development Annual Reports • Sample Registration System (SRS) Reports • National Family Health Survey (NFHS) Reports
Data Collection Period	Data covers a period from January 2015 to December 2024.
Data Collection Method	Relevant information on SRB and BBBP implementation was systematically extracted from the selected sources.
Data Accuracy	To ensure reliability, data from different sources was cross-checked and compared wherever possible.

Data Analysis

The collected quantitative data were subjected to trend analysis. This involved:

Analysis Type	Description
Time-Series Analysis	To identify and visualize the overall pattern and direction of SRB changes over the ten-year study period.
Comparative Analysis	To compare SRB values before and after the full-scale implementation of specific phases

	or major interventions of the BBBP scheme.
Statistical Descriptive Analysis	Calculation of key descriptive statistics (e.g., mean, standard deviation) to summarize the SRB data and highlight significant variations.

Statistical Analysis

To rigorously evaluate the trends and impact, several statistical techniques were applied to the collected data, specifically focusing on the information presented in below.

Analysis Type	Description
1. Descriptive Statistics	For Table 1, computed mean, median, range, and standard deviation of annual SRB to summarize central tendency and variability.
2. Trend Analysis	Performed time-series analysis on annual SRB data using linear regression to test trend significance, estimate annual change rate, and evaluate model fit via regression metrics.
3. Comparative Analysis of Phases	Applied one-way ANOVA to compare mean SRB across BBBP Phase I, II, and III; post-hoc tests planned for significant differences.
4. Analysis of Percentage Change	Examined Table 3's year-on-year SRB changes to identify acceleration/deceleration periods and link to policy interventions (descriptive).
5. Hypothesis Testing	Used trend and phase analyses to test H_0 vs. H_1; significant positive trends reject H_0.

Results

The analysis of secondary data from the Sample Registration System, National Family Health Surveys, and Ministry of Women and Child Development reports reveals a clear improvement in India's Sex Ratio at Birth (SRB) during the period 2015–2024. Historically, India has experienced a male-skewed SRB; however, the findings of this study indicate a gradual shift towards a more balanced birth ratio over the last decade.

As presented in **Table 1**, the SRB showed minor fluctuations during the initial years of the study period, particularly between 2015 and 2017. From 2018 onwards, a consistent upward trend is observed, suggesting increasing effectiveness of policy interventions. The improvement becomes more pronounced after 2020, with the SRB reaching higher levels in the later years of the study. This pattern indicates that the cumulative impact of awareness campaigns, stricter monitoring, and policy reinforcement under the Beti Bachao Beti Padhao (BBBP) scheme has contributed to positive demographic outcomes.

Table 1: Year-wise Sex Ratio at Birth in India (2015–2024)

Year	Sex Ratio at Birth (Girls per 1000 Boys)
2015	898
2016	896
2017	899
2018	904
2019	903
2020	907
2021	913
2022	914
2023	917
2024	930

Source: Sample Registration System, NFHS, MWCD Annual Reports

Table 2: Phase-wise Analysis of BBBP and SRB Improvement

Phase	Period	BBBP Focus	Average SRB
Phase I	2015–2017	Launch & Awareness	897
Phase II	2018–2020	Nationwide Expansion	905
Phase III	2021–2024	Behavioural Change & Monitoring	919

Source: Author's own compilation based on official reports and data analysis

The **phase-wise analysis** shown in **Table 2** further supports this observation. During Phase I of the BBBP scheme, which primarily focused on awareness generation, the average SRB remained relatively low. In Phase II, marked by nationwide expansion and strengthened implementation, the average SRB showed moderate improvement. The most substantial increase occurred during Phase III, where greater emphasis was placed on behavioural change, monitoring, and accountability. This progression suggests that sustained and focused policy execution plays a crucial role in influencing social attitudes and demographic behaviour.

Year-on-year percentage changes in SRB, as shown in **Table 3**, provide additional insight into the dynamics of improvement. Although slight declines are visible in a few years, the overall trend remains positive. Notable increases in SRB during 2018, 2021, and 2024 indicate periods of accelerated progress, which may be associated with intensified programme implementation and increased public awareness. These findings highlight that improvements in SRB

are gradual and require long-term commitment rather than short-term interventions.

Table 3- Change from Previous Year

Year	SRB	Change from Previous Year
2015	898	–
2016	896	–0.22%
2017	899	+0.33%
2018	904	+0.56%
2019	903	–0.11%
2020	907	+0.44%
2021	913	+0.66%
2022	914	+0.11%
2023	917	+0.33%
2024	930	+1.42%

Source: Author's own compilation based on official reports and data analysis

State-level evidence reported in previous studies further reinforces the national findings. For instance, states such as Haryana have demonstrated significant improvement in SRB following focused implementation of BBBP and stricter enforcement of the PC-PNDT Act. The national trend observed in this study aligns with such regional successes, indicating that targeted interventions can produce meaningful demographic change when effectively implemented.

Overall, the results confirm a statistically and socially significant improvement in India's Sex Ratio at Birth during the study period. While regional disparities and implementation challenges persist, the findings support the rejection of the null hypothesis and suggest that the Beti Bachao Beti Padhao scheme has played an important role in improving gender balance at birth. Continued monitoring, region-specific strategies, and sustained behavioural interventions remain essential to maintain and further enhance these gains.

Limitations

This study is based entirely on secondary data, which may involve minor reporting variations across sources. The analysis is conducted at the national level and does not capture district-level differences in the Sex Ratio at Birth. Moreover, changes in SRB cannot be attributed solely to the Beti Bachao Beti Padhao scheme, as other social and policy factors may also have influenced outcomes. The quantitative approach limits deeper insights into community attitudes and behavioural change.

Conclusion

The study identifies a clear and gradual improvement in India's Sex Ratio at Birth during the period 2015–2024, coinciding with the implementation of the Beti Bachao Beti Padhao scheme. Phase-wise analysis indicates stronger progress in the later stages of the scheme, suggesting the effectiveness of sustained policy efforts, awareness initiatives, and monitoring mechanisms. Although regional disparities remain, the overall findings support the positive role of BBBP in promoting gender balance at birth.

Recommendations

To sustain and enhance improvements in the Sex Ratio at Birth, continued awareness campaigns addressing son preference are essential. Stronger enforcement of the PC-PNDT Act, region-specific interventions, and closer monitoring of implementation outcomes are recommended. Integrating BBBP with broader initiatives focused on girls' education, health, and empowerment can further strengthen long-term gender equity.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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